



Underpinning National Capacity – Support for Policy

**Scottish Government Environment, Natural
Resources and Agriculture 2022–2027 Strategic
Research Programme**



**SSBSS calf mortality and
seasonality of calving intervals**

Scottish Suckler Beef Support Scheme holdings – calf mortality and seasonality of 410-day calving interval condition

An output from SRUC's Underpinning National Capacity
– Support for Policy as part of the Scottish
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Key Points

1. The Scottish Government have committed to introducing a 410-day calving interval eligibility criteria for the targeted £40 million per annum Scottish Suckler Beef Support Scheme (SSBSS). Within the current SSBSS there is also a 30-day retention period on the holding for claimed calves to ensure payments are targeted to calves that have not succumbed to neonatal mortality in the first month of life.
 - On-farm mortality of calves represents a lost income stream to the producer, potentially indicating animal health and welfare issues and leading to wasted greenhouse gas emissions. Calf mortality can also lead to the expenditure of Scottish Government resources through the SSBSS, which has no policy output.
 - Whilst investigations are limited on calf mortality in the suckler beef herd some recent analysis suggested calf loss from conception to weaning of 10%, with stillbirths and abortions the most common causes of loss followed by neo-natal mortality.
 - Analysis of agricultural holdings associated with businesses claiming SSBSS support found 5.6% registered calf mortality on the holding of birth (under 1 year of age) for the mainland and 5.3% for the islands for calves born between 2015 and 2021. Daily frequency charts of calf mortality do not appear to follow a natural pattern with a noticeable dip in calf mortality between 24-30 days and a spike from 31-40 days.
2. Scrutiny of RESAS Beef Efficiency Scheme (BES) data (2016 to 2020) reveals that the number of calves recorded in the BES fell from c.174k in 2016 to c.137k in 2020. Unregistered births (born dead or dead before tagging and registering) accounted for 1.9% of BES calves born in 2016 dropping to 0.9% of those born in 2020. The proportion of registered calves that died on the holding of birth within the first year of life peaked at 3.9% of calves born in 2017.
 - BES calf deaths were unevenly distributed across the year with monthly shares ranging from 5% to 15% of calves dead under 1 year of age on the holding of birth. The peak in April to June reflects the period where most young calves are out on grass after a spring calving. The uplifts in winter months reflect deaths from pneumonia in housed calves. Pneumonia was the largest recorded cause of calf deaths in BES, accounting for 25% of deaths. 16% of dams calving had a dead calf or the calf died before being tagged and registered.
 - Using BES metrics in the context of the new SSBSS calving interval condition, the data suggests that the calving interval for 1% - 2% of dams will be negatively impacted by unregistered calves that are born dead, or die shortly after birth.
 - Of c.335k dams associated with 2023 calf registrations on SSBSS associated holdings, two-thirds of calves were registered in March, April or May, re-emphasising the dominance of spring calving in the beef herd. There were marginally higher proportions of heifers with calf registrations in winter months (January and February – November and December), albeit often low absolute numbers of calved heifers in each

of these months. Annual calving patterns have changed over the last decade with fewer autumn calvings.

- The month of calf registration appears to impact the calving interval, likely due to bull management, bull fertility, cow fertility and herd management decisions. In 2023 93% to 94% of dams that calved in March and April achieved a 410-day calving interval criteria. In contrast, only 75-77% of dams calving on the mainland in January and December 2023 met a 410-day calving interval condition whilst only 58-60% of dams that calved in July and August met the 410 threshold. The seasonal calving interval performance variance followed a similar pattern over the last decade.
- In response to industry stakeholder requests, the calving interval based on the second last calving date was analysed. Cows that had their second last calf registered in March to May 2021 had the highest probability of meeting a 410-day calving interval for their subsequent calf (87-90% on islands and 85%-88% on mainland). In contrast, those cows that previously calved in January or December 2021 had the lowest probability of their subsequent calf meeting a 410-day calving interval (63-65% on the islands and 64-69% on the mainland).
- The bulk of SSBSS calves are spring born and dams calving in March to May have the highest probability of meeting the 410 calving interval criteria. Prolonged bulling periods likely lead to poor calving interval performance in certain months. Important messaging on herd fertility and bull management can support the industry to make improvements where necessary.

