

Case Study: Food Safety Regulation in 2020 during the COVID-19 Pandemic



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Published by:

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2021

ISBN: 978-1-910348-52-9

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1. Background

1.1 Functions of the Food Safety Authority of Ireland

The Food Safety Authority of Ireland (FSAI) was the first independent state agency in Europe focussed on food safety. Established in 1999 by the Food Safety Authority of Ireland Act 1998, the Authority operates as an independent body under the aegis of the Department of Health (DoH) and is overseen by a Board appointed by the Minister of Health. The Board of the FSAI is required by the FSAI Act to *'direct and carry out the functions of the Authority, satisfy itself as to the adequacy of the systems in place for that purpose and otherwise manage and review the workings of the Authority'*.

The DoH retains the policy function concerning food law in conjunction with the Department of Agriculture, Food and the Marine (DAFM). Both Departments draft national food law and ensure that it is enforceable by the FSAI. To achieve the highest level of protection reasonably attainable in the interests of public health and consumer protection, the FSAI conducts its activities to foster the establishment and maintenance of high standards of food hygiene and safety throughout the food chain. This includes organisation and oversight of the official controls system in Ireland which are, according to the FSAI Act, *'directed to bringing about a general acceptance amongst food businesses of the principle that, in respect of any food placed on the market, the primary responsibility for the safety and suitability of the food for human consumption is borne by them individually or, as appropriate, collectively'*. With respect to this activity, the FSAI establishes service level agreements with 36 providers of food inspection services, collectively referred to as the Official Agencies, and monitors and reports on these activities to seek continuous improvement and accountability through a programme of regular audits.

The FSAI provides the Government with the best independent scientific advice to underpin policy and risk analysis in respect of food safety and supports the development of a risk-based well-functioning, robust and proportionate food regulatory framework. It is required to consider and keep under review, the efficacy of the food inspection services and collect and analyse statistical data on official controls performed for the verification of compliance with the rules of food legislation and production, consumption of food. The Authority works with all stakeholders in the food chain to facilitate compliance with food law and to engage with the agri-food sector to improve standards of food safety and hygiene.

1.2 The early COVID-19 pandemic

In late December 2019 cases of human pneumonia of unknown cause emerged in Wuhan, Hubei Province China, with clinical presentations like viral pneumonia caused by a novel coronavirus (WHO, 2020). This virus was later named SARS-CoV-2 and the illness was called COVID-19 by the World Health Organisation (WHO)¹. This virus circulated throughout the world in 2020, leading to the WHO declaring a pandemic in March 2020. Vaccines, effective against SARS-CoV-2 were developed during 2020 and authorised for use at the start of 2021. Consequently, in 2020, the only measures available to stem the tide of COVID-19 were social distancing, face coverings, hand sanitisation and severe restriction on the movement of people including restrictions on travel and gatherings.

On the island of Ireland the first case of COVID-19 was diagnosed on the 26 February 2020 in a person returning from Northern Italy (Perumal et al., 2020). On 12 March 2020, the then Taoiseach Leo Varadkar announced the closure of all education establishments². Many parents were forced to leave the workplace and work from home. By 27 March 2020, all but listed essential workers were required to stay at home with no movement outside a 2km radius of home³. A list of essential workers who could attend the workplace was published by Government on 28 March 2020. It included those working in the food industry and “*regulation, inspection and certification services, necessary to support essential services*”⁴. Although initially planned as a short-term event, working from home continued throughout 2020 and well into 2021 including periods with varying movement restrictions.

These restrictions greatly affected the food industry, the FSAI and the Official Agencies charged with regulation of the food industry. They resulted in significant disruption to, and reconfiguration of the food supply chain, suspension of some official controls and other official control activities, cessation of business-to-business food safety verification activities and considerable restrictions on the nature and frequency of official controls.

¹ WHO Naming the coronavirus disease (COVID-19) and the virus that causes it ([link](#) accessed 12/8/21)

² Statement Department of Education ([link](#) accessed 12/8/21)

³ Briefing of the government response to COVID-19 ([link](#) accessed 12/8/21)

⁴ Irish Times article ([link](#) accessed 12/8/21)

2. Impact of the early part of the pandemic in 2020

2.1 Early warning and early action

The FSAI has an emerging risk brief to protect public health which is aimed at early identification of signals of risks in the food chain and at the time this system included monitoring news and scientific articles. On 5 January 2020, the World Health Organisation (WHO) issued the first disease outbreak news that mentioned a seafood and live animal market in connection to an outbreak of pulmonary disease in Wuhan, China (WHO, 2020). Later, on 11 January 2020, a news article from New Scientist, published on 7 January 2020, was circulated within the FSAI emerging risk team which discussed the issue and noted that doctors had ruled out viruses known to cause severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and Bird Flu (Hamzelou, 2020). An early report from the European Centre for Disease Prevention and Control (ECDC) on the 9 January 2020 concluded: *“Considering there is no indication of human-to-human transmission and no cases detected outside of China, the likelihood of introduction to the EU is considered to be low, but cannot be excluded”* (ECDC, 2020a).

Following these signals of a potential emerging risk, the FSAI continued to monitor the WHO and ECDC reports closely, especially as the cause was unknown and the outbreak in Wuhan, China was linked to a food market. The tipping point for the FSAI came on the 26 January 2020 when an ECDC report highlighted the first imported cases into the EU, which were identified in France, and urged Member States to strengthen capacity to deal with an outbreak (ECDC, 2020b).

This prompted the FSAI to publish, on the 4 February 2020, the first of what was to become many iterations of advice to consumers and food businesses on COVID-19. The initial advice outlined what the virus was and the fact that there was no evidence of transmission through food. This was published on 4 February 2020 and was focussed on the FSAI food safety mandate by providing advice on basic hygiene measures that could be taken by food business operators (FBOs) to prevent cross-contamination of food with SARS-CoV-2 (FSAI, 2020a). There was a high level of interest in this information, and visits to this website page rose quickly and peaked initially on the 15 February 2020 at 2136 page views (Figure 1).

Early Warning and Early Action

The FSAI has an emerging risk brief to protect public health by identifying early signals of risks in the food chain.



December 2019

Cases of human pneumonia of unknown cause emerges in Wuhan, Hubei Province China, caused by a novel coronavirus.

5 January 2020

The World Health Organisation issue the first disease outbreak news on the issue.



9 January 2020

A report from ECDC concludes: "likelihood of introduction to the EU is considered to be low, but cannot be excluded".

11 January 2020

The FSAI become aware that known viruses that cause severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and Bird Flu have been ruled out.



26 January 2020

The FSAI become aware of an ECDC report highlighting the first cases in the EU,

4 February 2020

The FSAI publishes advice for consumers and food businesses on COVID-19. It proves very popular and peaks initially on the 15 February 2020 at 2,136 page views.



