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Te Mana Kounga Kai – Ahitereiria me Aotearoa

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Decision Regulation Impact Statement

Proposal P1060 – Egg Food Safety & Primary Production Requirements

Office of Impact Analysis ID 24-08429

Executive summary

FSANZ has prepared and assessed a proposal to amend the egg food safety and primary production requirements in the Australia New Zealand Food Standards Code (the Code).

This Decision Regulation Impact Statement (DRIS) has been developed and provided to decision makers to inform their decision to approve the proposed changes.

The DRIS contains the impact analysis (including the consideration of costs and benefits) of the proposed changes.

FSANZ expects the proposed changes to the Code will lead to an overall net benefit to the community, Government and industry. The proposed changes aim to improve food safety measures to detect *Salmonella* Enteritidis (SE) early to reduce foodborne illness and reduce *Salmonella* related illness generally and are likely to also prevent the spread of SE among the Australian layer flock. Additional measures to manage SE will involve increased compliance costs for egg businesses to implement measures (if not already implemented), such as regular environmental monitoring for SE and meeting prescribed traceability system requirements.

What is the problem?

When Standard 4.2.5 – Primary Production and Processing Standard for Eggs and Egg Product was introduced in 2011, SE capable of direct internal contamination of the egg contents (vertical transmission) was considered to be absent from the Australian egg laying flock and thus controls to manage its unique risks were not included.

The prevalence of vertically transmittable SE in the Australian layer flock is no longer zero. This emergence has changed the food safety risk profile for Australian eggs. SE-infected hens are often asymptomatic, complicating detection and control and prevention of supply of contaminated eggs. Once introduced into poultry houses, *Salmonella* can spread rapidly and extensively throughout flocks. As control measures did not address early detection or control of SE, human illness has been the primary means of detecting SE on farms.

A FSANZ review of Standard 4.2.5 and the existing government and voluntary measures

concluded that these measures are not adequately safeguarding public health and safety. Gaps remain in control measures specific to vertically transmittable SE and also that not all industry members adopt best practice voluntary industry schemes.

The spread of SE overseas led to many foodborne illness outbreaks and required the introduction of a variety of highly prescriptive and costly measures to adequately protect public health and safety. Without interventions to sufficiently manage SE risks in eggs, it is possible that SE may spread in Australia in a similar way to overseas resulting in an increase in SE related foodborne illness.

If the spread of SE can be limited across the Australian flock, the need for more costly interventions to manage the food safety risk in the longer-term may be avoided.

Why is government action needed?

Explicit government regulation (like standards) is appropriate to be used as a regulatory tool where there is a perceived high risk and achieving compliance is seen as critically important. Amendments to the Code are required as current regulatory and non-regulatory measures do not manage the public health and safety risk of foodborne illness due to SE.

In response to recent SE outbreaks in Australia some jurisdictions have taken additional biosecurity action to control the spread of SE. The egg industry has also introduced a range of guidance materials and procedures to manage the food safety risks associated with *Salmonella* on-farm.

The primary objective of the amendments is to protect public health and safety and minimise foodborne illness.

To meet this objective, FSANZ's risk assessment identified key measures to address:

- early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia.

Detecting SE early allows egg businesses and food authorities to implement corrective actions to prevent further distribution of contaminated eggs as well as spread of SE among other layer flocks.

While some of the egg industry monitor the environment for SE, this is a voluntary measure for most producers. Requiring it in the Code will allow for greater coverage of the egg industry and delivers clearly identifiable outcomes to reduce foodborne illness.

- rapid traceback to an infected farm during a foodborne illness incident.

Enhancing traceback during a foodborne illness incident and ensuring all entities are captured under the standard provides for stopping supply and rapid removal of contaminated eggs. Currently, only 68% of *Salmonella* traceback investigations identify a farm where infected eggs have been produced.

- minimising SE microbial growth if present in an egg.

Requiring egg producers and processors to maintain temperature control of eggs during storage and transport avoids temperature fluctuations and poor handling practices that may contribute to making an egg unsafe or unsuitable, by supporting pathogen growth.

What options are to be considered?

The DRIS analyses three options to address the identified problems:

1. Maintaining status quo
2. Introducing a combination of regulatory and non-regulatory measures (preferred option)
3. Introducing a combination of regulatory and non-regulatory measures including mandatory refrigeration requirements for eggs

What is the likely net benefit of each option?

The options have been compared through a break-even analysis to consider whether the cost of implementing and complying with the measures outweigh the benefit of avoided foodborne illness.

The net benefit of the status quo option (option 1) by definition is zero as it involves no change. However, in this case, with the status quo we need to consider the potential growth in illness if no action is taken.

In order for industry, government and the community to break-even on the costs associated with the measures in option 2, the measures would need to achieve a benefit of a 15% reduction of egg-related *Salmonella* illnesses over ten years. However, this assumes that there would be no change in the annual illnesses.

In a scenario where there is a 30-50% increase of egg-related *Salmonella* cases in Australia, option 2 would only need to achieve a 10-12% reduction in illnesses to offset costs. Such a scenario is reasonable given the experience in overseas jurisdictions once SE emerged in layer flocks.

The break-even analysis does not take into account the unquantified benefits of option 2:

- minimising the likelihood of SE infection and spread on-farm through preventative measures to manage SE food safety risks.
- identifying SE on-farm early to prevent the distribution of contaminated eggs and limit the spread of SE to egg producers in close proximity, benefitting egg producers and government by avoiding a costly SE incident response and potential reputational damage as producers of safe food.
- enabling rapid traceback to the source of infection by strengthening traceability systems.
- a prepared egg supply chain in the event that SE does become established in the Australian laying flock by providing a set of national measures capable of addressing an increased SE risk.

While option 3 offers the same benefits as option 2, option 3 also involves greater cost to egg producers, processors and retailers.

The assessment concludes that the direct and indirect benefits to the community, Government and industry that would arise from amending the Code as in option 2 are expected to outweigh the costs and return a greater net benefit than option 3.

Who was consulted and how was their feedback incorporated?

During the proposal process, FSANZ consulted with an Egg Standard Development Advisory Group, consisting of representatives from industry and government, and an Egg

Implementation Working Group (established by the Implementation Sub-committee for Food Regulation) to ensure any amendments to the Code, if approved, could be consistently implemented at a national level.

A call for submissions (CFS) report on the proposal was released for public comment in March 2025. The CFS report presented stakeholders with the draft variations to the Code and supporting documents including a consideration of costs and benefits.

FSANZ considered all comments in developing the final approach and this DRIS. Minor clarifications have been made to the variations as a result of the CFS, but the approach remains the same.

What is the best option from those considered and how will it be implemented?

FSANZ considers option 2 to be the best available option.

Option 2 meets the proposal objective by:

- cost-effectively protecting public health and safety.
- requiring environmental monitoring of SE on-farm as a measure of identifying SE infection, rather than solely relying on human illness cases and successful traceback to identify an infected farm.
- enabling the early detection of SE to prevent the distribution of contaminated eggs and minimising foodborne illness, and limit the spread of SE to nearby farms thereby avoiding additional depopulation and decontamination costs.
- prescribing traceability system requirements and clarifying other traceability measures to support the rapid traceback to the egg producer in the event of a foodborne illness incident.
- emphasising the importance of temperature control in egg production by ensuring egg producers control temperatures that eggs are exposed to and the amount of time that eggs spend in storage and/or transport at that temperature.

Should Minister's agree to the amendments to the Code, implementation and enforcement of the draft variations to the Code would be the responsibility of the Australian states and territories.

The draft variation to the Code is intended to take effect 18 months from the date of gazettal.

How will the chosen option be evaluated?

Agencies with responsibility for food policy, implementation or standards development could act individually or in concert to evaluate and/or monitor the standards. Such monitoring and evaluation can be coordinated either through the Food Regulation Standing Committee and/or the Implementation Sub-committee for Food Regulation.

The results of any concerns identified through monitoring and evaluation will ultimately be communicated across the food regulatory system, including to FSANZ for potential action.

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1. Introduction

Proposal P1060 – Egg Food Safety & Primary Production Requirements is considering amending the Australia New Zealand Food Standards Code (the Code) to strengthen the food safety management of eggs and egg product during primary production and processing.

This Decision Regulation Impact Statement (DRIS) contains the impact analysis (including the consideration of costs and benefits) FSANZ has undertaken on the proposed changes, which will be provided to decision makers.

The DRIS has been prepared to meet the requirements of:

- *Regulatory Impact Analysis Guide for Ministers' Meetings and National Standards Setting Bodies* of the Office of Impact Analysis (the Guide; 2023)
- Section 59 of the *Food Standards Australia New Zealand Act* 1991 (FSANZ Act).

1.1. Assessment of the Office of Impact Analysis

This DRIS has been prepared in line with the Guide.

The Office of Impact Analysis (OIA) guidance requires FSANZ to answer the following impact analysis questions when developing a DRIS:

- What is the problem?
- Why is government action needed?
- What options are to be considered?
- What is the likely net benefit of each option?
- Who was consulted and how was their feedback incorporated?
- What is the best option from those considered and how will it be implemented?
- How will the chosen option be evaluated?

These questions have been answered in the sections that follow.

1.2. Consideration of costs and benefits

In assessing this proposal and in making its decision to prepare the proposed draft variations to the Code, FSANZ is also required by Section 59 of the FSANZ Act to have regard to, among other things, whether the costs that would arise from the proposed measure outweigh the direct and indirect benefits to the community, Government or industry.

As explained, FSANZ has decided to prepare a set of proposed amendments to the Code. This decision reflects in part FSANZ's assessment that the direct and indirect benefits to the community, Government and industry that would arise from amending the Code as proposed are expected to outweigh the costs of the proposed measures. The DRIS sets out the reasons for that assessment in section 5 below.

The assessment was based on the best available information at the time the decision was made to prepare the amendments. That included submissions received from stakeholders in response to the Call for Submissions (CFS).

1.3. Australian egg industry

The Australian egg industry produced 6.98 billion eggs with a gross production value of approximately $1.37 billion for the 2023-24 financial year (Australian Eggs 2024).[1]

There are three types of egg farming systems, these being caged, barn or free range (including 'pasture raised'). Supply chains for eggs vary considerably. Depending on the business, the egg supply chain includes a layer farm (housing the layer hens), grading floor (where collected eggs are assessed, cleaned, graded and packed) and egg processing (when eggs are processed into egg products). For small layer farms, eggs may be collected and then sold at the local farmers market or at the farm gate. Medium and large egg producers may supply independent grading floors that then distribute graded and packed eggs to retail and food service.

Eggs may be transported significant distances to meet demand in locations where there may be current short supply. Some large egg producers may also have short supply chains where the eggs are laid, fed into their on-site grading floors and within a couple of days be on sale on retail supermarket shelves.

Most egg producers are concentrated on the east coast of Australia, with Queensland, New South Wales and Victoria accounting for 87% of the national flock (Australian Eggs n.d.). Although Queensland contains only 8% of total number of layer farms, they are the second highest producing region.

Exports of eggs and egg products totalled approximately $15.76 million for the financial year 2022-23 (ABARES n.d.). Exports were to a range of countries, predominantly within south-east Asia and Pacific regions. Australia's strict biosecurity requirements mean there are limited imports of whole table eggs to Australia. There are some permissions for processed egg product such as egg powders and retorted eggs, where the products are able to satisfy the import permit requirements.

1.4. Current Code requirements for eggs and egg products

Standard 4.2.5 – Primary production and processing standard for eggs and egg product sets out food safety requirements for the primary production and processing of eggs, egg pulp and other egg products for human consumption.

At the primary production stage, there are requirements for egg producers to implement certain measures to control the food safety hazards and to trace their individual eggs. At the primary processing stage, there are requirements for egg processors to implement certain measures to control their food safety hazards and trace their individual eggs and egg product. It is the responsibility of these businesses to both comply with this Standard and be able to demonstrate compliance.

Standard 2.2.2 – Eggs and egg products contains requirements specifically for the sale or supply of eggs for catering purposes or retail sale. These requirements are:

- a prohibition of the sale or supply of unacceptable eggs for catering and retail sale purposes, and
- a requirement that eggs for retail sale or catering purposes must be individually marked with the producers' or processors' unique identification.

[1] Gross production value is the value placed on recorded production at the wholesale prices realised in the marketplace.

The following meaning of 'unacceptable egg' in Standard 4.2.5 also applies to Standard 2.2.2:

- a cracked egg or a dirty egg; or
- egg product which has not been processed in accordance with clause 21 of Standard 4.2.5; or
- egg product which contains a pathogenic micro-organism, whether or not the egg product has been processed in accordance with clause 21 of Standard 4.2.5.

1.5. Assessment of P1060

As part of FSANZ assessment of this proposal the following work was completed to identify risk and inform appropriate risk management options:

Microbiological risk assessment – The risk assessment assessed the best available data to identify key risk factors for SE and where in the primary production and processing supply chain it may be introduced, increased, reduced or eliminated. [2]

As part of the risk assessment, FSANZ developed a quantitative microbial risk assessment (QMRA) model to simulate the various stages of egg production, distribution, and consumption, estimating the probability of contamination and subsequent illness under different scenarios.[3]

As the model reflects unique characteristics of the Australian egg production and supply chain, it allows for a more granular assessment of SE risks, accounting for factors such as farm-level contamination, storage conditions (temperature and time) and the impact of some regulatory interventions.

Review of existing regulatory and non-regulatory measures – This review provided a summary of current food safety measures (both regulatory and non-regulatory) for eggs and egg product in Australia.[4] The summary was used to examine differences between Australian states and territories, determine whether the existing measures adequately support food safety in Australia and align proposed measures to existing practices, reducing impact on industry and government food regulators.

The review also examined current regulatory arrangements and compared them with five international markets that have legislation to manage SE.

Consumer literature review - FSANZ undertook a rapid systematic literature review to inform the proposal by investigating consumers' perceptions of risk in relation to eggs, how often do consumers eat eggs, in what setting and how are they cooked, how consumers store eggs, consumer egg handling behaviours, and whether behaviour change techniques are effective for improving safe egg handling behaviours among consumers.[5]

[2] Refer to Supporting document 1 – Risk assessment – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements
[3] Refer to Supporting document 2 – Quantitative model – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements
[4] Refer to Supporting document 3 – Current food safety measures – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements
[5] Refer to Supporting document 6 – Consumer literature review – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements

2. What is the problem?

Australia has one of the highest rates of foodborne illness caused by *Salmonella* per 100,000 population when compared to similar countries. *Salmonella* illness notification rates for Australia in 2023 were 43 per 100,000, compared to 15.8 in New Zealand, 15.1 in Canada, 15.4 in England and 13.9 in the United States of America.[6] Rates have significantly increased over the past 20 years from 7,700 notified cases in 2004 to 12,200 notified cases in 2024.[7]

The annual cost of *Salmonella* foodborne illness associated with eggs is estimated to be $35.78 million (Glass et al. 2024; inflation-adjusted to March 2025). The greatest proportion of the cost is attributed to under 5-year-olds. Previously, the total cost of salmonellosis for this group was largely due to lost productivity in carers, followed by premature mortality, and willingness-to-pay to avoid illness (Glass et al. 2022).