Table of Contents

Key Points	i
1 Introduction.....	6
2 On-farm calf mortality.....	7
2.1 Background.....	7
2.2 Calf Mortality Analysis	9
2.3 Beef Efficiency Scheme – Calf Mortality	12
3 Seasonality of Calving.....	16
4 Calving seasonality and 410-day calving interval criteria	20
4.1 Second last calving month and 410-day calving interval criteria.....	22
5 Conclusion.....	24
Appendix 1 – Calf Mortality by Agricultural Region.....	25

List of Figures

Figure 1 Frequency distribution of age (days old) of non-dairy breed calves dying on the holding-of-birth where calves are born in 2022 on holdings associated with an SSBSS claim and mortality restricted to 365 days of age	10
Figure 2 Age (days) frequency of on-farm mortality of non-dairy breeds of calf born in 2022 on holdings associated with an SSBSS Mainland claim. On-farm death is restricted to holding of birth and 365 days post registration.....	10
Figure 3 Age (days) frequency of on-farm mortality of non-dairy breeds of calf born in 2022 on holdings associated with an SSBSS Mainland claim. On-farm death is restricted to holding of birth and 365 days post registration.....	11
Figure 4 Proportion of non-dairy breed calves born in 2022 dying on the holding of birth by 30-day age groups – on holdings associated with a business claiming SSBSS support.	12
Figure 5 Beef Efficiency Scheme calf births by month, registered and unregistered (dead) calves, 2016–2020.....	13
Figure 6 Beef Efficiency Scheme calf deaths (under 365 days of age) by month, registered and unregistered calves, 2016–2020.....	14
Figure 7 Cause of death of registered and unregistered Beef Efficiency Scheme calves under 365 days old (2016 – 2020).....	14
Figure 8 Age bracket (month of life) for Beef Efficiency Scheme calf deaths (registered calves), 2016–2020.....	15
Figure 9 Beef efficiency scheme registered calf deaths due to pneumonia by month of death for calves under 1 year of age, 2016–2022	15

Figure 10	16
Figure 11 Proportion of 2023 non-dairy heifers on SSBSS holdings by calf registration month.....	17
Figure 12 Proportion of SSBSS non-dairy dams on SSBSS associated mainland and island holdings, by month of calf registration (2015–2023).....	19
Figure 13 Proportion of SSBSS non-dairy heifers on SSBSS associated mainland and island holdings, by month of calf registration (2015–2023).....	20
Figure 14 Proportion of dams meeting 410-day calving interval criteria by calf registration month on holdings associated with SSBSS mainland and island claims, 2023	21
Figure 15 Proportion of non-dairy breed cows and total dams meeting 410 calving interval criteria by calf registration month on holdings associated with SSBSS mainland claims, 2015–2023.....	22
Figure 16 Proportion of non-dairy breed cows and total dams meeting 410 calving interval criteria by calf registration month on holdings associated with SSBSS island claims, 2015–2023	22
Figure 17 Proportion of previously calved cows meeting 410-day calving interval criteria by second last calf registration month on holdings associated with SSBSS mainland and island claims, 2021 second last calving date	23
Figure 18 Proportion of non-dairy cows meeting 410 calving interval criteria / based on second last calving date on CPHs associated with BRNs claiming SSBSS, 2014–2021	24
Figure 19 Number of SSBSS non-dairy dams on SSBSS associated mainland and island holdings, by month of calf registration (2015–2023).....	26
Figure 20 Number of SSBSS non-dairy heifers on SSBSS associated mainland and island holdings, by month of calf registration (2015–2023).....	26

List of Tables

Table 1 Cow fertility and calf loss – key metrics from 2017–18 study.....	8
Table 2 On-farm mortality of non-dairy calf breeds within 365 days of registration on the holding of birth – holdings associated with SSBSS claims – by year of birth 2015–2022	9
Table 3 Number and proportion of non-dairy breed calves born in 2022 dying on the holding of birth when under 365 days old – on holdings associated with a business claiming SSBSS support.....	11
Table 4– Annual summary of Beef Efficiency Scheme calves, self-calving dams, unregistered calves, and registered calf deaths; 2016–2020.....	13
Table 5 Non-dairy breed heifers on holdings associated with BRNs with SSBSS claims by month of calf registration, 2023	17
Table 6 Non-dairy breed heifers by calf registration month on holdings associated with BRNs claiming SSBSS, 2023	18