13 March 2020

The FSAI moves to remote working. Technology is utilised to facilitate meetings, events, information dissemination and more.



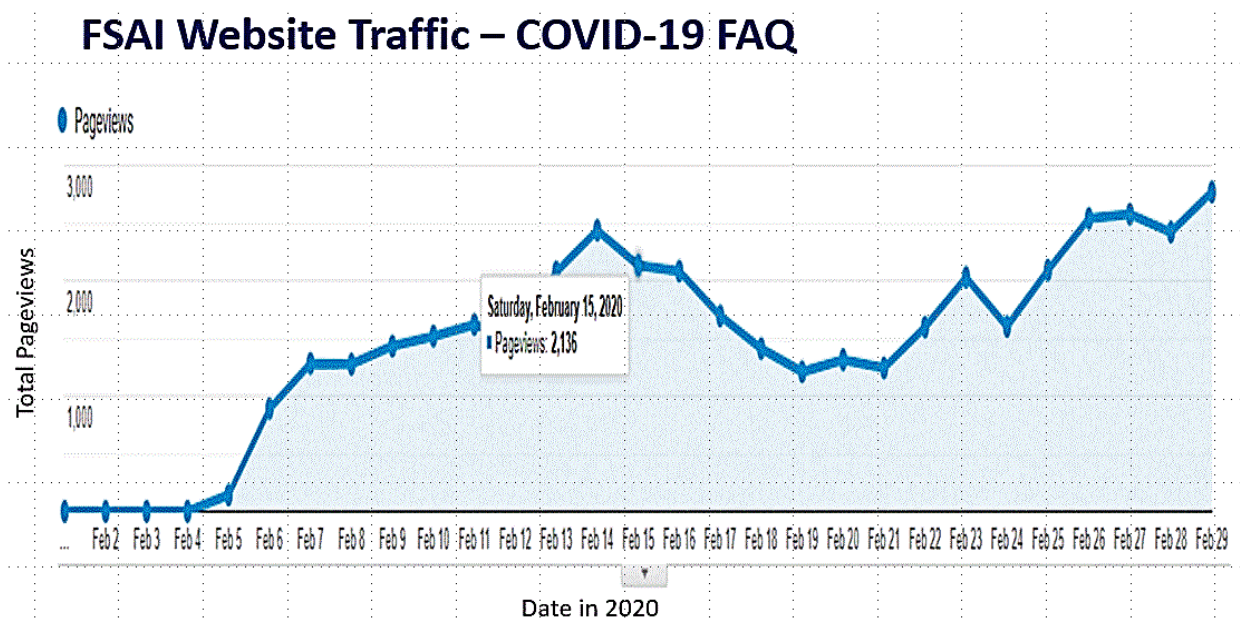


Figure 1: Pattern of page views through February 2020 for the FSAI FAQ on COVID-19

2.2 Preparedness within the FSAI

The FSAI is charged with the enforcement of food law and the protection of consumers’ health, irrespective of a pandemic. During February 2020 it became clear that, at the very least, FSAI could face a situation where staff were unwell or caring for other ill people and unable to attend the workplace. Therefore, a small group led by the Director Food Science and Standards, developed a COVID-19 incident management plan which established the recommended organisation, actions and procedures needed to:

- Respond to the COVID-19 incident
- Assess the situation quickly and effectively
- Notify the appropriate individuals about the incident
- Organise the FSAI’s response activities
- Escalate the FSAI’s response efforts based on the severity of the situation
- Support the business recovery efforts being made in the aftermath of the incident.

The plan was developed on three assumptions:

- A complete interruption of the FSAI office and associated facilities would occur, and there would be no access to the office or critical equipment.
- A partial or total loss of staff at the FSAI would occur due to employee illness or Health Service Executive (HSE) initiated containment measures and only a limited number of employees would be available to continue normal business operations.

- Enough staff with adequate knowledge would be available to facilitate recovery.

The plan laid out scenarios that would trigger the establishment of an incident response team with the FSAI Chief Executive Officer as Chairperson or, in her absence, the Director of Corporate Affairs. It specified the composition and responsibilities of the team, an initial meeting schedule and a draft agenda for meetings. The plan also specified how meetings would take place virtually and where documents would be stored. Nine priority FSAI functions were identified including external activities like food incident management and media communications as well as internal activities like payroll, HR and IT services. A lead and deputy person responsible for each area was assigned and these people were charged with preparedness activities like remote working tests and development of internal communication plans.

As COVID-19 started to accelerate in Ireland, discussions started about national control measures and on the 12 March 2020 all education establishments were closed leading to a significant number of FSAI staff being unable to attend the workplace. This scenario triggered activation of the Incident Management Plan and the first meeting of the Incident Response Team was held on 13 March 2020. This group continued to meet weekly until 5 June 2020 whereupon the FSAI was firmly established as a remote working organisation and such meetings were no longer necessary being replaced by other groups looking at the long-term response to the pandemic.

2.3 Early effects of COVID-19 on the food supply chain

An inevitable effect of COVID-19 arriving in Ireland was panic buying of certain grocery commodities. A Nielsen survey found the average grocery spend in the week ending 15 March 2020, was up 21% on the 2019 weekly average spend. They reported sales of non-perishable foods like pasta and rice were more than €16 million higher than the same period in 2019 (Irish Independent, 2020). This unexpected surge threatened the food supply chain causing shortages of certain foods which further fuelled the panic. The Government moved to reassure people that retailers would remain open. Some retailers imposed quotas to limit the impact of panic behaviours.

Threats to the food supply chain spread across European Union (EU) borders. The free movement of goods and people is a cornerstone of EU policy, yet in the early days of the pandemic, borders were closed, and food was stopped in transit further exacerbating the strain on the food supply chain. The European Commission (EC) worked hard to convince Governments to relax border restrictions and free up the movement of goods, finally issuing guidelines which struck a balance between health protection and the availability of goods and essential services (EC, 2020).

Nevertheless, supply chain problems meant that FBOs were faced with situations requiring rapid identification of alternative ingredients. This resulted in unavoidable breaches of food labelling

legislation. However, given the extraordinary situation, the FSAI provided further advice via FAQs that focused on FBOs maintaining compliance with the safety aspects of food law like allergen labelling, prioritising these over non-health related compliance issues like origin labelling. Overlaying of product labels was allowed and FBOs were warned not to overlook the allergenicity, chemical and microbiological safety aspects of new ingredients. Inevitably the food supply chain became vulnerable to fraud and food safety problems as due diligence checks on suppliers decreased because of movement restrictions and suspension of third-party audits, the mainstay of business-to-business checks and balances.