The dominant *Salmonella* in Australia responsible for illness associated with eggs is *Salmonella* Typhimurium. *Salmonella* can be transmitted within poultry flocks horizontally, via transmission of *Salmonella* on egg shells that then moves into the egg and egg contents, or vertically, via the direct internal contamination by an infected layer hen of the egg contents with *Salmonella* during formation. *Salmonella* infections in poultry can vary, with *Salmonella* Enteritidis (SE) demonstrating higher frequencies of vertical transmission and internal egg contamination than other strains. A higher frequency of vertical transmission can lead to a greater exposure to contaminated eggs and higher cases of human illness.

When Standard 4.2.5 was introduced in 2011 the risk associated with SE was assessed, including the ability of SE to be vertically transmitted. However, only measures to manage risk associated with horizontal transmission were included in the standard as vertically transmittable SE was considered to be absent from the Australian layer flock.

The prevalence of SE capable of vertical transmission in the Australian layer flock is no longer zero. Throughout 2018-19 there was a multi-jurisdictional outbreak of SE linked to eggs. The outbreak was associated with 245 human illness cases identified across New South Wales, Victoria, Queensland and Tasmania.[8]

The available data is limited as to how many SE-positive farms or SE outbreaks there have been in Australia following this outbreak, however, subsequent sporadic cases of SE have occurred in Victoria, NSW and Queensland between 2020 and 2024. These have been associated with commercial and backyard layer flocks.

SE is a nationally notifiable animal disease.[9] Nationally notifiable diseases are a legislated list of communicable animal diseases where data is collected and monitored by the Department of Agriculture, Fisheries and Forestry and jurisdictional counterparts. Data is used to coordinate responses to communicable animal disease outbreaks.

Australia's domestic biosecurity response to detecting SE on farm is to apply movement

[6] Australia: https://nindss.health.gov.au/pbi-dashboard/; New Zealand: https://www.mpi.govt.nz/science/food-safety-and-suitability-research/human-health-surveillance-and-attribution-programme/foodborne-disease-annual-reports/; Canada: https://diseases.canada.ca/notifiable/charts?c=pl; England: https://www.gov.uk/government/publications/salmonella-national-laboratory-and-outbreak-data/non-typhoidal-salmonella-data-2014-to-2023#salmonella-laboratory-data-2014-to-2023; US: https://www.cdc.gov/foodnet/reports/preliminary-data.html.

[7] Notified cases were sourced from the National Notifiable Disease Surveillance Dashboard - https://nindss.health.gov.au/pbi-dashboard/

[8] https://www.foodstandards.gov.au/consumer/prevention-of-foodborne-illness/Salmonella-Enteritidis-linked-to-eggs

[9] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable#national-list-of-notifiable-diseases-of-terrestrial-animals-at-april-2024

restrictions to prevent the spread of SE, depopulating that farm and then extensive decontamination to eradicate the presence of SE. As described in Box 1 below, some SE infected farms have faced nearly $2 million in costs related to flock depopulation and decontamination of premises.

SE-infected flocks are often asymptomatic, complicating detection and control. Once introduced into poultry houses, *Salmonella* can spread rapidly and extensively throughout flocks and between farms via wild birds, pests, rodents, movement of people between farms or visitors and movement of vehicles. The egg supply chain is also complex, and interactions between farms, grading floors and staff (e.g. veterinarians and maintenance labourers) all contribute to the potential spread from one farm to another.

Until recently, passive human surveillance has been the primary means of detecting SE on farms.[10] This relies on people seeking medical support coupled with effective traceback to a source farm.

Because SE can be inside the egg and grow rapidly, and there are no obvious indicators of contamination, the risk of consuming contaminated eggs have increased. There is also a significantly heightened risk associated with the consumption of raw and undercooked eggs and egg product. A FSANZ consumer literature review (2024) found the majority of Australian consumers have low perceptions of risk in relation to eggs, in particular with consuming eggs that have runny yolks and/or whites. The review also found many Australian consumers engage in a range of unsafe egg-handing or cooking behaviours, and that consumers are resistant to attempts to change these.

Like many countries, Australia has different egg farming systems and sizes which means on-farm practices to manage SE contamination vary. Current risk management activities required by Standard 4.2.5 such as managing inputs (e.g. feed and drinking water), waste disposal, bird health, visual inspection of eggs for cracks and leakage, traceability of eggs back one step and forward in the supply chain and prohibiting the sale of cracked and dirty eggs are focussed on addressing horizontal transmission and are not sufficient for egg producers and egg processors to manage vertical transmission and other SE-specific risks.

While this proposal considers managing the present SE food safety risks to protect public health and safety, it also considers reducing the likelihood of SE becoming more prevalent and established across the Australian flock.

Box 1. Response to detection of SE on farm

A positive SE detection on farm will trigger response activity to determine whether the flock is infected. Currently in Australia, where the flock is infected with a SE strain capable of vertical transmission, as a mandatory notifiable biosecurity disease under jurisdictional biosecurity legislation, biosecurity controls are implemented to prevent the spread of SE. Biosecurity controls are not mandated by the Code and vary by jurisdiction. Where these controls exist in a jurisdiction the controls may not be under food regulation.

The following incident response actions, as appropriate to the specific situation, may occur:

- cease supply of eggs from the farm to market.
- farm placed under quarantine notice with movement restrictions on eggs, hens and equipment to prevent the further spread of SE.
- eggs, birds, other livestock, equipment and litter may only be removed under a permit to a licensed or approved facility.

[10] Passive human surveillance is the epidemiological investigation in response to notified cases of human illness.

- the governing jurisdiction may issue a permit for eggs on the SE-positive farm to go to pasteurisation to render the egg product safe for sale.
- tracing of facilities or other businesses in recent contact with the farm. Samples from these properties may be collected and investigated.
- infected poultry farms are typically subject to a long process of depopulation, disposal, decontamination and sanitation processes.
- to return to egg producing, a business must demonstrate successful decontamination or begin production on a new property.
- to return to business, affected facilities such as egg processors undergo decontamination processes and may be subject to enhanced surveillance.

Experience from SE incidents in Australia have shown some infected medium farms facing nearly $2 million in costs, comprising of flock depopulation, property cleaning, loss of capital, and loss of income.

The management of an SE incident by food authorities amounts to around $50,000, including initial response, site visits, recall costs, briefings, and resource development. Jurisdictions may also cover the costs of the additional sampling required to verify the absence of SE on farm, in facilities and neighbouring properties.

Current food safety requirements for egg production in Australia are inadequate to effectively manage the additional risks posed by SE

Initial FSANZ review: the problem is SE risks are not managed

The 2018-19 outbreak showed the current Standard 4.2.5 did not manage risk factors associated with the vertical transmission of SE.

At the request of the Food Regulation Standing Committee in 2020, FSANZ reviewed Standard 4.2.5 and the existing regulatory and non-regulatory measures for managing egg food safety in Australia.[11] The review confirmed an absence of requirements in the Code to manage SE-specific risks and observed other requirements to be potentially inadequate to effectively manage SE.

The review concluded that current regulatory and non-regulatory measures are not adequately safeguarding public health and safety from the risk of foodborne illness from consuming eggs and egg product in Australia. The review recommended FSANZ consider amending the Code through a proposal and consider the effectiveness of a range of measures such as:

- bird health and farm hygiene – management of diseases or conditions of the layer flock that could make the eggs unsafe or suitable
- environmental monitoring – samples of dust and faeces in a layer house environment to monitor potential infection of layer flocks
- through-chain requirements – management of food safety requirements across the egg supply chain
- temperature control – how eggs are stored and transported after lay
- egg traceability – egg marking and detailed record-keeping to enable traceback to the egg producer.

Existing regulatory measures

Food safety legislation and jurisdiction-level biosecurity requirements converge on several

[11]https://webarchive.nla.gov.au/awa/20221120172958/https://www.foodstandards.gov.au/industry/safetystandards/Documents/W1138%20Egg%20Standard%20Review%20-%20Public%20Information%20Paper.pdf

aspects of egg production. Biosecurity focuses on poultry health, flock movement and breeding to prevent and control the spread of disease, some of which also impact on food safety.

In response to the 2018-19 outbreak, some jurisdictions have since taken additional biosecurity action to control the spread of SE. These measures differ across states and territories. One example is the Biosecurity Control Order introduced in NSW to require environmental monitoring, controlling movement of people, ensuring protective clothing and equipment cleaned and sanitised, footbaths used on entry to specific areas to disinfect footwear, handwashing, health of staff and visitors, and improved pest control. Other measures are discussed in subsection 3.2.

FSANZ notes reports of low adoption of biosecurity practices in different egg production systems in Australia, including practices such as equipment sharing between sheds and limited disinfection of shared equipment (Scott et al. 2018). Properties involved in the 2018-19 outbreak were interconnected in that people, eggs or equipment were moving between them.

As there have not been requirements in the Code to manage risks specific to SE, there is overall a lack of consistency among the jurisdictions to manage SE food safety risk factors which contributes to the inadequate protection of public health and safety. These measures are discussed further in subsection 3.3.

Existing non-regulatory measures

The egg industry has introduced a range of guidance materials and procedures to manage the risks associated with *Salmonella* on layer farms. While not all are SE-specific, these measures will provide for SE management and include:

- investing in research and development and developing *Salmonella* monitoring programs and SE response plans to improve *Salmonella* risk management.
- providing tools to assist producers and processors with traceability.
- providing accreditation programs for operators to participate in.

FSANZ notes large egg producers and some medium egg producers are participating in voluntary industry schemes that address SE-specific food safety risks alongside demonstrating compliance with the Code, such as Egg Standards of Australia (further discussed in subsection 3.3). 18% of producers are estimated to be participating in these schemes, generating 82% of total egg production in Australia (Egg Farmers of Australia, personal communication; Australian Eggs, 2024). Participation in such schemes may be a requirement to supply to large food retailers and for exporting purposes (Department of Agriculture, Forestry and Fisheries n.d.). Voluntary schemes are discussed further in subsection 3.3.

However, the review and consultation indicated voluntary measures are not uniformly adopted by all egg producers and there remains a considerable number of egg producers that do not take the recommended steps to address SE-specific food safety risks, including monitoring and minimising the presence and potential spread of SE. It is difficult to estimate with certainty how many egg producers are and are not engaging in these non-regulatory measures.

The unmanaged food safety risks and the spread of SE overseas led to many foodborne illness outbreaks and required the introduction of a variety of highly prescriptive and costly measures to adequately protect public health and safety

If SE food safety risks and the spread of SE can be limited across the Australian flock, the need for more costly interventions in the longer-term, such as those other countries implemented to protect public health and safety as described below, may be avoided.

SE is the predominant *Salmonella* in other countries such as the UK, EU and USA.

EU requirements mandate a durability date (i.e. a use-by and a sell-by date). The USA mandate refrigeration within 36 hours of lay. Canada mandates a gradual temperature control regime achieving refrigeration by the time eggs reach retail. All countries have prescribed environmental sampling programs to monitor SE on-farm (see Appendix A for further detail).

In the UK, SE accounted for approximately 10% of human *Salmonella* illness in 1981 (around 2,000 reports of illness). By 1993 this rose to nearly 70% of cases (23,230 cases; ACMSF 2016). The increase was associated with contaminated chicken meat and eggs.

The reporting of egg-associated outbreaks did not start to decline until 1997 after:

- the introduction of SE vaccination and a flock hygiene programme targeted at larger laying flocks.
- interventions introduced by the UK egg industry, largely under the Lion Code quality assurance scheme.[12]
- changes in the handling of eggs in catering environments and the increased use of pasteurised or heat-treated liquid egg also assisted in reducing the numbers of outbreaks reported associated with eggs.
- changes in the UK population's food habits, such as avoiding dishes involving raw egg (ACMSF 2016).

The UK presently requires environmental sampling of flocks for *Salmonella* and prescriptive requirements for a defined shelf-life.

Recent SE outbreaks in Australia highlight the potential for significant impacts if SE were to become established in the Australian laying flock

As mentioned earlier, the most significant multi-jurisdictional outbreak of SE linked to eggs happened in 2018-19 and was associated with 245 human cases identified across New South Wales, Victoria, Queensland and Tasmania.

Glass et al. (2022) estimated the cost of the foodborne illness of this outbreak at $7 million (inflation-adjusted to March 2025), including:

- 426 general practitioner visits
- 144 emergency department presentations
- 58 hospitalisations
- a further 945 unnotified cases of salmonellosis.

However, this estimate significantly underestimates the cost of the outbreak as it does not include all costs. For example, the investigation resulted in a large recall of eggs and a significant biosecurity response involving culling birds and closing egg farms (see Box 1).

[12] The Lion Code comprises a suite of measures including vaccination for SE and ST, a cool chain from farm to retail outlets, enhanced testing for *Salmonella*, improved farm hygiene, effective rodent control, independent auditing, date stamping on each individual egg and traceability.

There have also been sporadic notifications of illnesses linked to the outbreak strain since the initial outbreak investigation. Outbreaks and subsequent recalls may also damage the reputation of and consumer confidence in the egg industry as safe food producers.

Without interventions to sufficiently manage SE-specific food safety risks, it is possible a similar wide-spread emergence of SE in Australian layer flocks as there was in the UK may occur. Given Australia's current passive human surveillance, the emergence of SE would be unlikely to result in such large numbers of illness. However, in a scenario where there is a 30-50% increase of the current egg-related *Salmonella* cases in Australia (similar to the projection of UK illness; Lane et al. 2014), this translates to an additional 38,000-63,500 cases over 10 years (assuming the number of illness cases each year is constant over the 10 years).

As illustrated above, notified reports only represent a small proportion of the total illness cases that would occur. Such a scenario would entail significant additional costs associated with outbreak management with more farms and more flocks likely requiring depopulation, impacting the egg supply chain and Australian consumers. An alternate approach to eradicating SE may need to be considered in this scenario, involving additional costly interventions to manage food safety risks and minimise foodborne illness, as significant spread would make the egg industry unable to meet consumer demand for eggs and egg products.

3. Why is government action needed?

FSANZ's risk assessment for this proposal (see subsection 1.5) found the current regulatory measures do not adequately address the risks of the vertical transmission of SE.