Table 7 Proportion of non-dairy breed cows and heifers by calf registration month on holdings associated with BRNs claiming SSBSS, 2023.....	19
Table 8 Number of total dams and previously calved cows by calf registration month on holdings associated with SSBSS mainland and island claims, 2023 including % meeting 410 calving interval criteria	21
Table 9 Number and proportion of previously calved cows meeting 410-day calving interval criteria by second last calf registration month on holdings associated with SSBSS mainland and island claims, 2021 second last calving date	23
Table 10 Number and proportion registered non-dairy calves on SSBSS associate holdings and the number of cumulative calf-death recordings on the holding of birth, by death age categories and Scottish Government agricultural regions	25

This report is an output from SRUC's Underpinning National Capacity – Support for Policy as part of the Scottish Government Environment, Natural Resources and Agriculture 2022-2027 Strategic Research Programme

This report has been reviewed by Prof Andrew Barnes, 15th July 2024

1 Introduction

3. The Scottish Government support the specialist beef sector in Scotland through annual targeted funding of £40 million through the Scottish Suckler Beef Support Scheme (SSBSS). As part of the Scottish Government's commitments for new 'conditional' support measures in 2025 is the introduction of a 410-day calving interval eligibility criteria. This report examines (a) the seasonality of non-dairy calving rates, including the proportion of dams meeting a 410-day calving interval criteria; and (b) on-farm calf non-dairy mortality rates on holdings associated with businesses (BRNs) claiming Scottish Suckler Beef Support Scheme (SSBSS).
4. The report is a response to a data analysis request by the Scottish Government's Livestock Production Policy branch through the Underpinning National Capacity – Support for Policy topic and SRUC-C3-2 project ('Modelling the Socio-economic, Greenhouse Gas and Natural Capital Impacts of Land Use Policy and Opportunities') within the Scottish Government's [Environment, Natural Resources and Agriculture Strategic Research Programme 2022-2027](#).
5. SRUC, through EGENES, have a comprehensive data sharing agreement with the Animal and Plant Health Agency (APHA) for Cattle Tracing System (CTS) data that includes records of births, deaths and movements of cattle across Great Britain. The Scottish Government Data Sharing Agreement (DSA) No 53 with SRUC also provides access to Rural Payments and Inspections Division payment data. Beef Efficiency Scheme data was also utilised, through data-sharing arrangements with the Scottish Government.
6. The CTS data details the births, deaths and movements of individual cattle on individual agricultural holdings across Scotland – where cattle are identified by a unique lifetime tag number and holdings are identified by their unique County Parish Holding (CPH) location code. RPID make support payments to individual businesses in Scotland, identifiable by their unique Business Reference Number (BRN). BRNs can have interests in multiple CPHs as owners, tenants or through seasonal arrangements, and more than one BRN can have an interest in a CPH.
7. For this analysis, all CPHs associated with BRNs in receipt of SSBSS Mainland and SSBSS Island support payments were identified for 2015 to 2023. These SSBSS mainland and SSBSS island CPHs were then matched to CTS CPHs for data extraction and summary. For each year, 2015-2023, data for all non-dairy breed calves registered on SSBSS CPHs were extracted along with records of on-farm deaths, details of calves that were transferred off holding, and calf registration details of non-dairy breed dams. These data were used to assess on-farm calf mortality, as well as the seasonality of calving and associated calving intervals.

2 On-farm calf mortality

2.1 Background

8. On-farm mortality of calves represents a lost income stream to the producer, potentially indicating animal health and welfare issues¹, and leading to wasted greenhouse gas emissions. Calf mortality can also lead to expenditure from the Scottish Government through the SSBSS resources, which has no policy output.
9. Whilst perinatal mortality (full-term calves born dead or died within 48 hours) is important to understand and address, within the current SSBSS there is a retention period on the holding of birth of 30 days that is designed to ensure payments are targeted to calves that have not succumb to perinatal mortality – in particular neonatal mortality (in the first month of life).
10. Mötus, et al, (2017) reported that “*calf mortality is a concern worldwide...considerable research is available that identified risk factors for the mortality of young calves. Examples include dystocia, climatic conditions during calving, length of the calving period, large calf birth weight and male sex of the newborn calf. In young beef calves, it is known that diarrhoea and respiratory disease are the two most common causes of mortality.*”²
11. A SRUC Aberdeen Disease Surveillance Centre and Livestock Health Scotland study examined cow fertility and calf survival across 14 herds (1,822 cows) in 2017-2018³. The results (shown in Table 1) demonstrate that 1,679 calves were conceived (92% of cows to bull) and 1,502 calves were weaned (82.4% of cows to bull) meaning 10.5% calf loss between conception to weaning. Table 1 also shows the cause of loss of the 1,679 calves conceived – 3.3% loss to abortion, 3.1% stillbirths, 1.7% neonatal death and 1.5% older death. All of these losses come with an economic cost to the producer. The causes of deaths in the study were listed as:
 - **Abortions:** Feed / environmental borne pathogens; Specific herd infection (BVD, Leptospirosis, Campylobacter)
 - **Stillbirths:** Suffocation / trauma during calving; Feed / environmental borne pathogens
 - **Deaths in the first week of life:** Colostrum failure and subsequent infection; Trauma from calving
 - **Older deaths:** Pneumonia; Navel infection