Consumer concerns about the safety of food were many and varied in those early months of the pandemic despite continuing reassurance that SARS-CoV-2 was not foodborne. People were particularly concerned about the cross-contamination of loose food in supermarkets from other people infected with SARS-CoV-2. The prevention of cross-contamination of loose food was both a food safety problem and a health and safety problem. From a food safety perspective, retailers were reminded of their obligations for hygiene, sanitation of surfaces and frequent hand washing. They were also advised to reduce the availability of loose food as much as possible and to ensure supervision of consumer behaviour around open food displays (FSAI, 2020a). Safe handling of food in the home also became an issue with people concerned about contracting the virus from the surface of food containers. The FSAI issued advice reassuring people that food was not unsafe due to COVID-19 and collaborated with other State Agencies like *safefood*, which operates in both jurisdictions on the island of Ireland, to provide reassurance to consumers about handling food in the home and to advise against practices like disinfection of loose food, which was considered a greater threat to health than the low risk of SARS-CoV-2 cross-contamination⁵.

The early traffic to the FSAI COVID-19 FAQ web page continued to increase and on March 20 2020, peaked at almost 44,000 hits in a day before gradually dropping off as people and food businesses became familiar with the advice (Figure 2).

⁵ *safefood* advice of handling groceries at home ([link](#) accessed 12/8/21)

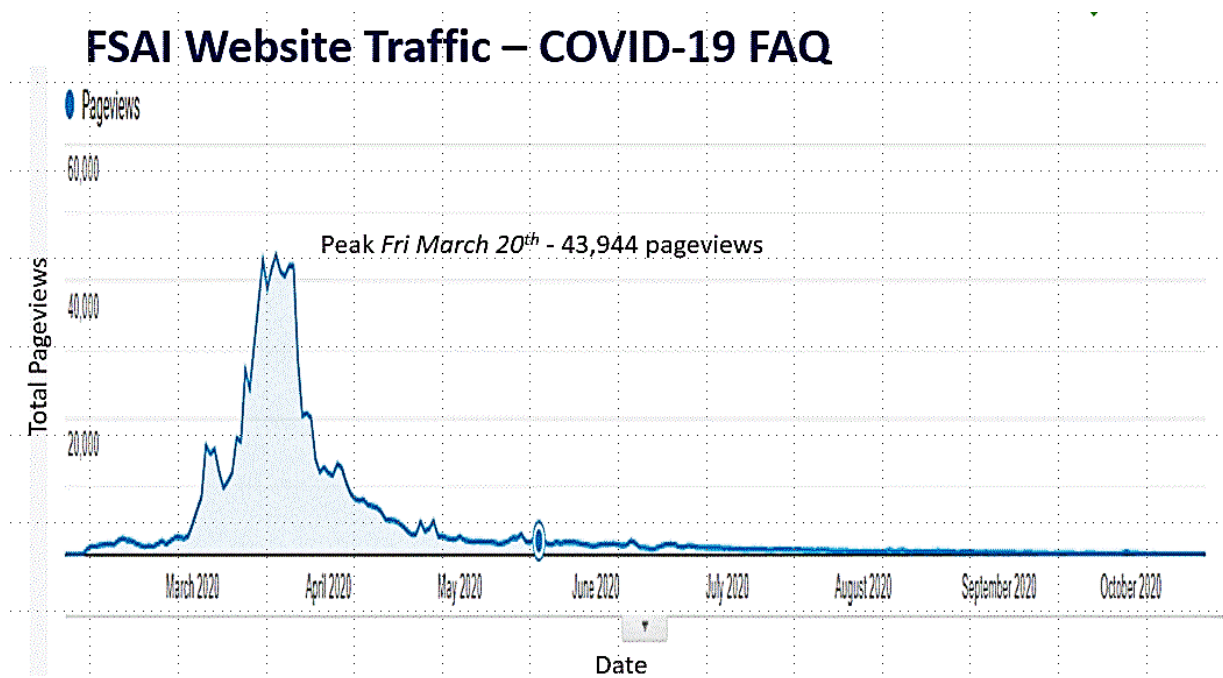


Figure 2: Pattern of pageviews for the FSAI FAQs on COVID-19, March to October 2020

2.4 Early effects of COVID-19 on the food inspection service

COVID-19 not only disrupted the FSAI’s own operations but also the official controls carried out by staff in the Official Agencies working under service contract to the FSAI. Staff carrying out official controls and FSAI staff had to be designated as essential workers under the COVID-19 legislation to allow them to move around the country during lockdown.

EU regulations on official controls⁶ require Member States to conduct certain controls on food businesses in certain ways. Given the disruption to food businesses and the food inspection service it was necessary for the EC to issue a new Commission implementing regulation to allow for flexibility⁷. The legislation required Member States implementing flexible oversight arrangements, to notify the EC and other Member States. It allowed for official controls to be carried out using a designated person in place of the authorised officer (inspector). It also allowed tests to be carried out in any unofficial laboratory on a temporary basis provided that laboratory

⁶ Information on official control regulations ([link](#) accessed 12/8/21)

⁷ Commission Implementing Regulation (EU) 2020/466 of 30 March 2020 on temporary measures to contain risks to human, animal and plant health and animal welfare during certain serious disruptions of Member States’ control systems due to coronavirus disease (COVID-19) ([link](#) accessed 12/8/21)

was designated by the competent authority for that purpose. In the case of physical meetings with operators and their staff in the context of official control methods and techniques referred to in Article 14 of Regulation (EU) 2017/625, this could take place by any available means of distance communication. Border checks were allowed using electronic documentation and physical inspections could be substituted by other means of communication. WHO guides and health and safety advice were used by the Official Agencies to provide the correct personal protective equipment (PPE) for inspectors and this enabled continuation of physical inspections of food business including those in the meat industry, along with official control border inspection activities.

COVID-19 impacted the inspection activities of all Official Agencies but in the early part of 2020 (March to June), the biggest impact on official controls was experienced by the HSE who are mainly responsible for official controls in retail food businesses and businesses manufacturing foods of non-animal origin. Since these workers had a unique skill set and were also employees of the HSE, which oversaw public health measures regarding COVID-19 in Ireland, over 300 Environmental Health Officers (EHOs) were trained in contact tracing and reassigned away from official control work on food until a phased withdrawal from that work during May and June 2020 (Part, 2020). This represented roughly 50% of the staff in the service. Initially, EHOs were also temporarily reassigned to ports and airports to provide arriving passengers with health protection information and undertake audits of COVID-19 control measures. This lasted until mid-April 2020 by which time international travel was severely restricted and passenger flow was extremely low. Overall, in the period March until June 2020, EHOs were temporarily moved away from programmed official food controls for limited timespans to carry out various essential roles within the HSE during its battle against COVID-19, which was the greater risk at the time (Part, 2020). Official laboratories operated by the HSE were also affected and some were reconfigured to carry out testing for COVID-19 rather than food testing.