Current regulatory measures do not account for flocks infected with SE being asymptomatic, that SE can be present inside the egg at time of lay and typically only a small percentage of eggs will be positive. This means SE detection on farm can only occur through either effective environmental monitoring of the flock for SE or effective investigation of a foodborne illness (with successful traceback to farm).

The risk assessment concluded that the 2018-19 outbreak and subsequent sporadic occurrences of SE reinforces the conclusion from the initial FSANZ review that current Code requirements do not manage SE-specific food safety risks or effectively protect public health and safety.

The primary objective of this proposal is to examine whether measures can be put in place to adequately protect public health and safety and minimise foodborne illness from consumption of eggs and egg products (Table 1). Consideration has also been given to the cost-effectiveness of introducing such measures.

Table 1. Primary objective and intended outcome

Outcome measures	Description
1. Protection of public health and safety by minimising foodborne illness from SE in Australia	Amending the Code to improve food safety measures prioritises public health and safety. Improved food safety measures to detect SE early will: • reduce SE foodborne illness

	• reduce S*almonella* related illness generally.

To achieve this objective and effectively protect public health and safety, FSANZ's risk assessment identified particular measures to manage SE-specific food safety risks. Table 2 describes these outcome measures.

Table 2. Outcome measures to achieve the objective

Outcome measures	Description
2. Early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia.	Early SE detection via environmental monitoring and testing allows egg businesses and food authorities to implement corrective actions to prevent: • further distribution of contaminated eggs • spread of SE among other layer flocks.
3. Enable rapid traceback to an infected farm during a foodborne illness incident.	Enhanced traceability measures will enable: • contaminated eggs to be more quickly removed from circulation • other compromised properties or operators to be identified faster.
4. Minimising SE microbial growth if present in an egg.	Storage and transport practices can minimise SE microbial growth, where: • temperature fluctuations are avoided • egg operators demonstrate safe handling practices that contribute to the safety and suitability of eggs.

FSANZ considers the best way to address the problem and achieve the proposal objective is to amend the Code. This will:

- adequately protect public health and safety from SE, reducing foodborne illness
- ensure SE-specific food safety risks are managed by all egg producers and processors
- reduce the likelihood of SE becoming more prevalent and established across the Australian flock.

This section covers the reasons why FSANZ considers explicit regulation to be appropriate in introducing these measures and how FSANZ considered whether existing regulatory and non-regulatory measures can solve the problem.

3.1. Primary production and processing standards are important to strengthen food safety and traceability throughout the supply chain

FSANZ is responsible for the amendment and maintenance of the Code, which is regulation. Only FSANZ can amend the Code with Ministers' agreement (see subsection 7.1). Among other things, the Code specifies requirements for the primary production and processing of eggs and egg product.

Explicit government regulation (like standards) is appropriate to be used as a regulatory tool as there is a perceived high risk, as indicated through the risk assessment and experience

from recent outbreaks, and achieving compliance is seen as critically important.[13]

Standard 4.2.5 aims to reduce foodborne illness associated with eggs and egg products. The current standard requires egg producers and processors to identify and control egg safety hazards, prohibits the sale of dirty or cracked eggs unless they are sold to a processor for pasteurisation, and requires eggs to be stamped with the producer or processor's unique identification so they can be traced.

Many other countries apply explicit standards to egg production and processing. Appendix A provides detail on the egg production and processing requirements in Canada, the EU, New Zealand, the UK and the USA.

It is important to strengthen the current Standard 4.2.5 to address known food safety risks and regulatory gaps to continue to reduce foodborne illness.

Changes to the Code are made frequently and the food regulatory system is well equipped to manage changes.

FSANZ is not responsible for the implementation of the Code. However, FSANZ works closely with an implementation working group of regulators from each jurisdiction (Implementation Sub-Committee for Food Regulation) to ensure the implementation of amendments to the Code do not act as a barrier to its success.[14] The working group promotes a consistent approach to implementing Code requirements.

3.2. Some jurisdictions have regulatory measures in place to address SE-specific food safety risks

As mentioned in section 2, some jurisdictions have since taken additional biosecurity action to control the spread of SE following the 2018-19 outbreak. For example, the NSW Biosecurity Control Order has demonstrated to be effective in identifying SE infected flocks early and preventing further spread of SE. However, flocks still become infected sporadically and these measures are considered differently in other states and territories.

Existing regulatory requirements for on-farm environmental testing vary, with only two jurisdictions requiring on-farm environmental testing but at different frequencies and under different legislation (Queensland and NSW).[15] One of these jurisdictions regulates under biosecurity legislation, the other under primary production food safety legislation.

Regulatory measures to address animal and pest control exist in biosecurity legislation in each jurisdiction, with some variation between jurisdictions in application. Similarly, existing biosecurity regulatory measures may address the management of range areas (outside area that a flock has access to for roaming or foraging) in part but FSANZ's risk assessment noted evidence of poor biosecurity practices by egg producers, such as equipment sharing between sheds and limited disinfection of shared equipment (Scott et al. 2018).

NSW requires temperature control under biosecurity legislation. Regulatory measures in other jurisdictions do not address the problem of *Salmonella*'s presence and growth inside the egg and resulting increased risk of foodborne illness.

The risk assessment identified cleaning of eggs, if done incorrectly, may contaminate internal egg contents and cause an egg to become unsafe or unsuitable. There are no regulatory

[13] https://oia.pmc.gov.au/resources/guidance-impact-analysis/regulatory-impact-analysis-guide-ministers-meetings-and-national
[14] https://www.foodregulation.gov.au/activities-committees/isfr
[15] E.g. Biosecurity (*Salmonella* Enteritidis) Control Order 2024 has effect until June 2025.

measures addressing this risk factor.

The risk assessment also identified when a foodborne pathogen is inside an egg, an egg is hazardous. Broken or leaky eggs managed improperly may provide opportunity for pathogenic growth. Existing jurisdiction level regulatory measures could be applied to broken and leaking eggs as Food Acts have a prohibition on the sale of unsafe and unsuitable food, however, there are no specific measures to prohibit their sale.

Overall, there is a lack of consistency among the jurisdictions in the management of the SE food safety risk factors identified by the risk assessment. The following section discusses the non-regulatory measures that are available to the Australian egg industry to address these risks and minimise foodborne illness.

3.3. Non-regulatory measures addressing SE food safety risks exist but are not adopted by the whole egg industry

Non-regulatory measures are available for Australian egg operators to adopt that address the SE food safety risks identified by the risk assessment. However, there are gaps in the industry adoption of these voluntary materials.

For example, there are a range of domestic and international guidance materials which Australia's egg industry could readily access to support compliance with current requirements and manage food safety risks.[16] Following the 2018-19 outbreak, additional resources were created to address food safety risks specifically related to SE.

Despite the available material, a relatively small percentage of egg producers adopt environmental monitoring practices. Adoption is driven by either voluntary use of an industry scheme or a regulatory requirement in the jurisdiction concerned (Australian Eggs, personal communication 2023). As mentioned in section 2, there are also reports of low adoption of biosecurity practices. Compliance with biosecurity practices is only verified following biosecurity incidents as there are no government inspections or audits of these practices.

Food safety schemes are available for operators to participate in. These are voluntary, prescriptive schemes that aim to ensure the safety of food during certain stages of production, packing, processing, transport, manufacture, wholesale and retail sale or food service.

Egg Standards of Australia (ESA) is a voluntary quality assurance program providing egg producers and processors with a practical mechanism to demonstrate compliance with egg primary production and processing standards. ESA provides standards for layer farms and grading and packing floors.

ESA also requires elements that go beyond the current requirements in Standard 4.2.5, such as undertaking monitoring for *Salmonella*, measures addressing the contamination due to the cleaning of eggs and explicit compliance criteria for the storage of eggs including that eggs are refrigerated or placed into a cool room operated between 4°C and 15°C.

The National SE Monitoring and Accreditation Program (NSEMAP) is also available for egg operators to participate in. NSEMAP provides testing requirements and accreditation processes for SE freedom, particularly for egg producers exporting eggs. NSEMAP requires sampling of each flock every three months to maintain accreditation status as SE-free. NSEMAP requires other measures including the prompt storage of eggs in cool storage set

[16] Example of guidance materials available to egg operators - https://www.australianeggs.org.au/for-farmers/resources/food-safety

between 1°C and 15°C.

FSANZ observed through industry site visits that adoption of these schemes is often by larger egg producers and understands the level of adoption by small egg producers is low. Large producers are likely to participate in ESA as it also meets the compliance needs of major retailers. FSANZ is aware that there may be around 20 medium egg businesses that may also be covered under ESA. Participation in NSEMAP may be in part due to large businesses exporting and having to demonstrate SE-free status.

While a large proportion of eggs produced in Australia are from producers participating in voluntary schemes that address SE food safety risks, there remains a large number of small egg producers not adopting these practices. These producers could produce contaminated eggs leading to foodborne illness and also become a source of contamination for other farms due to the rapid spread of SE.

To adequately manage the present food safety risks identified in the risk assessment and seen in recent SE incidents, risk management measures must be consistently applied across the egg industry to reduce foodborne illness in Australia. Amendments to the Code that address SE food safety risks would provide baseline requirements for the egg industry to comply with. A mandatory approach requires a change to the Code.

4. What options are to be considered?

This section presents the regulatory options FSANZ considered under this proposal. The following analysis in section 5 identifies the costs and benefits to the community, government, and industry that may arise from these options.

FSANZ considered three options to address the identified problem:

1. Maintaining status quo
2. Introducing a combination of regulatory and non-regulatory measures (preferred option)
3. Introducing a combination of regulatory and non-regulatory measures including mandatory refrigeration requirements for eggs.

These options are discussed in the following sections. Each option is compared against the proposal objective and outcome measures in tables 3-5, respectively.

Introduction of non-regulatory measures alone to support existing regulatory and non-regulatory measures would not provide the necessary framework for regulators or industry to have assurances that food safety risks are being managed to minimise foodborne illness. Non-regulatory activities are not legislated and there is no mandated requirement for industry to participate in these activities.

As discussed in subsection 3.3, voluntary measures that address SE food safety risks are already available with limited adoption by egg producers, particularly smaller farms. Given the consequences if these risks continue unmanaged, as observed during the 2018-19 outbreak, relying solely on non-regulatory measures does not sufficiently protect public health and safety.

4.1. Option 1 – Maintaining status quo

When considering any changes to regulation, FSANZ includes the status quo to compare other options against. If FSANZ's assessment leads to the decision to maintain the status quo, proposal P1060 would be abandoned.

Under status quo, Standard 4.2.5 would be maintained as it is currently written along with other egg food safety measures in the Code, such as Standard 2.2.2.

Egg operators would continue to meet jurisdiction-level requirements. As these requirements differ between jurisdictions, some egg producers would be taking additional measures to manage SE, such as undertaking environmental monitoring, while egg producers in other jurisdictions may not be.

Currently available non-regulatory measures would also continue to be available for egg operators to implement voluntarily to address SE-specific food safety risks. As discussed in section 2 and 3, while a large proportion of the eggs produced in Australia are under some form of environmental monitoring, this represents a small proportion of egg producers across Australia.

Table 3. Option 1 against the objective and outcome measures

Objective or outcome measure	How the option meets the objective/measures
1. Protection of public health and safety by minimising foodborne illness from SE in Australia	Protection of public health and safety is not satisfactorily achieved under status quo. The regulatory and non-regulatory measures under status quo have been assessed as not adequately managing the public health and safety risk of foodborne illness due to *Salmonella*, particularly SE which is capable of vertical transmission. Maintaining status quo does not meet this objective as while flock infection with SE is currently sporadic in Australia using human illnesses means of detecting SE does not protect public health and safety. Furthermore, it has been reported that in Australia only 68% of *Salmonella* traceback investigations result in identifying a specific farm from which the implicated eggs had been produced (Moffatt et al. 2016). While the present system is able to identify most outbreaks, FSANZ's QMRA modelling (see subsection 1.5) added it may be challenging to identify outbreaks in smaller farms as there is less SE illness to trigger epidemiological traceback investigations. SE-positive farms that go undetected may lead to the spread of SE to other farms, and more foodborne illness.
2. Early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia.	Maintaining status quo does not ensure the early detection of contaminated eggs and preventing the spread of SE. There will likely continue to be gaps in the adoption of environmental monitoring across the Australian layer flock.

3. Enable rapid traceback to an infected farm during a foodborne illness incident.	The rapid traceback to an infected farm during an incident is also not achieved under status quo. Eggs are currently required to be individually marked with a unique identifier as a traceability measure. This mark assists with identifying the source of eggs in the event of a foodborne illness investigation. The mark can identify the producer or the processor. Producers and processors must also have a system in place to identify where their eggs have been sold or have come from. There are known gaps and inefficiencies in the Code that have hampered tracing eggs back to the producer, such as: • where an egg is marked with the egg processor's unique identification as currently permitted under the Code, becoming a challenge, where multiple egg producers are supplying to an egg processor and eggs are 'co-mingled' before marking. • different interpretations of Standard 4.2.5 leading to the movement of unmarked eggs via 'egg traders' where the production source of these eggs has not been clear.[17] • consumers may discard or no longer have the egg carton to use to identify the farm of origin, indicated by the Scientific Advisory Group for Eggs assisting with FSANZ's risk assessment. • egg cartons may also be re-used, such as at farmers markets, and the information on the carton may no longer reflect the true source of the eggs. Maintaining status quo does not address these traceability concerns.
4. Minimising SE microbial growth if present in an egg.	While eggs and egg product are required to be safe and suitable under status quo, there are SE-specific food safety risks, such as the vertical transmission of SE, that FSANZ's risk assessment has identified are important for egg producers and processors to manage and are not adequately managed in current Code. Minimising microbial growth if present in the egg will also not be met in maintaining status quo.

Consideration of the status quo in this instance is complicated as FSANZ must not only have regards to the present risks and harms but also what they may be in future in the absence of applying additional interventions now to manage SE and minimise foodborne illness. Section 2 illustrates the potential trajectory of status quo if SE is to become established among the Australian layer flock.

[17] The intended outcome of the current standard allows for eggs to be sold to another egg producer or processor who must then mark the eggs. These egg producers may only sell eggs to other entities where those eggs are marked with their identification.

4.1. Option 2 – Introducing a combination of regulatory and non-regulatory measures (preferred option)

Under this option, FSANZ would amend existing standards, as relevant to egg and egg product, within the Code to introduce new measures to manage the emerging food safety risks associated with SE and other *Salmonella*.

These measures include:
- introducing environmental monitoring of poultry houses for the presence of SE
- strengthening traceability requirements
- temperature control during storage and transport of eggs and egg product.

As no single measure will adequately manage SE and other *Salmonella* food safety risks other measures would be introduced or amended in the standard under option 2, enhancing a multi-pronged approach to risk management on-farm. Other amendments relate to rodent, insect and wild bird control, safe cleaning of eggs, and range area management.