¹ See Hewitt (2018) [A Pilot project to evaluate key performance indicators for suckler herds and growing and finishing beef enterprises in England \(projectblue.blob.core.windows.net\)](#), Hyde et al (2020) <https://doi.org/10.3168/jds.2019-17383>, Ortiz-Pelaez, et al (2008) Calf mortality as a welfare indicator on British cattle farms, The Veterinary Journal, Volume 176, Issue 2, <https://doi.org/10.1016/j.tvjl.2007.02.006>

² Mötus, et al, (2017) doi: <https://doi.org/10.1017/S1751731117003548>

³ SRUC Animal Disease Surveillance News – Summer 2019 [sruc-surveillance-news-summer-2019.pdf](#)

Table 1 Cow fertility and calf loss – key metrics from 2017-18 study

FERTILITY	NUMBER		%
Cows to bull	1822		-
Not in calf	212		11.6%
Twins / triplets	67		3.6%
Calves conceived	1679		92%
CALF LOSSES	Cows	Calves	%
Cow died	16	16	1%
Abortion	53	55	3.3%
Stillbirth	45	52	3.1%
Neonatal death	29	29	1.7%
Older death	25	25	1.5%
TOTAL	168	177	10.6%

12. Whilst acknowledging their recent veterinarian investigative work on suckler herds findings should not be considered representative of the UK beef industry due to sample size and non-random participant selection Norquay, *et al*'s (2020) study into perinatal mortality provides useful insights. The study on a small number of Orkney herds found 5.1% perinatal mortality (full-term calves born dead or died within 48 hours) for 1,059 calvings (ranging from 1.6% to 12.4% at herd level, with a median of 4%).
13. Norquay, *et al*'s (2020) findings recorded that stillbirths occurred in 3.9% of calvings and the neonatal mortality rate was 1.2%. The authors reported that *“sex of the calf, plurality and level of calving assistance were associated with significantly greater risk of perinatal loss.”* They concluded that: *“Some of the significant risk factors (the level of assistance required and body condition score) and most common causes of death identified (parturition-related death and intrauterine infections) have the potential to be mitigated and prevented through improved herd management.”* Whilst perinatal losses (such as those caused by dystocia⁴) are an important feature of herd performance metrics around perinatal losses are generally embedded in poor calving intervals since dead calves are not recorded in ScotEID's⁵ ScotMoves+⁶.
14. Neonatal losses of registered calves do, however, appear in the official register of bovine births, deaths and movements in Scotland (ScotMoves) and are linked to several infections, such as calf scour, pneumonia, joint ill and navel ill. AHDB Benchmarking work in 2106⁷ suggested that 3 - 4% suckler calf losses from birth to weaning (% of born alive) from their Farmbench⁸ data, whilst the National Animal Disease Information Service (NADIS) estimate 7 - 8% beef breed calves die during

⁴ [NADIS – National Animal Disease Information Service](#)

⁵ [Home | ScotEID](#)

⁶ See [Cattle – Livestock identification and traceability: guidance – gov.scot \(www.gov.scot\)](#)

⁷ [Beef: cost of production benchmarks – suckler herds | AHDB](#)

⁸ [Farmbench – a farm business comparison tool | AHDB](#)

the rearing phase in the UK each year (noting dairy-beef calves are registered as beef-cross breeds thereby affecting these metrics).

2.2 Calf Mortality Analysis

15. Using CTS extracts, for non-dairy breed calves born on holdings associated with businesses claiming SSBSS between 2015 and 2022, there was an average on-holding-of-birth⁹ mortality levels of 5.6% on the mainland and 5.3% on the islands for animals under 1 year of age (see Table 2). The impact of the 'Beast from the East' in 2018 is apparent with higher calf mortality levels (6.3% on the mainland and 5.9% on islands) on calves born in 2017. In recent years there were improvements in on-holding-of-birth calf mortality levels (dropping to 5.1% on the mainland in 2022 and 4.7% on the islands).