This decrease in official controls capacity was offset to an extent by the fact that many businesses in the food service sector had to close under the COVID-19 public health measures, although a smaller proportion either continued to provide existing take-away services or altered their business model to provide new take-away services. In these latter cases, EHOs provided essential advice on safe operations in these businesses. Other food businesses inspected by EHOs were not accessible for physical inspections, some due to isolation and the need to suppress COVID-19 transmission e.g. nursing homes, and others like outdoor events, which were cancelled reducing the need for inspection of these venues and issuing of licences. Due to Government guidelines around remote working and the importance of restricting the spread of COVID-19, inspections of the businesses that remained open became remote in some instances through documentation

inspection. Nevertheless, physical inspections were carried out around complaints and food incidents where public health was at risk.

3. Impact of the latter part of the pandemic in 2020

3.1 The FSAI Advice Line and social media platforms

Communication throughout the COVID-19 pandemic was maintained through the FSAI Advice Line, website and social media platforms. The COVID-19 FAQ on the FSAI website has been previously discussed and this was further developed throughout 2020 as issues arose and solutions were identified. Although some of these issues arose via direct contact from food industry groups including members of the FSAI Retail and Food Service fora and Food Drink Industry Ireland (FDI), many were directed to the FSAI Advice Line. This service had to suspend its direct call operations as staff were working remotely, but still operated a voicemail and e-mail enquiry service throughout the pandemic. It is interesting to note correlations in the pattern of enquiries to the Advice Line and peaks in the national COVID-19 case frequency (Figure 3).

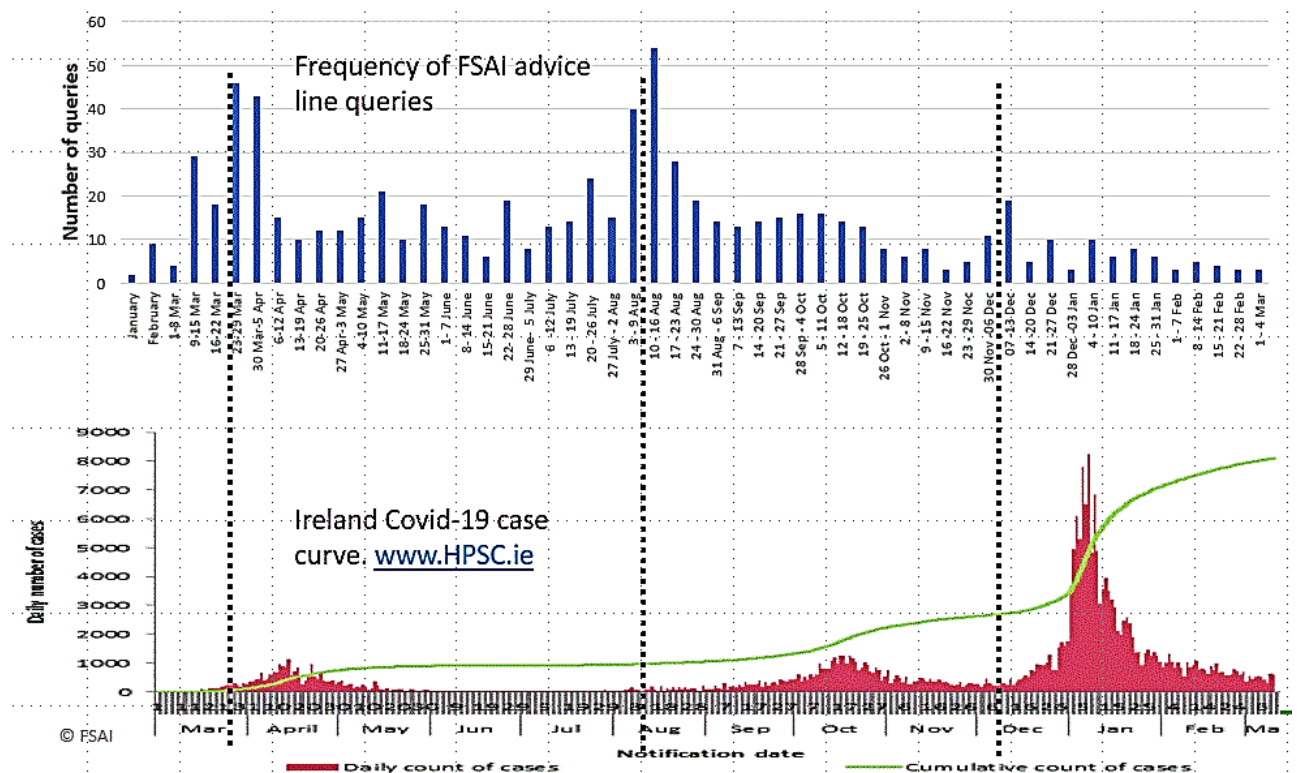


Figure 3: Rough correlation (dotted line) between peaks in frequency of calls to the FSAI Advice Line and rising COVID-19 case numbers in 2020 and early 2021

During 2020 Ireland faced three main surges in COVID-19 cases as shown in the bottom part of Figure 3, the last extending into quarter one 2021. Each time cases started to accelerate,

Government discussions focussed on lockdown restrictions including business restrictions, social distancing measures and movement restrictions. Generally, the FSAI Advice Line experienced a surge in enquiries that corresponded with food businesses and the public seeking advice on the impact of such restrictions on the food chain. However, as time progressed the number of enquiries declined as everyone became familiar with lockdown protocols. There were also smaller surges in enquiries towards the end part of each wave and these tended to be driven by enquiries about food safety issues as retail businesses reopened.

The pattern of enquiries illustrates the importance of an advice service provided by a National Competent Authority where people and food businesses can get timely definitive information. It also allowed the FSAI to populate its website FAQs with real questions from callers and the corresponding advice which in turn reduced the demand on the FSAI Advice Line facilitating faster turnarounds on enquiries.

In 2020 the FSAI Advice Line received 720 enquiries relating to COVID-19 and the top 5 enquiries in descending order were complaints, FBOs looking for general COVID-19 advice, advice on use of face coverings and visors, operation of outdoor markets and safety of open food displays. However, the total number of complaints dropped 20% in 2020 compared to 2019 from 3460 to 2772 respectively, influenced by the fact that many food businesses were closed during the three lockdowns. Although the complaint topics were similar between the years, with complaints about unfit food and hygiene standards in food businesses as the top two topics in both years, the main difference was complaints about suspect food poisoning, which fell from 22.9% of complaints in 2019 to only 15.5% of complaints in 2020. This was an unexpected result given the number of food businesses that transitioned from eat-in only to take-away business models during 2020 which raised concerns regarding food safety around these new unfamiliar processes. However, it is possible that numbers were affected by other factors like a general decrease in food eaten in/from food businesses and/or simplification of menus and/or an increase in underreporting due to reduced willingness of sick people to visit general practitioner's surgeries. According to Bord Bia market research, the food service industry on the island of Ireland, which grew by 5.1% and 4.6% in 2018 and 2019 respectively, contracted by 47.3% in 2020 (Bord Bia, 2020).