Table 4. Option 2 against the objective and outcome measures

Objective or outcome measure	How the option meets objectives/measures
1. Protection of public health and safety by minimising foodborne illness from SE in Australia	Amendments to the Code will help reduce foodborne illness by minimising identified public health risks, including proactive public health and safety measures such as environmental monitoring. Amendments to manage SE-specific food safety risks will also improve egg food safety measures generally to support efforts in reducing other *Salmonella*, such as *Salmonella* Typhimurium.
2. Early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia.	Introducing a requirement for regular environmental monitoring in the Code will meet this outcome measure by providing a national approach to flock monitoring. This will allow for greater coverage of the egg industry than the current voluntary uptake of these measures and delivers clearly identifiable outcomes to reduce foodborne illness.
3. Enable rapid traceback to an infected farm during a foodborne illness incident.	Prescribed traceability requirements and amendments to address regulatory gaps support meeting this outcome measure by enabling faster identification of the egg producer and the recall of potentially unsafe eggs.
4. Minimising SE microbial growth if present in an egg.	This amendment meets this outcome measure in preventing eggs being exposed to temperatures for periods of time that would result in more rapid changes inside the egg, supporting growth of *Salmonella*, when present. The amendments also support flexibility for temperature control through supply chains, given the multiple pathways some eggs progress through prior to consumption. This outcomes-based approach provides flexibility to adjust time and temperature conditions when

	and where required, such as in response to more wide-spread emergence of SE in layer farms. Where there is increased risk of flock infection with SE and thus likelihood of SE presence inside eggs, reduced storage and transport temperatures (such as refrigeration) would prevent SE growth and minimise risk of illness.

The amendments under option 2 would be supported by guidance material to assist the egg industry in complying with the amendments to the Code. The guidance material would be developed and provided by the Egg Implementation Working Group (see subsection 6.1.).

The following three sections discuss the main three amendments in option 2. The fourth section describes the minor amendments contained in option 2.

4.1.1. Environmental monitoring for SE

Option 2 would require a layer farm to do environmental sampling and testing for the presence of SE. This amendment would not prescribe the frequency of sampling and testing. However, this will be determined by jurisdictional food regulatory agencies.

SE-infected flocks are often asymptomatic, complicating detection and control. Relying on traceback following human illness to trigger action is not effective at protecting public health. FSANZ's risk assessment concludes effective sampling programs are crucial for detecting *Salmonella*, particularly SE, in poultry flocks.

Further, FSANZ QMRA modelling (see subsection 1.5) illustrates that implementing on-farm environmental monitoring significantly reduces the number of illnesses associated with small and medium sized SE-positive egg layer farms (the QMRA did not model the intervention on large layer farms as these farms had already implemented measures FSANZ was considering introducing into the Code).

In the case of small farms, QMRA modelling finds the majority of SE-positive farms go undetected during the first and second production cycles when relying on passive human surveillance alone. While human illness cases may be lower for small farms, the farm remains a source of SE with the potential for spread to other layer farms or egg handling businesses. This means without environmental monitoring small farms may only be detected when there is a major foodborne illness outbreak.

Early SE detection allows egg businesses and food authorities to implement corrective actions to prevent further distribution of contaminated eggs to minimise foodborne illness. Early SE detection can also prevent spread of SE among other layer flocks which could be cost saving to the egg supply chain as a whole, given the significant costs involved when SE is detected – see Box 1 above for further detail.

As mentioned in section 3, apart from NSW where it is mandatory to sample and test for SE every 12-15 weeks and Queensland where it is mandatory to sample and test for SE annually, only a small percentage of egg producers are environmentally monitoring for SE. Establishing measures across the egg supply chain now to reduce the risk of SE spread in layer flocks across Australia while SE prevalence is low and sporadic, may also avoid the many foodborne illness outbreaks and costly situations for the egg industry, consumers, and government observed overseas when SE was widespread (as described in section 2).

There is a likelihood that other *Salmonella* will be detected by undertaking environmental monitoring on-farm. Implementing such a measure may also offer a reduction of other

Salmonella illness widely prevalent and costly in Australia, such as *Salmonella* Typhimurium.

4.1.2. Strengthening traceability requirements

Experiences of recent SE incidents and FSANZ's risk assessment findings demonstrate the importance of having strong traceability across the supply chain to rapidly traceback to a SE-positive farm, of which egg marking is an important aspect.

Option 2 would amend Standard 4.2.5 to require the egg to identify the relevant egg producer by the use of a unique mark applied to the egg before the egg can be sold, not the egg processors' unique identification as currently written in the Code.

To improve the rapid traceback during a foodborne illness incident the marking applied to the egg must enable identification of the egg producer without the need to refer to other information, such as on the egg carton or processing records.

In addition, amendments under option 2 would require egg producers and egg processors to keep and maintain specific records to enable eggs and egg product to be traced more effectively.

4.1.3. Temperature control during storage and transport of egg and egg product

Findings from the risk assessment demonstrate the importance of temperature control in preventing SE (and other microbial) growth if present in the egg contents. *Salmonella* in and on eggs is influenced by storage and transport temperature. The growth of most *Salmonella* is substantially reduced below 15°C and prevented below 7°C. For SE growth potential to be effectively reduced, cold storage (below 7°C) would need to be imposed from shortly after lay until immediately before cooking and consuming an egg.

QMRA modelling finds significant decreases in SE human illness when refrigeration through-chain was applied. When implemented in tandem, environmental monitoring and refrigeration show the greatest decrease in SE illness.

To address this risk factor, under option 2 FSANZ would amend Standard 4.2.5 to require egg producers and egg processors to ensure time and temperature conditions under which eggs are stored and transported do not make eggs unsafe or unsuitable. One example of this in practice could be considering the storage conditions of eggs for sale at farm gate and ensuring egg temperature is adequate such as in a small fridge. In addition, an egg processor must also ensure time and temperature conditions under which egg product is stored and transported will control the growth of pathogenic micro-organisms in the egg product and not make egg product unsafe or unsuitable.

4.1.4. Other measures introduced under option 2

Option 2 would also make amendments to the Code related to:

- Contamination from presence of animals and pests

An amendment would be made to require an egg producer and egg processor to ensure the presence of animals, pests and vermin in premises, grading floors, equipment, range areas, poultry houses and transportation vehicles do not make eggs unsafe or unsuitable.

Regulatory measures exist in biosecurity legislation in each jurisdiction and voluntary non-regulatory measures are available to egg operators. However, amendments are required to address the inconsistency in application of this pest control requirement and gaps in industry adoption of the non-regulatory activities to control the presence of animals and pests.

- Contamination of eggs due to cleaning of eggs

An amendment would be made to require egg producers and processors which clean eggs, to ensure the cleaning did not make the eggs unsafe or unsuitable.

The risk assessment identified cleaning of eggs, if done incorrectly, may contaminate internal egg contents and cause an egg to become unsafe or unsuitable.

There were no regulatory measures addressing this risk factor. There are non-regulatory measures such as ESA and guidance material that address it, but these are voluntary and not all adopt it. Information collected for this proposal indicated many businesses wash their eggs, however, there was evidence best practice washing guidance was not always followed.

- Contamination of range area

An amendment would be made to require an egg producer to ensure a range area does not make eggs unsafe or unsuitable.

The existing Standard 4.2.5 did not explicitly require the range area to be managed. Existing biosecurity regulatory measures may address it in part, but the risk assessment noted evidence of poor biosecurity practices by egg producers. There are non-regulatory measures available, but these are voluntary and not uniformly adopted by the industry.

- Preventing the sale of eggs that are broken and leaking at time of collection from a flock

To improve clarity, a definition for a broken egg would be added to the Code and an amendment would be made to prohibit the sale or supply of broken eggs.

The risk assessment identified when a foodborne pathogen is inside an egg, an egg is hazardous. An egg that is broken and leaking at the time of collection has exposed the egg pulp to direct contamination from the poultry house environment. If contaminated with micro-organisms, the lack of temperature control and time until collection provide opportunity for pathogen growth.

The existing requirements in Standard 4.2.5 that could apply to a broken and leaking egg at the time of collection were requirements for a cracked egg. These were:

- a cracked egg must not be sold and must either be disposed of or sent to an egg processor for heat treatment; and
- require processed egg product to be stored or transported under time and temperature conditions that control the growth of pathogenic micro-organisms.

These requirements in Standard 4.2.5 meant a broken and leaking egg may be considered a ‘cracked egg’ and go for processing prior to sale for human consumption.

Current industry practice is to divert to waste, eggs that were broken and leaking at the time of collection. However, some concerns were raised with FSANZ by industry representatives that some egg producers do not discard these eggs and instead send them for heat treatment for use in food for human consumption.

Amendments would also be made to improve alignment of Standard 4.2.5 with Chapter 4 of the Code. These amendments are new references to general food safety management requirements and the amendment to the title for health and hygiene requirement clauses.

4.2. Option 3 – Introducing a combination of regulatory and non-regulatory measures including mandatory refrigeration requirements for eggs

Under this option, FSANZ would make amendments to the existing standard as detailed in option 2 and would also require refrigeration of eggs and egg product throughout the supply chain (from grading floor to retailers, including refrigerated transport).

Option 3 is presented as an option under this proposal as refrigeration was identified by the risk assessment as a control measure to effectively reduce SE growth potential and minimise foodborne illness.

Refrigeration of eggs is a control measure used in other countries such as the USA and Canada (refer to Appendix A for further detail on international requirements). However, the SE situation in Australia differs from the countries that have introduced refrigeration in that SE is not endemic in the Australian layer flock.

Table 5. Option 3 against the objective and outcome measures

Objective or outcome measure	How the option meets objective/measures
1. Protection of public health and safety by minimising foodborne illness from SE in Australia	As met in Table 4. FSANZ's QMRA modelling finds refrigeration alone significantly reduces the number of illnesses associated with SE, reducing the burden on the public health system.
2. Early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia.	As met in Table 4.
3. Enable rapid traceback to an infected farm during a foodborne illness incident.	As met in Table 4.
4. Minimising SE microbial growth if present in an egg.	Option 3 goes further than option 2 in minimising SE microbial growth, by prescribing the temperature below which an egg operator must store and transport their egg and egg products.

5. What is the likely net benefit of the proposal?

The net benefit of the status quo option (option 1) by definition is zero as it involves no change. If no other options are likely to achieve a net benefit, option 1 would be the preferred option.

However, in this case, consideration of status quo also needs to consider the potential rise in foodborne illness if no action is taken. Section 2 describes a possible future scenario if SE food safety risks continue to be unmanaged in Australia under status quo option.

This section sets out the quantitative analysis, where possible, of the proposed regulatory measures under option 2 and 3. The analysis compares the direct benefits to the community from a potential reduction in foodborne illness and greater food safety management of *Salmonella* infection, against the costs associated with the regulatory measures to the egg industry and jurisdictional government agencies.

This analysis focusses on very small, small and medium producers as the measures in

option 2 and 3 are expected to mostly affect these egg producers. As stated above, large producers are likely to have measures in place that meet the proposed requirements through participation in voluntary schemes such as ESA and NSEMAP. FSANZ is aware that there may be around 20 medium egg businesses that may also be covered under ESA and currently meet the proposed requirements. The analysis indicates where amendments to the Code are likely to impact egg processors.

FSANZ received estimates of the number of layer farms (Table 6) and egg processors from jurisdictions (Table 7). The size of an egg producer has been categorised by the number of layer birds.

Table 6. Number and size of egg producers by jurisdiction[18]

Jurisdiction	Layer farm size				
	Very Small	Small	Medium	Large	Very Large
NSW	111	66	43	34	5
Victoria	677	112	63	50	13
Queensland	33	41	21	13	4
South Australia	54	19	4	3	1
Western Australia	50	12	8	4	5
Tasmania	8	7	3	1	1
ACT	-	3	1	0	0
Total	**933**	**260**	**143**	**105**	**29**

Note: Very small: less than 1,000 layers; Small: 1,000 to 10,000 layers; Medium: 10,000 to 50,000 layers; Large: 50,000 to 250,000 layers; Very Large: more than 250,000 layers.

Table 7. Number and type of egg processors by jurisdiction

Jurisdiction	Third party grading floor	Pasteurisation and processing
NSW	6	16
Victoria[19]	-	-
Queensland	8	3
South Australia	1	1
Western Australia	1	1
Tasmania	0	0
ACT	1	0
Total	**17**	**21**

There is great variation from business to business in their egg supply chain. It is therefore difficult to accurately estimate the costs that each business will encounter from the proposed measures, as each egg producer may experience these impacts differently.

Due to the current sporadic nature of SE in Australia, it is also not possible to estimate how many or how frequently egg producers will become SE-positive over the 10-year period of the analysis. However, based on the prevalence in other countries in which SE is endemic, it is likely that a significant number of egg producers will become SE-positive if it is not further managed.

[18] Due to available data, the number of egg producers do not include farms selling less than 20 dozen eggs in Tasmania and New South Wales, along with producers with less than 50 layers in Victoria. Very small egg producers in Victoria that are currently under a state-based exemption may be captured in this figure. The figure represents the producers that have applied for a Property Identification Code, which is recommended by Agriculture Victoria for exempt egg producers. There are no large commercial poultry farms in the Northern Territory, but a few small producers do sell free-range eggs. However, FSANZ does not have a numeric estimate of these farms to include in this analysis.

[19] Department of Health Victoria could not advise of the number of egg processors in this jurisdiction as these businesses fall under local government.

Given the uncertainty of how many egg producers are likely to be impacted by SE, it is therefore challenging to calculate a generalisable net present value.[20] Therefore, the options are compared in subsection 5.11 through a break-even analysis to consider whether the cost of implementing and complying with the measures outweigh the benefit of avoided foodborne illness. Doing this calculation gives a comparison of the magnitude of possible costs and benefits but is a highly limited measure given many of the benefits extend beyond avoiding the cost of illness.

There are also limitations to quantifying the costs of option 3. Only initial costs of refrigeration to egg producers and processors are known. At the CFS, FSANZ asked stakeholders if they had any information to provide FSANZ to assist in quantifying the costs and benefits identified as unquantified in Table 9 below, including costs involved in option 3. FSANZ did not receive data and evidence to assist in this quantification.

Impacts associated with the proposed amendments are illustrated in Table 8.