Table 2 On-farm mortality of non-dairy calf breeds within 365 days of registration on the holding of birth - holdings associated with SSBSS claims – by year of birth 2015-2022

Year of birth	Registered Calves	Mainland On-farm mortality – holding of birth, <365 days old		Registered Calves	Islands On-farm mortality – holding of birth, <365 days old	
		Calves	% of registered calves		Calves	% of registered calves
2015	348,291	20,089	5.8%	41,369	2,431	5.9%
2016	344,502	19,647	5.7%	39,237	2,180	5.6%
2017	339,313	21,495	6.3%	39,758	2,360	5.9%
2018	336,697	19,115	5.7%	39,337	2,113	5.4%
2019	335,857	18,736	5.6%	39,336	2,062	5.2%
2020	339,002	18,407	5.4%	39,885	1,960	4.9%
2021	330,242	17,026	5.2%	39,278	1,902	4.8%
2022	328,910	16,651	5.1%	39,865	1,884	4.7%
Average	337,852	18,896	5.6%	39,758	2,112	5.3%

16. The age distribution of non-dairy breed calf mortality on the holding-of-birth in the first 365 days post-registration is shown in Figure 1 for holdings associated with a business claiming SSBSS support. Each bar represents a day post-birth registration, and it is evident that there are three main spikes. The first spike comes in the few days post registration (possibly related to dystocia), with another spike at 14-21 days of age and then again at 31-40 days old. The dip in mortality between 24-30 days and subsequent spike from 31-40 days does not appear to follow a natural pattern.
17. The patterns for the SSBSS mainland and SSBSS Island schemes are also shown in Figure 2 and Figure 3 and it is noticeable that there is very limited calf mortality in the first month following registration on the islands.

⁹ Note this excludes calves moved-off (i.e. sold or slaughtered) the registered holding of birth. The denominator remains the population of animals born on a holding.

Figure 1 Frequency distribution of age (days old) of non-dairy breed calves dying on the holding-of-birth where calves are born in 2022 on holdings associated with an SSBSS claim and mortality restricted to 365 days of age

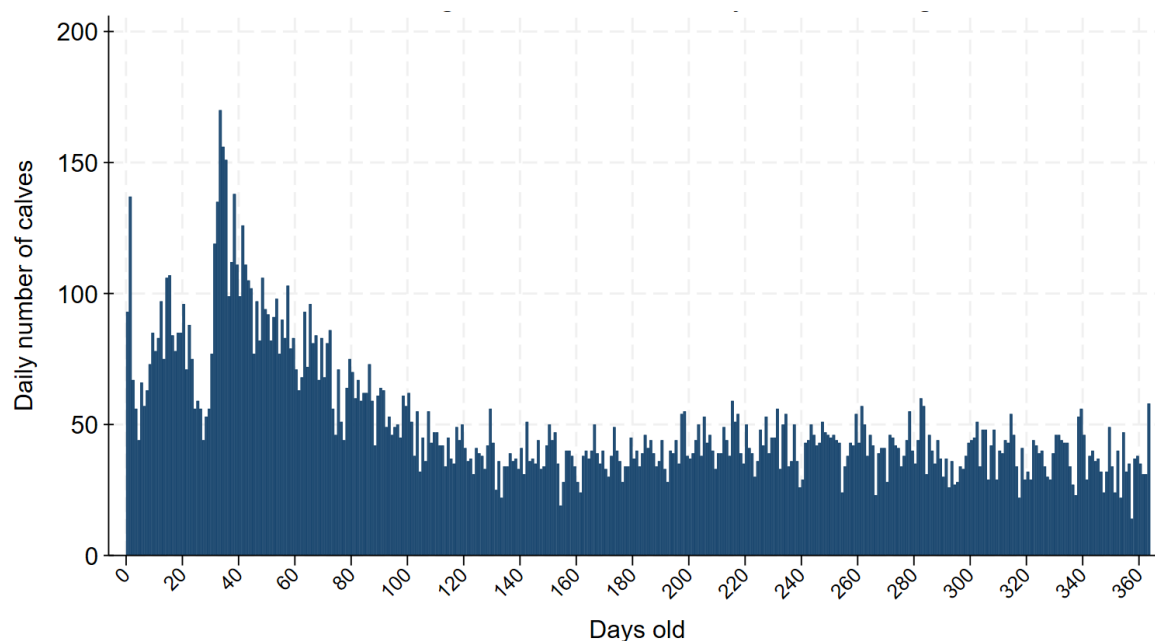


Figure 2 Age (days) frequency of on-farm mortality of non-dairy breeds of calf born in 2022 on holdings associated with an SSBSS Mainland claim. On-farm death is restricted to holding of birth and 365 days post registration.