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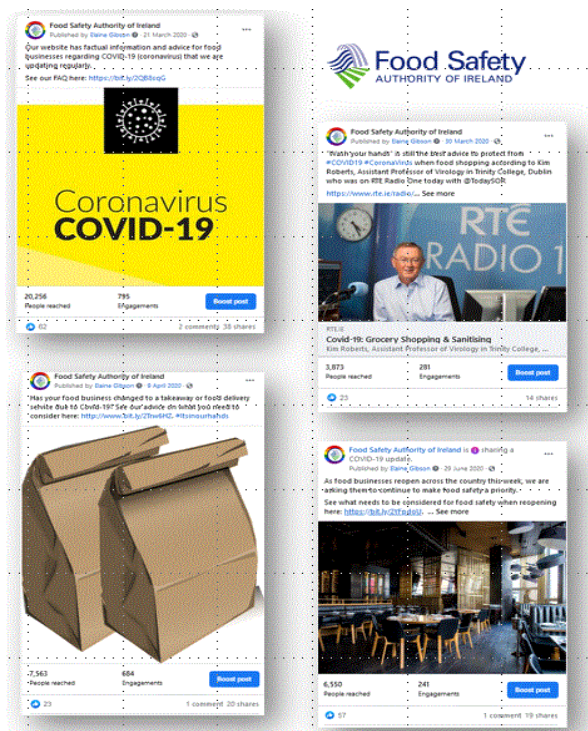


Figure 4: Examples of FSAI social media posts during 2020

As well as the FSAI Advice Line service, the FSAI communicates with people via its four social media platforms; Facebook, Twitter, Instagram and LinkedIn. These are monitored in real time and used as a means of dispelling myths and directing people to definitive information on the FSAI website. They are also uniquely useful for understanding peoples' opinions about the information provided and their concerns about various food related issues. Example topics during the pandemic in 2020 included advice around how to display allergen information when running a takeaway or guidance on who inspected COVID-19 health and safety restrictions for food businesses. Furthermore, they allowed more people to access free FSAI events, some of which provided information on food safety for food businesses reopening after lockdown. Social media also allowed the FSAI to support other state bodies like the HSE and Fáilte Ireland in the communication of relevant COVID-19 information⁸. In 2020, social media was the main way of communicating timely information to the public and food businesses about food safety and by the end of that year, 442 Covid-19 and reopening posts had reached 525,233 followers across the FSAI's social media channels, and overall followers had grown by 25% (13,000). This emphasises

⁸ Operational guidelines for reopening food service businesses ([link](#) accessed 25/8/21)

the demand for fast, accurate advice from a trusted provider that only a social media presence can address.

3.2 Risk assessment challenges

COVID-19 created many risk assessment difficulties due to the 'infodemic' created in the scientific literature regarding highly transmissible and pathogenic coronavirus, SARS-CoV-2 and its behaviour. Never has so much research been published so quickly, often in pre-print⁹ form without peer review, resulting in media coverage and social media amplification of often contradictory science. Eventually, these preprint websites started putting a warning message above papers relating to Covid-19 to make clear that they were not peer reviewed. An analysis of the COVID-19 literature found that over 125,000 scientific articles were released within 10 months of the first confirmed case of COVID-19 and over 80,000 of these papers were made available through open access due to changes in publication policy for COVID-19 papers by many journals (Fraser *et al.*, 2021). These researchers found that 30,260 papers in their data set were hosted by pre-print servers. Others noted that 40% of English language articles about COVID-19 were pre-prints in the early days of the pandemic (Lachapelle, 2020). One concern for government risk assessors is the veracity of information contained in a pre-print article given the lack of peer-review. Many of these papers should go on to be peer reviewed and published leading to a higher degree of confidence in the findings. However, an analysis of bioRxiv pre-prints posted between 2013 and the end of 2016 showed that this isn't always the case with only 67.0% published by the time the study ended in November 2018 (Abdill and Blekhman, 2019). It is probably still too early to be definitive about the peer-reviewed publication rate of COVID-19 pre-print papers, but Fraser *et al.* (2021) noted in their study, that 40% of pre-publication papers posted in January 2020 had been published in peer-reviewed journals by the end October 2020.

For a small organisation like FSAI it was impossible to keep up with the developments in science and therefore FSAI scientists relied heavily on their respective international scientific networks to keep abreast of important papers. The developing nature of information about SARS-CoV-2 coupled with the pre-print release of non-peer reviewed papers resulted in a high degree of uncertainty around risk assessments concerning SARS-CoV-2 and food safety. The FSAI in conjunction with the Sea Fisheries Protection Authority (SFPA) completed one structured qualitative risk assessment on the safety of bivalve molluscs in response to a question from Government in which it was concluded that the risk to public health from SARS-CoV-2 and eating

⁹ A preprint is a version of a scholarly or scientific paper that precedes formal peer review and publication in a peer-reviewed scholarly or scientific journal

bivalve molluscs was very low to negligible depending on cooking method used (FSAI, 2020b). Using a framework developed by the United Kingdom Advisory Committee on the Microbiological Safety of Food (ACMSF) the risk assessment explicitly qualified the uncertainty in its conclusions as high, arising from the limited extent of available scientific information particularly for faecal-oral transmission of SARS-CoV-2. In completing this exercise, the FSAI was able to call on the services of some of the members of its independent Scientific Committee and Biological Safety Subcommittee to help peer review the risk assessment, again emphasising the importance of scientific networks.

3.3 Challenges for, and disruption to official controls

Emergency measures introduced by Government during 2020 to curb the spread of SARS-CoV-2 resulted in the closure of food service businesses for sit-in dining. Although food retail stores were designated as essential and allowed to remain open, health and safety measures restricted access to a limited number of customers at any one time which invariably led to queues outside stores resulting in an increase in the time it took to buy food. Consequently, coupled with the desire of people to reduce close contacts, online shopping, food delivery and click and collect food provision increased significantly. Data from the Irish Central Statistics Office (CSO) shows that in January 2020, before SARS-CoV-2 arrived in Ireland, only 6% of internet users surveyed bought food and drink online. In March 2020 post COVID-19 in Ireland, this figure had more than doubled to 13%¹⁰. Data released by Kantar in March 2021, a year into the pandemic, showed that take-home grocery sales in Ireland had grown by 16.3%; an extra €2 billion in spending¹¹. This activity raised food safety challenges for the Official Agencies.