Table 8. Impact on different stakeholder groups arising from option 2 and 3

Stakeholder group	Option 2 (preferred option)	Option 3
Consumers	Improved food safety of eggs reducing likelihood of illness. Potentially increased cost of eggs if additional costs of compliance get transferred to the consumer.	As described in option 2. Additional illness avoided from minimised pathogen growth.
Egg industry	Increased compliance costs (e.g. environmental monitoring, record-keeping), where relevant measures are not already in place. Reduced risk of SE spread across Australian layer flock. Improved traceability when managing an outbreak. Potential benefits from improved reputation from food safety measures.	As described in option 2. Additional costs associated with refrigerating eggs through-chain (e.g. constructing cool rooms, investing in refrigerated transport, and increased energy usage). Effective prevention of microbial growth across the supply chain.
Food manufacturers, food service and retailers	These stakeholders may benefit from improved control measures on-farm to support the sustainable supply of eggs.	Where not already in place, additional costs associated with refrigerating eggs through-chain (e.g. purchasing display fridges and increased energy usage). Potential reputational benefits of providing safer eggs at retail.
Government	Potentially increased implementation and enforcement	As described in option 2. Additional costs associated with

[20] A net present value obtains a discounted net value of the benefits and costs to account for the present day value of benefits and costs that will be received or incurred in the future. This is unable to be quantified as it is difficult to predict how many farms may avoid becoming SE-positive and how many illnesses may be avoided as a result of the proposed measures.

	costs for new requirements. Improved capacity to effectively and efficiently manage an outbreak, including reduced cost associated with investigation time. Savings in healthcare expenditure.	enforcing through-chain refrigeration. Further savings in healthcare expenditure from additional illness cases avoided.

Of the impacts listed in Table 9, FSANZ has identified quantifiable impacts and those where the impacts are discussed qualitatively.

Table 9. Quantified and unquantified impacts arising from option 2 and 3

	Stakeholder group	Impact
Quantified cost	Industry	Increased compliance costs.
	Government	One-off implementation costs and potentially increased enforcement costs.
Unquantified cost	Industry and consumers	Potential price increases (this is a transfer of additional compliance costs partially or fully to consumers). It should not be considered as an additional cost as to do so would be to double count.
	Industry	Costs incurred from implementing refrigeration to store and sell eggs.
Quantified benefit	Consumers	Avoided foodborne illness.
	Government	Avoided healthcare costs.
Unquantified benefit	Industry	Improved management of SE food safety risks on farm, minimising the likelihood of infection.
		Identifying SE on-farm early to cease supply of potentially contaminated eggs and take corrective actions.
		Limit the spread of SE to egg producers in close proximity as a result of identifying SE early.
		Strengthened traceability systems to enable rapid traceback to the source of infection.
		Improved reputation from enhanced food safety measures.
	Government	Improved capacity to manage a foodborne illness incident from improved traceability systems.
		Potentially less resources required to manage an SE outbreak if SE spread is limited and controlled due to early detection.
	All stakeholders	Cost avoided by limiting the spread of SE now.
		A prepared egg supply chain in the event that SE does become established in the Australian laying flock.
		Avoided *Salmonella* illness costs from improved egg food safety management generally.

5.1. Cost of the regulatory measures to industry

Subsections 5.1 to 5.6 discuss the different implementation and compliance costs that egg producers and processors may face as a result of the amendments made to the Code as a result of this proposal.

Through the CFS, Safe Food Production Queensland indicated that all Queensland egg producers and processors currently meet the measures proposed by FSANZ at the CFS. Queensland egg producers and processors have therefore been excluded from the implementation and compliance costs.

South Australia Health and Primary Industries and Regions SA (PIRSA) also indicated that they expected industry traceability systems will require minimal adjustments and that regulatory costs are assessed to be minimal. This is based on their assessment the environmental sampling and testing costs will depend on the laboratory used and frequency of testing required, based on a risk assessment of the business's entire management system by PIRSA.

FSANZ also asked at the CFS if stakeholders agreed with the estimated cost of the proposed interventions that was presented at the CFS. While some submitters believed the estimated costs were too low, FSANZ did not receive data or evidence to support the inclusion of alternative estimates. Refer to subsection 6.2 for more detail on stakeholder views.

Detail of the cost estimates and other assumptions used in the following analysis are outlined in Appendix B.

5.2. Administrative cost of regulatory measures

The costs discussed in the following section cover the following amendments:

- temperature control during storage and transport of egg and egg product (separate to mandatory refrigeration in option 3)
- contamination from presence of animals and pests
- contamination due to cleaning of eggs
- contamination of range area
- preventing the sale of eggs that are broken and leaking at time of collection from a flock
- other minor amendments.

Egg producers may incur costs when considering the impact of time and temperature on the food safety of eggs. This may include how a producer collects their eggs and where they are stored. A producer may also consider how eggs might be presented for sale at farmgate or markets and how they will be transported to ensure actions do not make eggs unsafe or unsuitable.

Should egg producers choose to implement refrigerated storage and transport conditions to meet the time and temperature requirement, there may be an impact to retailers to manage storage conditions and maintain the safety of the eggs for sale. Retailers that receive refrigerated eggs should store and display eggs in refrigerated conditions or manage how the eggs are brought up to ambient temperatures for retail display.

Egg producers will have administrative costs involved in reviewing, updating and maintaining ongoing record-keeping of their food safety management statement to include new activities such as verification, pest control, egg cleaning processes, if not already documented.

The presence of animals and pests is expected to have been considered by egg producers and processors as a biosecurity measure. Some egg producers may need to implement additional measures to prevent or restrict the access of these animals to layer hens.

The estimated costs of amendments relating to administrative processes are highlighted in Table 10 and include costs to undergo initial activities and ongoing record-keeping (see Appendix B for further detail).

Table 10. Cost estimates of implementing administrative changes from the proposed measures

	First year	Ongoing (p.a.)
Very small and small egg producer	$1,927	$732
Medium egg producer	$3,237	$2,214

Option 2 and 3 also propose additional ongoing regulatory measures. These measures are discussed in the following sections.

5.3. Environmental sampling to monitor for the presence of SE

Costs involved in implementing regular environmental monitoring include material and time costs of sampling and training for both small and medium producers to enable effective sampling. It may also include administrative costs of implementing a system to maintain records of monitoring activities. Egg producers inexperienced in environmental monitoring may need to seek expert advice from industry professionals or veterinarians before conducting sampling and testing to ensure they comply with this requirement.

Table 11 presents the estimated cost associated with this proposed measure, assuming a farm takes one sample of each flock in a year.[21] To be consistent with FSANZ's risk assessment, a very small egg producer is assumed to have one flock, a small egg producer is assumed to have three flocks, and a medium producer is assumed to have five flocks.

Analytical costs will be dependent on the laboratory used. Transport and storage costs may also be higher for egg producers located further away from capital cities and major regional centres. Flocks that have multiple poultry houses will encounter additional material and time costs, such as in a free-range system (see Appendix B for further detail).

Table 11. Cost estimates of implementing regular environmental sampling (one annual test)

	First year	Ongoing (p.a.)
Very small egg producer	$614	$351
Small egg producer	$706	$444
Medium egg producer	$904	$536

Proposed amendments to the Code do not prescribe the frequency of sampling and testing, but FSANZ notes monitoring every 13 weeks yields the greatest reduction in foodborne illness.[22] This is because a single environmental test at peak production will only detect farms which were SE-positive prior to the single test. For example, an egg producer might take an environmental test around peak production (week 26) and SE could enter the layer environment at week 27. The single environmental test would be too early and the test in the following cycle would be the time that the farm would be detected as being SE-positive.

Jurisdiction food regulation agencies may determine frequencies, based on the combination of measures an individual farm may implement.

[21] Flock means all the birds that share a contained area (such as a range area or a poultry house), consisting of all the layer hens that inter-mingle and have direct contact with one another.
[22] Refer to CFS Supporting document 1 - https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements

While the analysis assumes an egg producer will take a minimum of one sample a year, the cost associated with testing on a quarterly basis has been covered in Appendix B (see Table 26 to 28). Depending on the frequency, ongoing environmental monitoring costs may range from $351-1,405 for very small producers, $444-1,775 for small producers, and $536-2,145 for medium producers.

5.4. Strengthening traceability systems

The proposed strengthening of traceability requirements may involve staff training, administrative costs of implementing or updating traceability systems, and ongoing costs of record-keeping.

An egg producer or processor could set-up or strengthen their traceability system using technology-assisted data collection applications, such as the free tool EggTrace developed by Australian Eggs for egg producers.[23] As described above, implementing such a system may involve upfront costs such as staff training and familiarisation with these tools, and the ongoing cost of data entry to maintain strong traceability records.

Egg producers that top-up their egg supply with eggs from other producers will need to ensure eggs are identified as coming from another source under the proposed amendments. This is not expected to be a significant cost. A producer may choose to meet this measure by purchasing additional hand stamps to identify the supplemented eggs. A 2017 NSW review of egg stamping implementation found hand stamps purchased by small egg producers cost between $90-$2,500, where some producers purchased a number of stamps to use to mark a carton of eggs in one go (NSW Food Authority, 2017).

An egg processor that receives eggs from a number of different layer farms is likely to use automated ink jet printers to mark eggs (information received though stakeholder engagement). To identify the egg source, an egg processor will have to reconfigure the identification settings between batches to reflect the source of the eggs.

Reprogramming is expected to be a reasonably quick process, estimated at 30 minutes between batches. Egg processors already stop processing between different farms and egg production systems. This proposed measure may create additional regulatory burden for egg processors but is not expected to cause delays in their processes.

Estimated costs are provided in Table 12 (see Appendix B for further detail).

Table 12. Cost estimates of strengthened traceability systems

	First year	Ongoing (p.a.)
Very small, small and medium egg producer	$3,156	$2,730

5.6. Total cost of option 2 to egg producers

As discussed earlier, there will be great variation as to how amendments to the Code will impact egg producers from business to business. While not all businesses will require changes to their processes to be compliant with the amendments, Table 13 provides the total estimated cost for an egg producer and egg processor to implement and comply with all amendments to the Code.

Table 13. Total cost of the regulatory measures to producers

[23] EggTrace – https://www.australianeggs.org.au/for-farmers/traceability/more-information

	First year	Ongoing (p.a.)
Very small egg producer	$5,996	$3,813
Small egg producer	$6,089	$3,906
Medium egg producer	$7,296	$5,481

Table 14 summarises the total cost across very small, small and medium farms of implementing the measures proposed in option 2 and 3.

The total cost assumes 10% of very small and small producers and 25% of medium producers are already meeting some of the proposed measures:

- traceability, in response to stakeholder consultation
- administrative measures, given some of these measures are likely to overlap with biosecurity considerations.

The total cost also assumes all Queensland producers and processors already meet the requirements in option 2, and NSW producers and processors have met initial regular environmental monitoring costs.

Table 14. Summary of costs for option 2

		Very small farms	Small farms	Medium farms
Option 2	First year	$4,861,659	$1,176,197	$639,684
	Ongoing	$3,106,887	$765,441	$487,967

It should be noted that the majority of the total cost of option 2 falls to very small egg producers (categorised as a layer farm with less than 1,000 birds; see Table 6). The large number is due to the many egg producers in this category among the Australian egg industry.

Some Australian states and territories provide exemptions to smaller egg producers from meeting certain requirements in Standard 4.2.5. For example, Victoria, Tasmania and NSW provide exemptions to businesses with fewer than 50 egg-producing birds or producing fewer than 20 dozen eggs a week. Depending on the jurisdiction, an exemption can range from an annual audit requirement or licensing exemption to an egg producer being exempt from complying with Standard 4.2.5 (provided the business controls food safety hazards).

It is possible that states and territory food authorities will consider providing exemptions to or part of the amended Standard 4.2.5. The total cost presented in Table 14, particularly for very small farms may therefore be overestimating the total cost of option 2. Appendix B provides the cost assumptions of the total cost figures presented for each of the measures in Table 10 to Table 12 that may assist a jurisdiction in this consideration.

5.7. Mandatory refrigeration of eggs (option 3)

Option 3 considers requiring eggs to be refrigerated from grading through to transportation to retail and foodservice storage and sale. This would involve significant costs across the egg supply chain.

Egg producers and processors

Under this option, small and medium egg producers would likely incur costs involved with installing cool rooms on-farm capable of storing eggs around 7°C degrees and purchasing additional equipment. Small egg producers may also need to purchase mobile refrigeration equipment for selling eggs at farmers markets.

Egg operators would also likely incur costs related to refrigerated transport. Some egg

farmers will already use refrigerated trucks but may not have trucks that are able to reduce their temperature to 7°C.

The initial cost to small egg producers to implement on-farm refrigeration is estimated to be $26,500, and $55,000 for medium egg producers (see Appendix B for further detail).[24] This is likely to be a significant cost to egg producers.

Where refrigeration is installed into existing production spaces there would be a reduction in the overall production area within a shed. This may impact processing activities or necessitate enlarging the production area or building structure to accommodate a cool room.

Implementing mandatory refrigeration across the supply chain will also require an ongoing cost of increased energy usage to power refrigeration units and ongoing maintenance costs of refrigeration units. This ongoing cost has not been quantified due to complexity in estimating this across the whole egg industry and existing information gaps.

It is understood that many large egg producers and egg processors already practice temperature control and would partially or fully fulfil this requirement. Some farms would need to decrease their storage temperature, incurring increased electricity costs and/or purchase of additional refrigeration units.

Retailers

Option 3 would impact numerous small retailers, such as fruit shops, which may not currently have the capability or capacity to store and display eggs under temperature control.

This measure would also impact medium and large retailers. Stakeholder consultation indicated that eggs are sold in refrigerated conditions in around 90% of certain supermarkets chains but differs for other retailers which sell eggs entirely in ambient conditions.

Due to more complex supply chains, some large retailers that do not refrigerate eggs under status quo may encounter additional costs to implement refrigeration throughout their distribution transport and warehousing, along with the cost of implementing refrigerated display of eggs.

For all retailers there would be cost involved in installing refrigeration equipment. Ongoing costs include running costs, such as electricity and additional compliance checks, and ongoing maintenance costs.

The impact of implementing refrigeration of eggs at retail has not been quantified but is expected to present a significant cost.

Changes may also need to be made to the labelling on egg cartons to update consumer storage instructions to indicate consumers to refrigerate eggs after purchase. This may be more costly where changes to packaging artwork is required to make adequate space for changes in storage instructions.

[24] The costs of implementing on-farm refrigeration have been estimated using web search of business that offer commercial refrigeration sales and installation. Therefore, they might not be generalisable and they have not been scaled up to estimate total cost of implementing an on-farm refrigeration for small and medium egg producers.

5.8. Cost to consumers

The cost to consumers and following subsection discussing cost to government apply to the consideration of both option 2 and 3 against status quo.

Egg businesses that incur increased cost of complying with the Code as a result of the proposed amendments may decide to transfer this cost through increased price of eggs which may impact consumers. However, this is a transfer of costs and should not be considered as an additional cost as to do so would result in double counting.