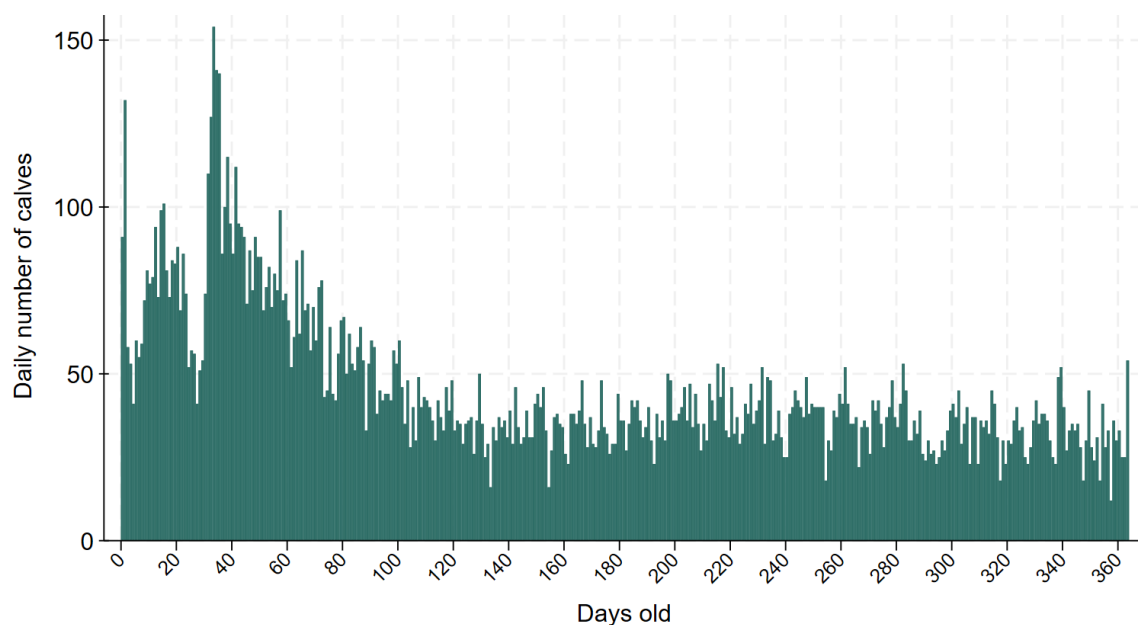
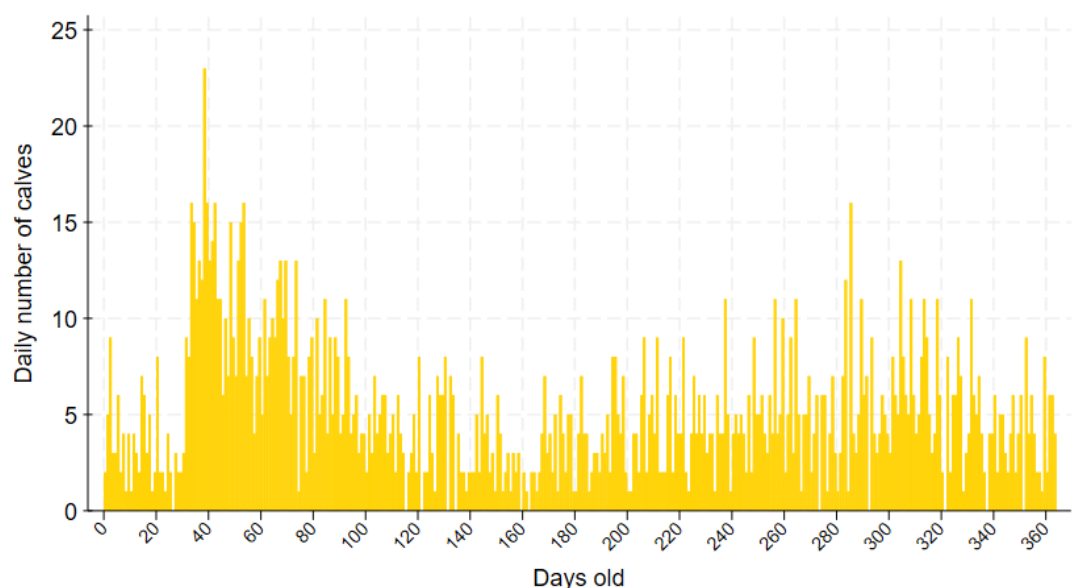