A particular issue arose with people operating illegal unregistered food businesses. In EU law food businesses must be registered or approved by a competent authority before they can operate. However, the FSAI became aware of a surge in food businesses set up in inappropriate premises during the pandemic. These illegal food businesses were often not hygienic and had little or no food safety systems in place. For example, in October 2020 closure orders were served on sushi businesses operating from the bedroom of a rented house in Santry, Dublin¹². The number of unregistered businesses uncovered by the FSAI and its Official Agencies rose by 147% from 19 in 2019 to 47 in 2020¹³. The FSAI introduced measures to detect unregistered food business through

¹⁰ Impact of COVID-19 on ICT Usage by Households ([link](#) accessed 25/8/21)

¹¹ Kantar Irish shoppers spend extra €2 billion on groceries in pandemic year ([link](#) accessed 25/8/21)

¹² https://www.fsai.ie/uploadedFiles/Monitoring_and_Enforcement/Enforcement/Enforcement-Orders-Closure.pdf

¹³ FSAI investigations into unregistered food businesses increased in 2020 ([link](#) accessed 25/8/21)

investigation of their online presence and instigated a campaign on social media to highlight the legal requirement to register a food business with the competent authorities.

The impact of COVID-19 on the work of food law enforcement officers has been discussed earlier. Redeployment, physical distancing, personal protective equipment availability and Government advice to work remotely restricted the basic official controls of physical inspection within food businesses and sampling and analysis of food. However, it should be noted that this impact was offset because the availability of food businesses for inspection declined as well due to business closure during the three lockdowns imposed by Government and restrictions on reopening of some businesses which extended well into 2021. Therefore, changes in inspection and sampling numbers are due to a combination of these factors.

Data provided to the FSAI by the HSE, which is predominantly in charge of official controls on food service and retail businesses as well as some manufacturing and wholesaling of food of non-animal origin, showed a 36% decrease in the inspection count in establishments. A decline in food business inspections count was also seen in the data supplied to the FSAI by the Department of Agriculture Food and the Marine (DAFM) which predominantly carries out official controls on-farm as well as manufacturing and wholesale of food of animal origin. Here the inspection count in establishments in 2020, fell by 39% from 12,214 in 2019 to 7,408 driven by reductions in inspection of the horticulture, plant health and honey sectors, egg and poultry meat sectors as well as the organic sector. It should be noted however, that some of these data may be also affected by changes in inspection procedures within the DAFM so may not all be due to COVID-19. In the SFPA which is responsible for official controls in seafood establishments, the inspection count was largely maintained in 2020 at 1,911 compared to 2,121 in 2019; only a 10% reduction. A similar trend was reported by the Local Authorities where veterinary officers carry out official controls in small meat establishments. Here the inspection count decreased by 12% from 4,320 in 2019 to 3,790 in 2020. With respect to sampling of food by all Official Agencies, there was a reduction of 30% in numbers of samples taken for analysis from 28,374 in 2019 to 19,951 in 2020. The biggest reduction being 48% for food samples taken from premises under HSE supervision. This would have resulted from various factors, not all related to COVID-19, including temporary and permanent business closure, availability of laboratory capacity and the necessary reduction in physical visits to food business premises to take samples during lockdowns.

In general, the FSAI and enforcement officers found it a challenge to ensure food businesses kept a focus on food safety measures when they were trying so hard to focus on complying with COVID-19 health and safety measures and the impact of the pandemic on its workforce. Problems were particularly acute in Irish meat and poultry plants which, like similar establishments in many other countries, suffered a considerable number of outbreaks of COVID-19 amongst workers. In a

cross-sectional study of 22 meat and poultry plants in Germany employing 19,072 workers, employees in areas like cutting rooms, where workers were within a minimum distance of 1.5 metres of other workers, had a higher chance of testing positive for COVID-19 (adjusted odds ratio 3.61; 95% CI 2.83–4.6) (Pokora *et al.*, 2021). In Ireland outbreaks in meat plants were investigated by HSE-led multidisciplinary outbreak investigation teams which implemented control measures locally. Guidance on the control of outbreaks in meat plants was published in 2020 by the HSE and updated regularly thereafter based on the findings of many outbreak investigations (HSE, 2021). The Irish Government also introduced measures to reduce meat plant outbreaks and thereby reduce community spread of COVID-19 via the workforce. These included State provided isolation for infected meat plant workers who could not isolate effectively at home and polymerase chain reaction (PCR) testing on site every 4 weeks at 85 meat plants employing approximately 25,000 workers. Later, in early 2021, the DAFM conducted validation of rapid antigen testing for meat plant workers and made this available to supplement the monthly PCR testing regime. Science Foundation Ireland (SFI) also funded a research project called 'understanding and preventing COVID-19 in meat processing plants (UPCOM)¹⁴.

3.4 Food safety risk of SARS-CoV-2

Throughout the COVID-19 pandemic the topic of whether SARS-CoV-2 was a food safety issue was hotly debated. Statements from WHO¹⁵ and EFSA¹⁶ as well as consensus around the world from different renowned Food Safety Bodies and regulators concluded that SARS-CoV-2 was not a food safety hazard. A more detailed opinion supporting this view was published by the International Commission on Microbiological Specification for Food (ICMSF, 2020). A review of data in the published literature looked at the survival of SARS-CoV-2 in food and food packaging, its survival and inactivation on food contact surfaces and the possibility of faecal oral transmission via food (Anelich *et al.*, 2020). These researchers concluded that "*although the current evidence suggests that SARS-CoV-2 does not cause foodborne illness, the virus has caused major disruptions to the global food supply chain.*".

To date the FSAI is of the view that in respect of food as a vector of SARS-CoV-2, if it plays any role at all, that role is a very minor one. Person to person spread is the main infectious pathway through respiratory droplets and probably aerosols. COVID-19 is not a food safety risk in the sense

¹⁴ UCD UPCOM project ([link](#) accessed 25/8/21)

¹⁵ WHO Coronavirus disease (COVID-19): Food safety and nutrition FAQs ([link](#) accessed 07/9/21)

¹⁶ EFSA and COVID-19 ([link](#) accessed 07/9/21)

that the SARS-CoV-2 virus is a hazard that needs controlling through a food safety management system. However, the FSAI still advised food businesses to focus all efforts at maintaining COVID-19 free workplaces to prevent person to person spread which would in turn minimise the exposure of food to the SARS-CoV-2 virus. A useful document outlining how food businesses could prevent the transmission of COVID-19 was produced jointly, by the WHO and the Food and Agricultural Organisation of the United Nations (FAO) in April 2020 and was recently updated by the FAO in 2021 (FAO, 2021).