However, stakeholder feedback at the CFS noted that an increase in compliance costs may be absorbed by the industry and not transferred to consumers. Submitters also shared the new requirements are already met by some egg producers and that there are no expected additional compliance costs for these producers.

Amendments to Standard 4.2.5 are not expected to impact the supply of eggs. Amendments are expected to detect SE early to prevent the spread to other egg producers and processors. Minimising the spread combined with improved traceability systems should allow more eggs to remain in the marketplace.

5.9. Cost to government

For government food authorities it is expected there will be an increase in enforcement and response activities.

State and territory food authorities may incur additional costs from the proposed measures in terms of adding additional measures to consider when conducting regular audits of egg businesses. Authorities already regularly audit egg businesses, and it is not a new cost.

For the additional staff time required to audit these additional measures, food authorities are estimated to incur $185 for each small and medium egg producer audit (half an hour), and $370 for each large egg producer and egg processor audit (one hour) based on a proposed NSW Food Authority audit fee.[25]

The total cost of proposed measures to government has not been calculated as FSANZ does not have an estimated number of audits and inspections that occur each year and this may depend on the jurisdiction.

As an example of additional costs, in the year 2023-24 the NSW Food Authority completed 486 inspections and audits in the egg sector. Assuming 85% of egg operators are small or medium, 280 additional hours would be spent assessing compliance annually, equal to $103,420. Audit fees are charged to egg operators.

5.10. Benefits of the regulatory measures

The proposed interventions will improve Australian egg food safety. These interventions are expected to benefit consumers, the egg industry, and government.

In the event that a farm is SE-positive, the environmental monitoring under option 2 reduces the number of foodborne illness cases associated with SE-positive egg layer farms compared to status quo. The cost savings from illness avoided can be quantified in monetary terms and is discussed in the following section.

[25] https://www.foodauthority.nsw.gov.au/about-us/legislation/draft-food-regulation-2025

This section discusses the many benefits that are unable to be monetised, as illustrated in Table 9.

Routine environmental monitoring will enable an SE-positive farm to be identified early, compared to status quo where identified human illness cases are relied upon to trigger traceback investigations. As under status quo, detection of SE via environmental monitoring will trigger follow-up activity and, if linked to illnesses, product recall, incident response procedures and/or ceasing supply of potentially contaminated eggs into the market.

The combination of measures proposed under option 2 will address SE-specific on-farm food safety risks and improve the food safety management of eggs. This aims to minimise the likelihood of SE infection on-farm and foodborne illness from contaminated eggs. Reducing the risk of SE spreading within a flock or to other properties will benefit the egg industry and government, noting a significant outbreak may involve a number of farms where SE has managed to spread between them. Box 1 above describes the costs that some egg producers might encounter if their flock becomes SE-positive and similarly the incident response costs to government.

Early identification of a SE-positive farm will also limit the spread of SE to egg producers in close proximity. QMRA modelling identifies that where a small farm is SE-positive, it may go undetected under status quo as there is a likelihood that there may be too few notified illnesses to trigger epidemiological investigations. Environmental monitoring will be particularly beneficial in these cases where foodborne illness cases and the wider spread of SE may otherwise go undetected for some time.

Where a human illness case triggers a traceback investigation under option 2 and 3, the food and public health system may benefit from the strengthening of traceability requirements in incident response. The prescribed traceability system requirements and additional measures, such as egg marking to identify the source will benefit the egg industry and state and territory authorities by enabling rapid traceback to the source of contamination.

Finding the source of contamination quickly will enable eggs at foodservice or retail level to be identified and removed from the supply chain, the avoided foodborne illness benefiting consumers. Transparent and accurate traceability systems may also benefit the wider Australian egg industry in the event of a recall, where contaminated eggs are easily identifiable and unnecessary product withdrawals can be avoided.

Proposed traceability system requirements may also incentivise egg businesses to comply with the Code. For example, an egg producer may take extra steps to ensure eggs that are cracked and/or dirty do not reach retail given the intended ease to trace back to the farm source.

The proposed measures will provide a set of national measures addressing the emerged SE food safety risk, which supports nationally consistent implementation of egg food safety measures across jurisdictions.

Over time, SE monitoring data could be used by an egg producer to gauge the effectiveness of their food safety controls. Data can also be used to flag any inconsistencies in epidemiological investigations.

Overall, the egg industry may benefit from improved reputation as food producers as a result of implementing enhanced food safety measures.

5.11. Benefits from illnesses avoided due to improved egg food safety

Consumers may benefit from less illness due to preventative measures on-farm, environmental monitoring for SE, and improvements to rapidly traceback to the source of infection. Benefits to government include avoided healthcare costs from illness avoided from the proposed food safety measures.

FSANZ used the QMRA model to estimate the value of illness avoided from the proposed measures.[26] Due to the current sporadic nature of SE in Australia leading to infrequent cases of human illness the model looks at an individual farm rather than on a national flock basis.[27]

To quantify the estimated SE illness avoided FSANZ used the per case cost for *Salmonella* illness of $2,780 (inflation-adjusted to March 2025) from Glass et al. (2022), a project commissioned by FSANZ to estimate the cost of foodborne illness in Australia.

Table 15 presents the mean illness avoided by a small and medium farm under option 2 and 3 if SE is detected on the small or medium farm via one environmental test rather than solely relying on passive human surveillance.

Table 15. Mean SE illness avoided from QMRA modelling (one farm model)

	Estimated SE illness avoided		Estimated savings from SE illness avoided	
	Small farm	Medium farm	Small farm	Medium farm
Option 2	7	32	$19,500	$89,150
Option 3	24	143	$66,860	$398,370

5.12. Long term benefits

The egg supply chain will benefit in the long term by implementing SE prevention measures now, before SE could become more prevalent. The measures will ensure Australian egg producers and processors have adequate measures in place to protect public health and safety and minimise egg supply chain disruption in the event that SE becomes established in the Australian laying flock.

If SE prevention measures are able to minimise foodborne illness from SE in Australia and limit the spread of SE to the wider Australian laying flock, additional expensive interventions could be avoided that would otherwise be required to protect public health and safety. Avoided costs could include:

- prohibition orders to food service or retail on the sale and supply of runny eggs to minimise illness where there are many potentially contaminated eggs and a recall is not feasible.
- different supply lines created for eggs certified as SE-free and eggs not certified.
- investment in pasteurisation facilities for SE-positive farms to divert their eggs through prior to being offered for sale
- consumers impacted by higher prices of eggs at retail and food service.

Furthermore, while the proposed preventative measures are targeted at managing SE, improved food safety measures will support the food system in reducing costs associated with other *Salmonella* widely prevalent in Australia, such as *Salmonella* Typhimurium.

[26] Refer to CFS Supporting document 1 and 2 - https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements

[27] However, when consideration of the status quo is extended across a longer timeframe without interventions, it is possible that the spread and rate of illness may begin to more closely resemble those experienced overseas.

5.13. Comparison of options

As mentioned at the beginning of this section, option 1 will not result in a net benefit as it involves no change but would be the preferred option if no other options are likely to achieve a net benefit.

If SE were to become more prevalent in the Australian laying flock under status quo, there would be no measures in the Code to manage the SE-specific food safety risks and adequately protect public health and safety. This would likely result in significantly higher rates of illness and the egg industry would then likely encounter significantly greater costs in the longer term to manage the spread of SE.

Option 2 proposes amending and introducing new requirements to the Code to manage food safety risks associated with SE and eggs across the supply chain.

In order for industry, government and the community to break-even on the costs associated with the measures in option 2, the measures would need to achieve a benefit of a 15% reduction of egg-related *Salmonella* illnesses over 10 years (not only SE illness cases). While the proposed measures are targeted at SE, there is a likelihood that environmental monitoring may detect other *Salmonella* that are widely prevalent and costly in Australia, such as *Salmonella* Typhimurium.[28] Many of the proposed measures will also improve egg food safety management in general.

However, this assumes that there would be no change in the annual illnesses (12,700 cases; Glass et al. 2024). Please note the break-even analysis is a highly limited measure given many of the benefits, presented in Table 16 below, extend beyond just avoidance of illness costs which means a much smaller percentage reduction in illness would be needed in fact.

As noted throughout the report, maintaining status quo may result in significant costs if SE were to become more prevalent without sufficient measures in place to manage food safety risks and its spread. In a scenario where there is a 30-50% increase of egg-related *Salmonella* cases in Australia, the community could see an additional 38,000-63,500 cases over 10 years (noting this is assuming the amount of illness is constant over the 10 years). In this scenario, measures proposed would only need to achieve a 10-12% reduction in these illnesses to completely offset costs. Again, please note the limits of this measure.

The purpose of the break-even analysis is to merely compare the magnitude of the costs and the class of benefit we have been able to quantify (reduced illness). As mentioned, the break-even analysis does not take into account the unquantified benefits of option 2. These are discussed in Table 16.

Table 16. Unquantified benefits of option 2

Benefit	Description
• minimising the likelihood of SE infection and spread on-farm through preventative measures to manage SE food safety risks. • identifying SE on-farm early to prevent the circulation of contaminated eggs	These will both benefit egg producers by avoiding a costly SE incident response for all parties (see Box 1).

[28] Where *Salmonella* Typhimurium is detected on-farm, the farm will often introduce feed additives or other management measures to assist the birds in fighting off the infection and reduce presence in the flock, with the aim of reducing the presence of *Salmonella* Typhimurium on eggs. Detection of *Salmonella* Typhimurium will also indicate to an egg producer their on-farm control measures need strengthening.

	and limit the spread of SE to egg producers in close proximity.	
•	enabling rapid traceback to the source of infection by strengthening traceability systems.	This will benefit consumers by easily identifying and recalling infected eggs from the food supply, reducing likelihood of foodborne illness and triggering a timely incident response on-farm to limit the spread of SE.
•	a prepared egg supply chain in the event that SE does become established in the Australian laying flock.	This will potentially limit the costliness of such an event happening under status quo by providing a set of national measures capable of addressing an increased SE food safety risk.

It is highly likely that sufficient benefit will be achieved to offset and exceed the costs of complying with the amendments to the Code.

Option 3 considers the mandatory refrigeration of eggs alongside amending and introducing new requirements to the Code included in option 2.

The total cost associated with option 3 has not been comprehensively quantified. However, the cost of option 3 is expected to be substantially larger than option 2 given operational costs for refrigeration (capital and running costs). To illustrate this, a break-even has been calculated using the known costs of option 3 (implementation cost of refrigeration to very small, small and medium egg producers and the initial and ongoing costs of option 2).

In order for industry, government and the community to break-even on the known costs associated with the measures in option 3, the measures would need to achieve a 31% reduction of egg-related *Salmonella* illnesses over 10 years. In a scenario where there is a 30-50% increase of egg-related *Salmonella* cases in Australia, measures proposed in option 3 would only need to achieve a 21-24% reduction in illnesses to completely offset these costs (noting that not all costs of implementing option 3 have been quantified in this analysis).

There is a significant jump in SE illness avoided when mandatory refrigeration is introduced into the supply chain, as illustrated in Table 15. However, option 3 is not expected to result in as large a net benefit as option 2 in the immediate future as SE is not occurring in flocks frequently.

At the CFS, submitters indicated that the costs involved with option 3 may impact the viability of very small and small producers, particularly in locations where there are no confirmed SE food safety risks.

If the SE situation in Australia were to change, the option of mandatory refrigeration of eggs would need further analysis to comprehensively determine whether the benefits offset the full cost of implementing mandatory refrigeration. Costs such as procuring refrigerated storage units (on farm, distribution centres, back of retail), transport, and refrigeration for retail display and ongoing cost of maintenance and increased energy usage would need to be quantified and included in the total cost of option 3.

FSANZ's assessment is that the quantified and unquantified benefits that would arise from the measures proposed in option 2 are expected to outweigh the costs and return a greater net benefit than option 3.

6. Who was consulted and how their feedback was incorporated

Consultation is a key part of FSANZ's standards development process and is underpinned by a statutory consultation process. FSANZ consults with stakeholders to ensure we understand their business, and to seek information and advice to inform the proposal assessment and standard development.

6.1. Who and how we consulted

Initial consultation occurred through an Information Paper during the Egg Standard Review in September 2021. Submissions were received from state governments, egg farmer representative groups and industry peak bodies.

As part of the assessment under P1060, FSANZ undertook consultation with the groups listed below:

- Egg Standard Development Advisory Group (Egg SDAG) – Comprising of government and industry representatives, to provide input on development of risk management measures and conduct of economic and social analyses of proposed amendments to the Code. The Egg SDAG included industry representatives of small, medium and large egg producers.
- Scientific Advisory Group for Eggs (SAGE) – To assist in FSANZ work on the microbiological risk assessment. The SAGE provided expert advice, opinion and information to FSANZ relating to the microbiological risk assessment for this proposal.
- Egg Implementation Working Group (EIWG) – Established by the ISFR to facilitate the consistent national implementation of standards. FSANZ worked with this group to ensure the amendments to the Code could be adopted by industry and implemented in each jurisdiction.

Representatives of FSANZ completed several industry site visits to improve understanding of current industry practices. These visits also provided further opportunities to engage directly with a range of businesses and staff employed within the egg sector. Visits assisted with understanding how the Code requirements were interpreted and applied. It also provided an opportunity to receive feedback on issues with the standards and to improve understanding of potential impacts from any proposed changes.

Industry visits occurred during late 2022 through to December 2023 across Victoria, NSW, ACT, South Australia and Queensland. The layer farms visited varied from small operations of approximately 3,000 hens up to large operations with over 500,000 hens. Several processors were visited including pulping and pasteurising facilities and food manufacturers.

A CFS report was released in March 2025 in line with FSANZ's statutory consultation process. The CFS report presented stakeholders with the draft variations to the Code as well as the accompanying draft explanatory statement.[29] Additional supporting documents were also released at the CFS including both a qualitative and quantitative microbiological risk assessments, and a consideration of costs and benefits.[30]

In addition to FSANZ's standard consultation process and targeted engagement, FSANZ provided updates at the following FSANZ stakeholder committees:

[29] Refer to the CFS – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements
[30] Refer to CFS Supporting document 1, 2, and 4 – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements

- Binational Food Industry Dialogue
- Consumer and Public Health Dialogue
- Jurisdictional Technical Forum.

6.2. Stakeholder views

Egg Standard Review

Submissions from state governments were generally supportive of FSANZ amending the Code to address inadequacies in the management of egg-related food safety risks, where supported by the risk assessment and cost-benefit analysis.

Submissions from egg production and primary processing stakeholders were also supportive of the need to reconsider the efficacy of food safety risk management for eggs. They supported improved egg traceability and raised concerns about gaps in regulatory oversight due to inconsistent jurisdictional exemptions applying to small-scale and backyard egg producers. While there were reservations about a requirement for refrigeration of eggs on-farm, there was tentative support for temperature control if informed by a risk assessment and cost-benefit analysis.