Figure 3 Age (days) frequency of on-farm mortality of non-dairy breeds of calf born in 2022 on holdings associated with an SSBSS Mainland claim. On-farm death is restricted to holding of birth and 365 days post registration.

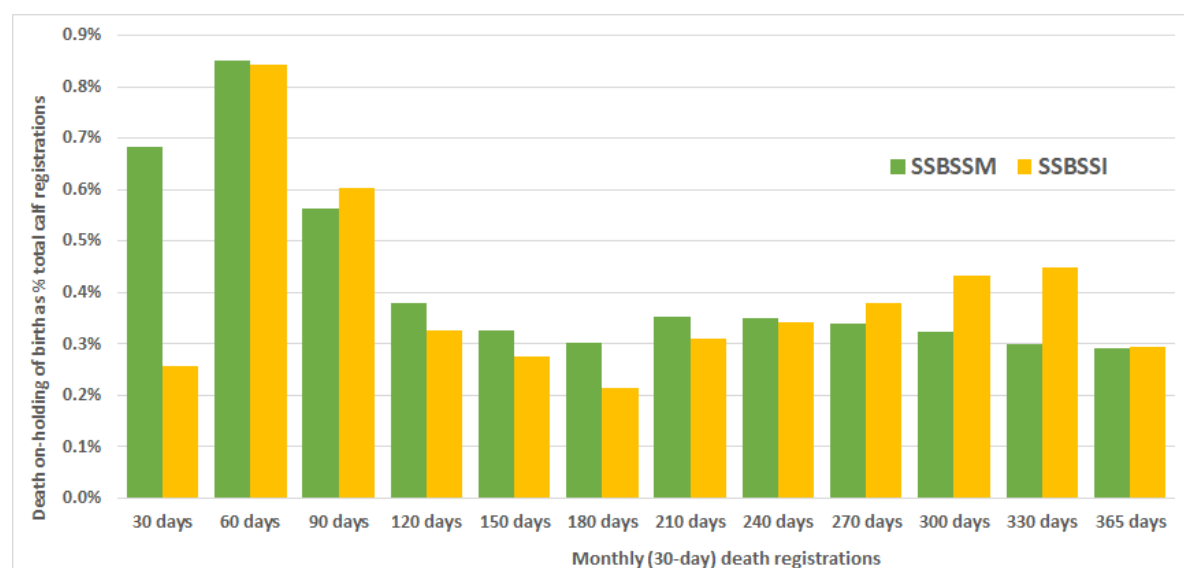


18. Table 3 summarises the cumulative number and percent of calves born in 2022 that died on the holding at birth within the first year of life on holdings associated with business claiming SSBSS scheme. For the mainland, a similar proportion (0.7%) of calves were registered dead on the holding of birth in each of the first three months before tailing off. On the islands, three times more calf deaths were registered in the second month (0.84% of calves registered) compared to the first month of life (0.26%). These differences are also shown in Figure 4. Figure 19 and Figure 20 in Appendix 1 – Calf Mortality by Agricultural Region also show the regional breakdown of calf mortality by age.

Table 3 Number and proportion of non-dairy breed calves born in 2022 dying on the holding of birth when under 365 days old – on holdings associated with a business claiming SSBSS support.

On-holding-of-birth calf mortality age	Mainland cumulative calf mortality		Island cumulative calf mortality	
	Calf deaths	% registered calves	Calf deaths	% registered calves
Within 30 days	2,248	0.7%	102	0.3%
Within 60 days	5,051	1.5%	438	1.1%
Within 90 days	6,901	2.1%	679	1.7%
Within 120 days	8,147	2.5%	809	2.0%
Within 150 days	9,218	2.8%	919	2.3%
Within 180 days	10,216	3.1%	1,004	2.5%
Within 210 days	11,375	3.5%	1,128	2.8%
Within 240 days	12,524	3.8%	1,264	3.2%
Within 270 days	13,642	4.1%	1,415	3.5%
Within 300 days	14,704	4.5%	1,588	4.0%
Within 330 days	15,693	4.8%	1,767	4.4%
Within 365 days	16,651	5.1%	1,884	4.7%
Total Calves	328,910		39,865	

Figure 4 Proportion of non-dairy breed calves born in 2022 dying on the holding of birth by 30-day age groups – on holdings associated with a business claiming SSBSS support.