Nevertheless, a counter narrative emerged during 2020 especially in China. Reports from China emerged suggesting SARS-CoV-2 was being transmitted to humans via packaging of frozen food and the surface of frozen foods, particularly seafood and meat. These were mainly contained in media reports, but certain information was published in the peer reviewed literature (Bai et. al., 2020; Liu et al., 2020). Chinese authorities were unique in the world for the scale of the regime they implemented for sampling and testing cold chain food and food packaging. A Chinese government press release stated that the PCR positive rate from their testing of imported cold chain food was 0.48 positives per 10,000 tests¹⁷. This approximates to one positive test for every 20,000 tests. At that level of defective product, the FSAI calculated that to have 95% confidence that a shipping container carrying 50,000 packs of 500g frozen seafood was free of SARS-CoV-2, an official would have to sample approximately 40,000 packs in the container (80% of the food packs in the container) (Appendix 1). Therefore, it was concluded that it was not practical or protective of public health to implement PCR testing of imported cold chain foods for SARS-CoV-2. This decision was verified in 2021 by FAO, which stated “*Whilst microbiological environmental sampling has a role in verifying sanitation protocols, the testing for SARS-CoV-2 in food processing facilities or on food packaging is costly, time consuming and does not aid in risk-based decision-making processes for consumer protection and is therefore not recommended.*” (FAO, 2021)

4. Lessons learned

Lesson 1: Early warning and emerging risk systems are essential for food control authorities to enable quick response to new threats.

The Covid-19 pandemic has been devastating for the world economically, but more importantly, socially. Few people have escaped unscathed by the impact of the SARS-CoV-2 virus. Debate

¹⁷ Chinese Government press release: China strengthens nucleic acid testing of imported cold chain foods– in Chinese ([link](#) accessed 07/9/21)

continues around its origin, but its early association with a food market in Wuhan is undisputed. Because of this link and the early concern about food as a source, the issue was picked up early by the FSAI emerging risk monitoring system. Therefore, the FSAI was well positioned to take early action to prepare both the Authority itself but also food businesses when the global spread of the virus began.

Lesson 2a: Investment of time and money in multiple channels of communication and information is essential to establish competent authorities as a trustworthy source of advice.

Lesson 2b: Advice must be communicated quickly and must be consistent on all channels of communication to discourage the spread of misinformation during crises.

The importance of FSAI's communication and information infrastructure during the COVID-19 pandemic cannot be underestimated. The integration of web site information with a dynamic social media presence and an efficient and effective Advice Line service enabled the FSAI to make clear and consistent communication to the public and the food industry. It facilitated interaction with stakeholders which in turn strengthened the content of our communications and ensured they were fit for purpose. In the absence of a strong voice and a fast response from the Authorities, misinformation propagates.

Lesson 3: An investment in time for staff of competent authorities to build and maintain comprehensive networks of scientific and regulatory colleagues is recouped multi-fold during crises.

For a small organisation regulator like the Food Safety Authority of Ireland it is impossible to maintain complete awareness of the science surrounding a newly emerging risk like SARS-CoV-2. Keeping on top of the so-called 'infodemic' required the FSAI to rely heavily on pre-established networks of scientists and regulators around the world. This enabled the FSAI to establish what the consensus was and to understand quickly critical pieces of information that could affect its view on risk.

Lesson 4: By accepting an inevitable impact on official controls and assessing the risks in the food chain, competent authorities can maintain priority activities during crises and still protect public health.

The COVID-19 pandemic has been unprecedented in its impact on everything and everyone. The FSAI and Official Agencies had to be flexible, dynamic, and resourceful to navigate the many tsunami of difficulties that arose. The pandemic was always going to have an unavoidable impact on official food controls due to the shortage of skilled staff for COVID-19 public health duties and the way Government restrictions hampered business as usual. The important issue

was to prioritise activity based on the risk to food safety, and this was done throughout the pandemic to maintain the protection of consumer health.

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Acknowledgements

This report was compiled and written by Dr. Wayne Anderson: Director Food Science and Standards, FSAI. The contributions of the following people are gratefully acknowledged.

Elaine Gibson, FSAI Communications Executive

Foteini Bompola, FSAI Advice Line Executive

Karl McDonald, FSAI Contracts Manager

Olive Ryan, FSAI Data Analysis Executive

Ann-Marie Part, HSE Assistant National Director for Environmental Health

Donal Sammin, DAFM Director of Laboratories

Kevin Burke, FSAI Research Fellow attached to the University of Limerick

Appendix 1: A sample size calculation based on the hypergeometric and binomial distributions

Kevin Burke, Research Fellow, Food Safety Authority of Ireland

December 9, 2020

Background

Consider the following situation:

- There is a batch of $N = 50,000$ food products
- there are $K = 2$ defective products
- it is also helpful to define the defect rate, p which will be approximated by K/N (here $p = 1/20,000$, and $K/N = 1/25,000$ for the choice of N and K)
- a sample of n products are examined
- from this sample, k defective products are identified (assuming that there is no error in detection, i.e., both the sensitivity and specificity are 100%)
- the batch will be rejected if at least one defective product is identified, i.e., $k \geq 1$
- let $p(k; n)$ be the probability that k defective products are identified in the sample of size n ;

Note: There are $N - K$ non-defective products in batch of size N , and there will be $n - k$ of defects in a sample of size n .

Aim: To ensure that at least one defect is found with probability 0.95, or equivalently that no defects are found with probability 0.05. Thus, it is necessary to find the value of n which yields:

$$p(k = 0; n) = 0.05.$$

Hypergeometric distribution

The probability distribution which describes the above setting is known as the *hypergeometric distribution* wherein:

$$p(k; n) = \frac{\binom{K}{k} \binom{N-K}{n-k}}{\binom{N}{n}}$$

Where:

$$\binom{a}{b} = \frac{a!}{b!(a-b)!}$$

(pronounced “ a choose b ”) is the *binomial coefficient* which describes the number of possible selections of size b from a group of size a . Therefore, the above hypergeometric probability can be interpreted as follows:

$$\frac{(\text{selecting } k \text{ of the } K \text{ defects}) \text{ AND } (\text{selecting } n - k \text{ of the } N - K \text{ non-defects})}{\text{all possible selections of size } n}$$

It is worth highlighting that:

$$\binom{a}{0} = \frac{a!}{0! a!} = 1$$

because $0! = 1$. This has the physical interpretation that there is only one possible group of no objects. Because of this, for the purpose of the problem of interest:

$$p(0; n) = \frac{\binom{N-K}{n}}{\binom{N}{n}},$$

and, more specifically, with $N = 50,000$ and $K = 2$,

$$p(0; n) = \frac{\binom{49,998}{n}}{\binom{50,000}{n}}.$$

This expression could be computed for a range of n values on a scientific calculator to find the one which yields a probability close to 0.05 (but there may be issues because the numerator and denominator of the fraction will be huge for even moderate n values).