Call for submissions

18 responses were received from stakeholders at the CFS. The stakeholders FSANZ heard from include:

- eight government agencies and local government authorities
- six individual businesses
- four industry bodies.

While some industry bodies represent egg producers of all production sizes, lack of engagement with the CFS by individual small businesses could be a limitation to the feedback that was received. However, FSANZ considers the ongoing consultation with industry bodies and jurisdictions throughout the proposal, including site visits to small producers, have adequately informed FSANZ of the issues faced by very small and small egg producers.

Overall, submitters supported option 2 being the preferred option. Several submitters were not supportive of option 3, advising there would be significant costs associated with requiring refrigeration of eggs.

Throughout the standard development process FSANZ revised its approach in light of the stakeholder feedback received. Feedback provided by stakeholders at the CFS was considered in the preparation of the approval report and the final analysis of the DRIS. Key issues raised on the draft variations prepared at the CFS and how this feedback has been incorporated into the final approach is summarised in Table 17.

Table 17. Key submitter issues at the CFS

Key issue	How feedback has been incorporated
Amendments to the Code may impose significant costs on smaller producers.	FSANZ acknowledges submitter concern that the amendments to the Code may impose significant costs on smaller producers. States that have implemented control measures, such as environmental monitoring in NSW, demonstrate that these measures can be implemented across the industry. Together with the risk assessment indicating the importance for smaller farms to address SE food safety risk factors, FSANZ considers it important for the whole Australian egg industry to consistently implement the amendments. Where possible, FSANZ has provided flexibility in its amendments, for example, allowing jurisdictions to adopt a risk-based approach to setting a minimum frequency of SE testing for an egg producer.
Submitters thought refrigeration costs would be significant and much higher than the analysis assumed, particularly for smaller producers.	Additional detail has been provided in the analysis of option 3 where possible following submitter feedback.
Some submitters disagreed with the estimated cost provided for environmental monitoring. Submitters believed the cost would be higher than what was presented at the CFS, while one submitter noted certain aspects of the estimate, such as packaging, transport and administrative costs, has been overestimated.	While some submitters shared the cost had been underestimated, the estimated cost of environmental monitoring has been kept the same as what was provided at the CFS as no evidence was provided to support the inclusion of a higher cost.
Submitters indicated the need for further guidance materials on the new requirements, including temperature control, traceability and environmental testing.	FSANZ is committed to developing guidance material for Standard 4.2.5 and supporting the work of the ISFR EIWG in developing the implementation package.
That FSANZ consider an evaluation checkpoint in partnership with regulators to assess the effectiveness of changes to the risk management of *Salmonella.*	Multiple agencies have the responsibility for actively monitoring and evaluating food standards including FSANZ and other Commonwealth agencies and the jurisdictions. Section 8 describes how the amendments to the Code may be evaluated.

Amendments to the draft variations following feedback provided by stakeholders at the CFS include clarifications to:

- titles for several clauses
- animals and pests clause to clarify poultry houses and grading floors are captured by 'premises'
- application clause to clarify the retail sale of egg products are excluded from the standard
- references to 'egg pulp' to now refer to 'egg product'
- sale or supply clause to ensure broken eggs are also excluded from further processing and to clarify an egg producer may sell or supply dirty eggs to egg processor for cleaning.

7. What is the best option from those considered and how will it be implemented?

Maintaining status quo does not achieve the primary objective and outcome measures of this proposal as the current Standard does not account for SE-specific food safety risks. Currently, the Code does not support detecting SE on-farm at the earliest instance and preventing the distribution of contaminated eggs. The current standard also presents gaps in traceability that has caused challenges in identifying the farm source of infection.

Maintaining status quo could also lead to wider issues in the event that SE becomes established in the Australian laying flock and costly interventions need to be introduced to protect public health and safety.

Option 2 meets the objective and outcome measures described in section 3 by:

- cost-effectively protecting public health and safety.
- requiring environmental monitoring of SE on-farm as a measure of identifying SE infection, rather than solely relying on human illness cases and successful traceback to identify an infected farm.
- enabling the early detection of SE to minimise foodborne illness and limit the spread of SE to nearby farms thereby avoiding additional depopulation and decontamination costs.
- prescribing traceability system requirements and clarifying other traceability measures to support the rapid traceback to the egg producer in the event of a foodborne illness incident.
- emphasising the importance of temperature control in egg production by ensuring egg producers control temperatures that eggs are exposed to and the amount of time that eggs spend in storage and/or transport at that temperature.

The break-even analysis in section 5 found the measures in option 2 would need to achieve a 15% reduction in egg-related *Salmonella* illnesses over 10 years to completely offset the costs, or a 10-12% reduction if an increase in illness cases of 30-50% is considered.

Option 3 similarly meets the objective and outcome measures, however, would come at a greater cost for the Australian egg industry to meet the mandatory refrigeration requirements. The breakeven analysis with the known costs of option 3 find this additional measure would need to achieve a 31% reduction in egg-related *Salmonella* illnesses over 10 years, or a 21-24% reduction if an increase in illness cases is considered.

Refrigeration is a well-known and understood measure that prevents microbial growth. It is unsurprising the QMRA modelling, discussed in subsection 5.10, confirmed the refrigeration

of eggs to be effective in minimising SE growth and reducing foodborne illness. However, mandating this measure would involve significant investment and change to the way the Australian egg industry operates.

Consistent with the analysis in section 5, FSANZ considers the best available option to be option 2.

Though option 2 does not propose to prescribe a temperature at which eggs and egg product must be stored and transported, it requires temperature control to ensure eggs and egg product remain safe and suitable. This requirement also provides flexibility and may result in jurisdictions using temperature control as a mitigation measure in response to local flock infections of SE or during periods of high temperatures.

Option 2 also does not propose to prescribe a frequency for regular environmental monitoring. Jurisdiction food regulation agencies may determine alternative frequencies. While the break-even analysis is based on an egg producer taking a minimum of one sample a year, the cost and benefit associated with testing on a 13-week (quarterly) basis has been covered in Appendix B (see Table 26 to 28) as this is known to be effective in detecting SE in flocks.

The QMRA modelling finds a single test during a production cycle will have a decrease in SE illness, however, while more costly, the most effective testing schedule at reducing SE illness is on a quarterly basis. As discussed in subsection 5.3, this is because a single environmental test at peak production will only detect farms which were SE-positive prior to the single test. For example, an egg producer might take an environmental test around peak production (week 26) and SE could enter the layer environment at week 27. The single environmental test would be too early and the test in the following cycle would be the time that the farm would be detected as being SE-positive.

7.1. Decision-making process for the proposed changes

The FSANZ Board will make a decision to approve, amend or reject the draft variations to the Code.

All FSANZ decisions on proposals are notified to Food Ministers (from the Commonwealth, Australian States and Territories and New Zealand) who can, within 60 days of notification from FSANZ, decide to either:

- ask for a review, or
- agree that the standard should become law.

If ministers do not seek a review, the changes are:

- registered as legislative instruments in Australia on the Federal Register of Legislative Instruments and gazetted.

If a review is requested, FSANZ will review the proposal. Review requests must be finalised within three months, unless an extension is granted by the Food Ministers. The proposal will come back to the Board who will decide to either:

- reaffirm its decision (with or without changes to the proposal), or
- withdraw its approval (resulting in no change to the Code).

Reviewed decisions are returned to Food Ministers for further consideration. Food Ministers can accept, amend or reject the draft standard.

This is currently scheduled for November 2025, with a commencement date for May 2027.

7.2. How the changes will be implemented

After the above decisions, implementation and enforcement of the draft variation to the Code would be the responsibility of the Australian states and territory regulators and applicable local government authorities.

Compliance is enforced and non-compliance is addressed under each jurisdictions' Food Act. Those Food Acts and related legislation also specify penalties for non-compliance. Verifying compliance forms part of routine audit or inspection activity by government officers. Additionally, jurisdictions follow-up on specific complaints by individuals or organisations. Apart from this, there will be no additional or special mechanism to enforce compliance with the amended Standard 4.2.5.

As mentioned in section 6 above, FSANZ has consulted with the ISFR EIWG to ensure any proposed amendments to the Code could be consistently implemented at a national level.

Industry is ultimately responsible for complying with new and existing Code requirements. Governments are committed to working with industry to help industry meet requirements, including providing advice about requirements.

The EIWG has developed a range of tools to help businesses and regulators understand how the amendments would be implemented and monitored. These tools include guidance plans for egg producers and processors to support Standard 4.2.5 and give practical advice to industry to meet the requirements of the amended standard.[31]

7.3. No significant implementation challenges are expected

FSANZ does not expect there to be any significant challenges to successfully implementing the changes to the standards. Changes to the Code are made frequently and the food regulatory system is well equipped to manage changes.

As noted in subsection 6.1, stakeholders with a key role in implementation have been deeply involved in drafting the standards (including jurisdictions, peak bodies, and some businesses).

Alongside the guidance plans developed by the EIWG, FSANZ will be developing guidance materials to support industry in adopting the amendments to the Code to further manage consistent implementation and compliance to effectively protect public health and safety.

Additionally, the following section discusses the date of effect of the variation to the Code provided for this proposal which is expected to minimise implementation challenges.

7.4. Transitional arrangements

For this variation, there will be a commencement date 18 months after gazettal of the draft variation.

While there is no transition period, the delayed date of effect will allow time for the egg industry and government to prepare to comply with the new requirements. Until the date of effect, egg producers and processors must comply with the Code as it currently exists. From the date of effect, compliance must be against the Code as amended by the variation.

[31] Refer to CFS Supporting document 7 – https://www.foodstandards.gov.au/food-standards-code/proposals/Proposal-P1060-20-20Egg-Food-Safety-26-Primary-Production-Requirements

The approach has been adjusted from the 12-month period proposed at the CFS following stakeholder feedback requesting that an additional six-month period be considered. This was requested to account for additional state-wide industry consultation on the implementation of the amendments.

8. How the chosen option will be evaluated

Across Australia's food regulatory system, multiple agencies have responsibility for actively monitoring and evaluating food standards including FSANZ and other Commonwealth agencies and the jurisdictions.

Under the food regulatory system, the Commonwealth and jurisdictions develop the policy principles against which FSANZ consider when developing food standards. This structure also provides for reviewing the outcomes of the standards against their policy principles. Agencies with responsibility for food policy or implementation or standards development could act individually or in concert to evaluate and/or monitor the standards. Such monitoring and evaluation can be coordinated either through the Food Regulation Standing Committee or ISFR.

Non-food policy entities within government can also play a role in evaluation and monitoring food standards, including but not limited to food inspection and enforcement agencies.

Following the implementation of the amended Standard 4.2.5, ISFR proposes to conduct a national survey of the egg industry under their provided guidance plan (see subsection 7.2) two years following the commencement date of the Egg Standard.

State and territory regulators will continue to monitor industry activity using current monitoring arrangements (e.g. inspections or audits).

Objectives of an evaluation for P1060 could focus on whether the amendments to the Code:

- improved the rate of *Salmonella* foodborne illness associated with eggs in Australia
- minimised the spread of SE among the Australian flock.

Particularly, an evaluation of the amended Standard 4.2.5 could investigate how the implemented changes have met the proposal objective and whether the outcome measures have been met.

Specific questions that may be asked could include:

- Have foodborne illness outbreaks associated with eggs decreased?
- How many farms have been identified as SE-positive from a regular SE test?
- Has regular SE testing resulted in egg producers implementing measures to address flock infections with *Salmonella* other than SE??
- In relation to the previous question, has the egg industry responded differently to the identification of other *Salmonella*?
- In the event of a foodborne illness outbreak associated with eggs, have challenges with traceback investigations been resolved?
- To meet the amendment to consider the time and temperature that eggs are stored, have egg producers introduced adequate temperature controls to their operations to prevent contamination?

References

ACMSF (Advisory Committee on the Microbiological Safety of Food - UK) (2016) *An update on the microbiological risk from shell eggs and their products*, accessed 21 November 16 2024.

Australian Eggs (n.d.) *Australian Egg Industry Overview,* Australian Eggs website, accessed 21 November 2023.

Australian Eggs (2024) *Australian Eggs Annual Report 2024,* Australian Eggs website, accessed 20 May 2025.

ABARES (Australian Bureau of Agricultural and Resource Economics and Sciences) (n.d.) *Trade dashboard*, ABARES website, accessed on 21 June 2024.

DAFF (Department of Agriculture, Fisheries and Forestry) (n.d.) *Manual of Importing Country Requirements - Eggs*, DAFF website, accessed 4 February 2025.

FSANZ (2024) Consumer Literature Review for Proposal P1060 – Egg food safety & Primary production requirements, FSANZ website.

Glass K, McLure A, Bourke S, Cribb D, Kirk MA, Lancsar E (2022) *The annual cost of foodborne illness in Australia. Final report for: Food Standards Australia New Zealand*, Australian National University.

Glass K & McLure A (2024) *The annual cost of foodborne illness in Australia by food commodities and pathogens. Final report for: Food Standards Australia New Zealand*, Australian National University.

Lane CR, LeBaigue S, Esan OB, Awofisyo AA, Adams NL, Fisher IST, Grant KA, Peters TM, Larken L, Davies RH, Adak GK (2014) Salmonella *enterica Serovar Enteritidis, England and Wales, 1945-2011*, *Emerging Infectious Diseases, 20*(7).

Moffatt CR, Musto J, Pingault N, Miller M, Stafford R, Gregory J, Polkinghorne BG, Kirk MD (2016) Salmonella *Typhimurium and Outbreaks of Egg-Associated Disease in Australia, 2001 to 2011*, *Foodborne Pathogens and Disease* 13(7):379-85.

NSW FA (NSW Food Authority) (2017) *Review of Egg Marking Implementation in NSW*, NSW FA website, accessed 18 June 2025.

OIA (Office of Impact Analysis) (2024) *Regulatory Burden Measurement Framework*, OIA website, accessed 1 November 2024.

OIA (Office of Impact Analysis) (2024) *Regulatory Impact Analysis Guide for Ministers' Meetings and National Standard Setting Bodies*, OIA website, accessed 6 November 2024.

Scott AB, Singh M, Groves P, Hernandez-Jover M, Barnes B, Glass K, Moloney B, Black A, Toribio, J (2018) *Biosecurity practices on Australian commercial layer and meat chicken farms: Performance and perceptions of farmers*, *PLoS ONE* 13(4):e0195582, https://doi.org/10.1371/journal.pone.0195582.

Appendix A. International egg food safety requirements

International egg food safety requirements were reviewed as part of this proposal. The table below provides a summary of Supporting Document 3 – Current food safety measures that was published at the CFS.

Jurisdiction	Requirements
Canada	The Canadian Food Inspection Agency (CFIA) has established hatchery and supply flock testing standards for layer flocks that must be complied with under Health of Animals Regulations. The testing standards include non-verified supply flocks requiring *Salmonella* testing and must return a negative SE result. Egg producers are subject to Safe Food for Canadians Regulations and voluntary Egg Quality Assurance certification program. Egg producers and egg processors must comply with requirements for implementing preventive controls and documenting a preventive control plan. SE is identified as a hazard and industry referred to consult Health Canada's guidance that industry comply with voluntarily. Guidance recommends sourcing layer flocks from hatcheries and pullets free of SE, environmental testing of laying flocks for SE as per the minimum national standard sampling protocol, eggs from flocks whose environments are positive for SE should be diverted directly to further processing for lifetime of that flock. Repopulation of layer farms that had a SE-positive flock removed only occurs after cleaning, sanitisation, and retesting of barn/site. Environmental testing must be negative for SE before restocking may commence. Once restocked, new flocks are subject to recommended testing and if the new flock then subsequently test positive for SE, all eggs are diverted directly to further processing for lifetime of that flock. Canadian egg grading stations are responsible for washing, candling, and sorting eggs. Individual egg producers are not permitted to wash eggs unless they are registered as a CFIA-approved egg washing station. Parameters for washing are specified in guidance material for licensed operators who must document washing processes in their preventive control plans. Eggs at grading facilities and stored awaiting grading are to be kept either at or below 10°C or 13°C (depending upon the grade that they will become). Once graded, the cooling continues through the supply chain such that by the time eggs reach the retail environment they are at or below 4°C, and handled as a perishable food.
European Union (EU)	The EU require a national control program for SE and *Salmonella* Typhimurium to be in place, which outlines minimum sampling activities. While sampling frequency varies among flock types, all are subject to ongoing sampling for SE and *Salmonella* Typhimurium. For layer flocks, environmental samples are taken for day-old chicks, then approximately two weeks prior to commencement of laying and at 15-week intervals during egg laying phase. Eggs sourced for human consumption as table eggs must only be sourced from a commercial flock subject to a national

	control program and not under official restriction, such as a movement restriction in response to disease. Where eggs are sourced from SE or *Salmonella* Typhimurium infected flocks, these eggs may be used for human consumption only if treated to guarantee the elimination of all *Salmonella* of public health significance. The EU prohibits washing of eggs. Eggs must be marked with the producer's unique identifier before being transported from egg producer to a distributor, packing centre or non-food industry participant in another Member State. Exemptions to egg marking may be provided by a competent authority. Marking is also exempted where eggs are cracked or soiled and it is not technically feasible to apply the mark to the egg (and must be diverted to processing), and where the egg producer supplies direct to egg processor and eggs are only used for processing. Egg collectors, who collect eggs from producers and supply to packing or processing centres, must be registered/licensed, keep records on what they purchased, from whom and to whom they were sold. When packed, the egg carton or pack must have the packer's unique code applied to the carton, date of minimum durability (best before) applied and wording to advise consumers to keep eggs chilled after purchase. Eggs may be stored at room temperature in the retail environment.
New Zealand	Farmers must operate under a whole flock health scheme, which is a documented program for health surveillance requiring retention of records for medications, feeding regimes, veterinary visits, results of microbiological sampling and other information relating to flock health. Egg producers must comply with the Animal Products Act 1999, which requires primary processors (who collect, candle, grade and pack eggs) to have a registered risk management program (RMP). The RMP must be verified by government approved verifiers. In 2023 NZMPI implemented a regulatory framework to manage the long-term risks to public health from SE. Amendments were made to the Animal Products Notice to require the implementation of routine (or enhanced) environmental monitoring for SE. The Animal Products Notice also specified how eggs from a SE-positive production area were to be managed and provided a process for a SE-positive production area to return to a transitional and then SE negative production area. When eggs are sorted on layer farm, broken and excessively dirty eggs are to be removed and disposed of either by burial on farm, picked up by waste removal company or sent for rendering. Secondary processors (who break eggs and make egg products) must have either a registered RMP or if only supplying domestically, have a registered food control plan (FCP). New Zealand has requirements for egg processors to ensure processing grade eggs for human consumption are assessed on receival or prior to processing to ensure they are not defective (such as leaking or being excessively dirty, rotten or mouldy). Eggs do not need to be marked or stamped, but cartons or packaging must contain all labelling requirements, including identification of the facility that packed or prepared the eggs. Traceability to layer farm for eggs is through a combination of the egg carton and then documentation at the packing facility.
United Kingdom	The UK implemented a *Salmonella* control program in layer flocks in 2008. This required all layer flocks of 350 hens or more to participate in a national control program, including for those flocks to be registered with the competent authority. For layer hens, environmental samples are taken for day-old chicks, then approximately two weeks prior to commencement

	of laying and then at 15-week intervals during egg laying phase. If a flock tests positive for a regulated *Salmonella*, eggs are required to be diverted to processing (broken) and pasteurisation. Actions are to be taken prior to restocking of previous positive SE sheds, with replacement flocks subject to SE sampling Eggs must be graded, marked and packed within 10 days of laying. Egg washing is prohibited. Cracked eggs are not to be sold for human consumption, but may be diverted to processing. Exemptions on quality or weight grading exist for where eggs are sold by egg producers directly to the final consumer either onsite, by door-to-door selling or at local public markets. There are exemptions from egg marking for egg producers with up to 50 laying hens, provided the name and address of the producer are indicated at point of sale to final consumer. The British Egg Industry Council introduced the British Lion Code of Practice in 1989 for breeders and commercial layer flocks. It is a voluntary code of practice with an estimated 90% of UK egg production under this scheme. This requires vaccination of flocks against *Salmonella*.
United States of America	The US Food and Drug Administration (USFDA) implemented the Egg Safety Final Rule which requires control measures, designed to prevent SE infection and contamination, to be adopted by egg producers with 3000 or more laying hens whose shell eggs are not processed with a treatment to ensure their food safety. There are specific requirements for pullets to be raised under SE monitored conditions and chicks sourced from SE monitored breeder flocks. There is also biosecurity, pest control, cleaning & disinfection (at depopulation if positive environmental swabs) requirements. Vaccination against SE of layer hens is not a mandatory requirement. Environmental sampling requires egg producers to develop a sample plan specific to the poultry house, with one test completed when hens are 40 to 45 weeks of age and one test 4 to 6 weeks after moulting. If the pullet environmental test is negative for SE, there is no additional testing until the environmental test at 40 to 45 weeks of age. If the pullet environmental test is positive for SE, egg testing commences within two weeks of the start of egg laying and the pullet environment cleaned and disinfected when the flock is moved into the laying shed. If any environmental test is positive for SE, then eggs must be diverted for treatment for the life of the flock, or eggs are sampled at two-week intervals, with each test comprised of a minimum of 1000 eggs representative of a day's production. At four consecutive negative tests, no further egg testing is required, environmental testing resumes and eggs may be sold. If any of the four tests are positive for SE, eggs must be diverted for pasteurisation until four consecutive negative tests are achieved. Where there was a positive egg test in a flock (and eggs then diverted), and then later meet the negative test result requirements to return to table egg production, one egg test per month for that flock will be required for the life of the flock. While monthly egg tests remain negative, the flock may supply table eggs. Egg producers are required to maintain a written SE prevention plan, documentation that pullets were raised under SE monitored conditions and retain documentation/records as evidence of compliance with requirements including retention of all sample testing results. Intact eggs are required to be held and transported at or below 7.2°C, beginning 36 hours after laying.

Appendix B – Cost benefit analysis assumptions

This appendix provides the underlying assumptions of the costs and benefits included in the SD. The analysis is sensitive to a number of these assumptions, including the estimated number of SE illness cases avoided and the cost of those illnesses, and the proportion of businesses that already undergo the activities proposed.

Number and size of egg producers and processors

Information provided at the CFS noted the total estimated number of NSW egg producers presented at the CFS differs from the 240 egg producers reported in the 2023-2024 NSW Food Authority annual report. As FSANZ does not know the breakdown in size of these businesses the estimated total remains the same as presented at the CFS.

Cost of proposed regulatory measures

Figures presented in the following tables have been rounded to the nearest whole number.

Administrative measures

The implementation of proposed regulatory measures is likely to incur one-off administrative costs, staff training and upgrades to infrastructure, and ongoing record-keeping costs.

The costs captured in Table 18 and Table 19 have been derived by FSANZ based on consultation with the Egg SDAG.

Administrative costs include:
- five hours of updating a food safety management statement (six hours for medium-sized)
- two hours of assessing risks associated with range and housing areas (additional half an hour for medium-sized)
- two and a half hours of documenting egg cleaning processes.

Infrastructure upgrades for small egg producers include $300 of minor changes to exclude animals from the grading and packing area, and $300 to consider how eggs are stored at farm gate, such as providing shade for eggs at farm gate.

Record-keeping costs include five minutes when grading and packing is undertaken (assumed twice a week) to monitor egg cleaning processes (half an hour a week for medium-sized).

Table 18. Initial and on-going cost to small egg producers for administrative proposed measures

Initial cost	
Training (hr)	1
Administration (hr)	9.5
Infrastructure upgrades	$600
Egg producer wage	$48.67[32]
Wage on-costs	75%[33]
Total cost	**$1,494**
Ongoing cost (p.a.)	

[32] The default hourly cost recommended by the OIA Regulatory Burden Measurement Framework where labour rates are unknown.
[33] On-cost multiplier recommended by the OIA Regulatory Burden Framework.

Record-keeping (hr)	8.6
Total cost	**$732**

Table 19. Initial and on-going cost to medium egg producers for administrative proposed measures

Initial cost	
Training (hr)	1
Administration (hr)	11
Egg producer wage	$48.67
Wage on-costs	75%
Total cost	**$1,022**
Ongoing cost (p.a.)	
Record-keeping (hr)	26
Total cost	**$2,214**

Environmental sampling to monitor for the presence of SE

The NSW *Biosecurity (Salmonella Enteritidis) Control Order 2024* was to expire on 30 June 2025, however NSW have recently extended the biosecurity order for another 12 months. This is to provide time for NSW to amend their Food Regulation legislation to adopt these SE management measures, following which the biosecurity order will expire. The analysis assumes small and medium egg producers in NSW will only incur ongoing costs associated with routine SE monitoring as these producers are expected to have already undertaken initial activities such as record management and training.

Costs presented in Table 20 and Table 21, unless noted otherwise, have been derived by FSANZ based on consultation with the Egg SDAG.

Administrative costs include two hours of engaging with laboratories and one hour of setting up record-keeping systems.

Table 20. Initial cost to small egg producers to implement regular environmental monitoring for SE

Training (hr)	2
Administration (hr)	3
Farm hand wage	$30
Wage on-costs	75%
Total cost	**$263**

Table 21. Initial cost to medium egg producers to implement regular environmental monitoring for SE

Number of staff	2
Training (hr)	2
Administration (hr)	3
Farm hand wage	$30
Wage on-costs	75%
Total cost	**$368**

Table 22 outlines the cost of conducting one sample test.

Administration costs include half an hour of liaising with the laboratory, and one and a half hours of filing and organising sample courier.

Table 22. Cost to an egg producer of undertaking one SE sample test

Material (per sample)	$20

Time (per sample) (hr)	0.5
Farm hand wage	$30
Wage on-costs	75%
Material and time cost	**$46**
Laboratory and analysis	$100
Packaging and transport	$100
Administration (hr)	2
Administrative cost	**$305**
Total cost of one sample	**$351**

Note: Material cost assumes five swabs per shed at $4 each from NSW DPI (personal communication, 1 June 2023); Staff time to collect sample, time to complete paperwork, and cost of farm hand wage estimates from WA Health (personal communication, 1 August 2024). Laboratory and courier costs are an average estimate to transport and analyse SE sample tests. Swabs are assumed to be composited together for one test.

Strengthened traceability systems

Table 23 presents the cost of implementing and maintaining strengthened traceability systems for small and medium egg producers. These costs have been derived by FSANZ based on consultation with the Egg SDAG.

Record-keeping costs include one hour total of data entry and balancing figures a week.

Table 23. Initial and on-going cost to egg producers to strengthen traceability systems

Initial cost	
Training (hr)	3
System set-up (hr)	2
Producer wage	$48.67
Wage on-costs	75%
Total cost	**$426**
Ongoing cost (p.a.)	
Record-keeping (hr)	52
Farm hand wage	$30
Wage on-costs	75%
Total ongoing	**$2,730**

Mandatory refrigeration of eggs

Mandatory refrigeration of eggs throughout the supply chain would include cost such as procuring refrigerated transport, implementing refrigeration at farms and in retail spaces and ongoing cost of maintenance and increased energy usage.

For both small and medium egg producers, cool rooms are assumed to be installed in existing on-farm structures.

Refrigeration units are assumed to have a life expectancy of 15 years, and insulation and other equipment are assumed to last 30 years.

Table 24 and Table 25 outlines the estimated initial cost of implementing mandatory refrigeration of eggs measures for small and medium egg producers. These costs are based on internet searches of business that offer commercial refrigeration sales and installation. Those cost estimates have not been checked for generalisability and therefore have not been scaled up to estimate total cost of implementing an on-farm refrigeration for small and medium egg producers.

Table 24. Initial cost to small producers to implement mandatory refrigeration of eggs

	Initial
Refrigeration units	$9,000
Insulation	$1,000
Mobile cool room	$13,000
Additional equipment	$2,000
Refrigeration at farm gate	$1,500
Total cost	**$26,500**

Table 25. Initial cost to medium producers to implement mandatory refrigeration of eggs

	Initial
Refrigeration units	$50,000
Insulation	$5,000
Total cost	**$55,000**

Routine environmental monitoring on a quarterly basis

To illustrate the cost of quarterly environmental monitoring (every 13 weeks) referred to in subsection 5.3 in the main body of the DRIS, the following tables have been provided.

Table 26. Cost estimates of implementing regular environmental monitoring for SE (quarterly basis)

	First year	Ongoing (p.a.)
Very small egg producer	$1,668	$1,405
Small egg producer	$2,038	$1,775
Medium egg producer	$2,513	$2,145

Table 27. Summary of costs for option 2 (quarterly testing)

		Very small farms	Small farms	Medium farms
Option 2 (quarterly testing)	First year	$5,844,808	$1,522,322	$877,779
	Ongoing	$4,090,036	$1,111,566	$726,062

Table 28. Mean SE illness avoided from QMRA modelling (one farm model) for option 2 (quarterly testing)

	Estimated SE illness avoided		Estimated savings from SE illness avoided	
	Small farm	Medium farm	Small farm	Medium farm
Option 2 (quarterly testing)	24	91	$66,360	$251,620