Therefore, the dhyper function in R¹⁸ was used which computes hypergeometric probabilities, and these are shown for a range of n values in the table below. Clearly, $n \in [37,500, 40,000]$ in order to get the probability to 0.05, i.e., 95% chance of seeing at least one defect. In other words, there would be a need to test approximately 80% (40,000/50,000) of the batch.

Table A: Probabilities for different nn values

n	prob
10000	0.6400
12500	0.5625

¹⁸ R is a free software environment for statistical computing and graphics

n	prob
15000	0.4900
17500	0.4225
20000	0.3600
22500	0.3025
25000	0.2500
27500	0.2025
30000	0.1600
32500	0.1225
35000	0.0900
37500	0.0625
40000	0.0400
42500	0.0225
45000	0.0100
47500	0.0025
50000	0.0000

Varying K via the binomial distribution

The value of $K = 2$ defects was taken to correspond to a representative situation where $p = 1/20,000$. In practice, of course, the value of K will vary from batch to batch. As an example, it is assumed that, if there are at least some defects, half of the time $K = 2$ and half of the time $K = 3$. Then the previous probability calculation is extended as:

$$p(0; n) = 0.5 \frac{\binom{N-2}{n}}{\binom{N}{n}} + 0.5 \frac{\binom{N-3}{n}}{\binom{N}{n}}.$$

More generally, there could be a whole range of K values according to a realistic probability distribution, i.e.,

$$p(0; n) = p(K = 1) \frac{\binom{N-1}{n}}{\binom{N}{n}} + p(K = 2) \frac{\binom{N-2}{n}}{\binom{N}{n}} + p(K = 3) \frac{\binom{N-3}{n}}{\binom{N}{n}} + \dots.$$

where there is no $p(K = 0)$ given the requirement of finding defects in a batch which has at least one.

A more realistic distribution can be obtained from the fact that each of the products which ends up in the batch has a 1/20,000 chance of being defective in the first place. Due to the constant probability, the number of defects in the batch will have a binomial distribution whose probability function is:

$$p(K) = \binom{N}{K} p^K (1-p)^{N-K}.$$

For this distribution, the average number of defects is $Np = 50,000/20,000 = 2.5$ and note that the probability that there are no defects is $p(0) = (1-p)^N$ which is 0.0821 for the values of N and p . Thus, there is a relatively small probability that a batch will *not* contain a defect.

The focus is on cases where there *are* at least some defects. So the truncated binomial distribution can be used where:

$$p(K) = \frac{\binom{N}{K} p^K (1-p)^{N-K}}{1 - (1-p)^N};$$

Here it was just divided by $p(K > 0)$ so that the probabilities sum to one (for $K = 1, \dots, N$). The final distribution is a binomial mixture of hypergeometric distributions which yields:

$$p(0; n) = 0.2236 \frac{\binom{N-1}{n}}{\binom{N}{n}} + 0.2795 \frac{\binom{N-2}{n}}{\binom{N}{n}} + 0.2329 \frac{\binom{N-3}{n}}{\binom{N}{n}} + \dots$$

The next few mixing probabilities are 0.1456, 0.0728, 0.0303, and 0.0108 for $K = 4, 5, 6, 7$.

Ultimately, the probability of finding no defect in a batch which has at least one defect is given in table below (along with the $K = 2$ case from before). The final conclusion is very similar to the $K = 2$ case, i.e., it is necessary to test $n \approx 40,000$.

Table B: Probabilities for different nn values for $K = 2$ and varying KK

n	prob (K = 2)	prob (K varies)
10000	0.6400	0.5713
12500	0.5625	0.4937
15000	0.4900	0.4252
17500	0.4225	0.3647
20000	0.3600	0.3113
22500	0.3025	0.2643
25000	0.2500	0.2227
27500	0.2025	0.1860
30000	0.1600	0.1537

n	prob (K = 2)	prob (K varies)
32500	0.1225	0.1251
35000	0.0900	0.0999
37500	0.0625	0.0776
40000	0.0400	0.0580
42500	0.0225	0.0407
45000	0.0100	0.0254
47500	0.0025	0.0119
50000	0.0000	0.0000

Different batch sizes

It is useful to vary the value of N to consider different batch sizes. Here, consider: $N \in \{10,000, 25,000, 50,000, 100,000, 200,000\}$. Keeping $p = 1/20,000$, the probability that there is no defect for each of these batch sizes is given by: 0.60652, 0.28650, 0.08208, 0.00674, 0.00005.

The table below repeats the calculations of the previous section where K varies; in each case the probability closest to 0.05 is highlighted in bold green.

Table C: Probabilities for different n and N values (with varying K)

n	N = 10,000	N = 25,000	N = 50,000	N = 100,000	N = 200,000
8000	0.162	0.538	0.641	0.668	0.670
8250	0.141	0.526	0.632	0.660	0.662
8500	0.120	0.515	0.623	0.651	0.654
8750	0.099	0.503	0.614	0.643	0.646
9000	0.079	0.492	0.605	0.635	0.638
9250	0.059	0.481	0.597	0.627	0.630
9500	0.039	0.470	0.588	0.619	0.622
10000	0.000	0.449	0.571	0.604	0.607
12500	-	0.349	0.494	0.532	0.535
15000	-	0.260	0.425	0.469	0.472
17500	-	0.183	0.365	0.413	0.417
20000	-	0.114	0.311	0.364	0.368
22500	-	0.053	0.264	0.320	0.325
25000	-	0.000	0.223	0.282	0.286
27500	-	-	0.186	0.248	0.253


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n	N = 10,000	N = 25,000	N = 50,000	N = 100,000	N = 200,000
30000	-	-	0.154	0.218	0.223
32500	-	-	0.125	0.191	0.197
35000	-	-	0.100	0.168	0.174
37500	-	-	0.078	0.148	0.153
40000	-	-	0.058	0.129	0.135
42500	-	-	0.041	0.113	0.119
45000	-	-	0.025	0.099	0.105
47500	-	-	0.012	0.087	0.093
50000	-	-	0.000	0.076	0.082
52500	-	-	-	0.066	0.072
55000	-	-	-	0.058	0.064
57500	-	-	-	0.050	0.056
60000	-	-	-	0.043	0.050
62500	-	-	-	0.037	0.044
65000	-	-	-	0.032	0.039





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