2.3 Beef Efficiency Scheme – Calf Mortality

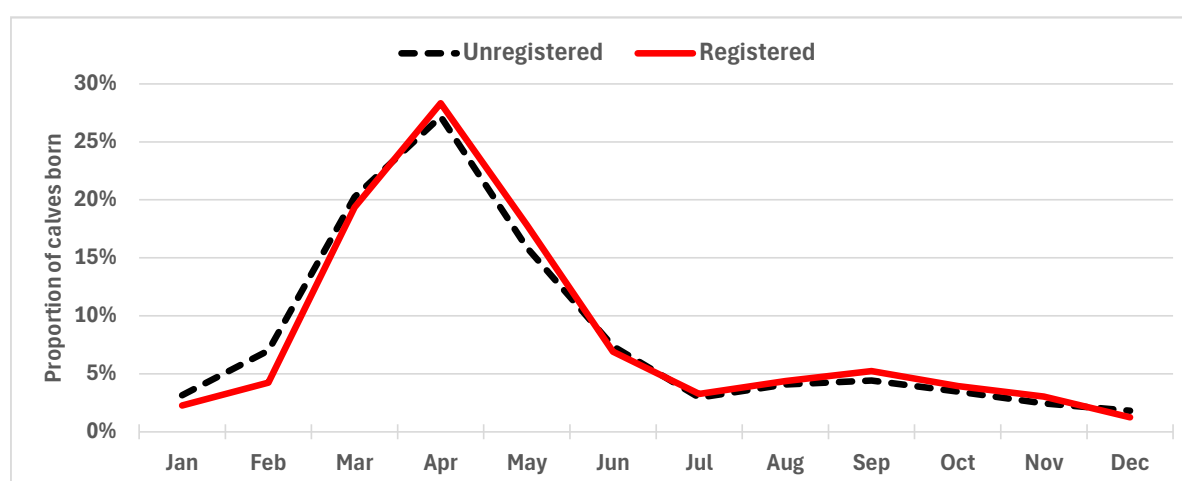
19. Data extracts from the Beef Efficiency Scheme (BES) data (2016 to 2020), supplied by RESAS in the 2016-2022 Strategic Research Programme, were also scrutinised for calf death details. The data was split by officially registered (ear-tagged) and BCMS unregistered calves, with the latter used to register calves that died before registration with ScotEID. The recorded disposal details of calves and dams were used to assess the cause of death. Death events were extracted from disposals by matching the disposal event date with the official death registration date. It should be noted that the cause of death was self-reported by scheme participants, and some data quality issues were identified that any future similar data collection exercise should note.
20. Table 4 reveals that the number of calves recorded in the BES fell from c.174k in 2016 to c.137k in 2020 (a 21% drop). Over the scheme life, the proportion of dams recorded as self-calving increased from 85% to 88% - meaning an intervention rate of 12-15%. Unregistered births (born dead or dead before tagging and registering) accounted for 1.9% of BES calves born in 2016 dropping to 0.9% of those born in 2020. The proportion of registered calves that died on the holding of birth within the first year of life peaked at 3.9% of calves born in 2017 and fell to 2.3% for those born in 2020.

Table 4- Annual summary of Beef Efficiency Scheme calves, self-calving dams, unregistered calves, and registered calf deaths; 2016-2020

Calving year	2016	2017	2018	2019	2020
Calves	173,635	154,459	144,260	142,426	137,233
% Self-calved dams	147,444	133,881	124,205	124,966	120,959
Self-calved dams	84.9%	86.7%	86.1%	87.7%	88.1%
Unregistered calves (birth-death)	3,265	2,178	1,687	1,379	1,179
% Unregistered calves	1.9%	1.4%	1.2%	1.0%	0.9%
Calf death <365 days	6,606	5,972	5,490	4,830	3,205
% Calf death <365 days	3.8%	3.9%	3.8%	3.4%	2.3%

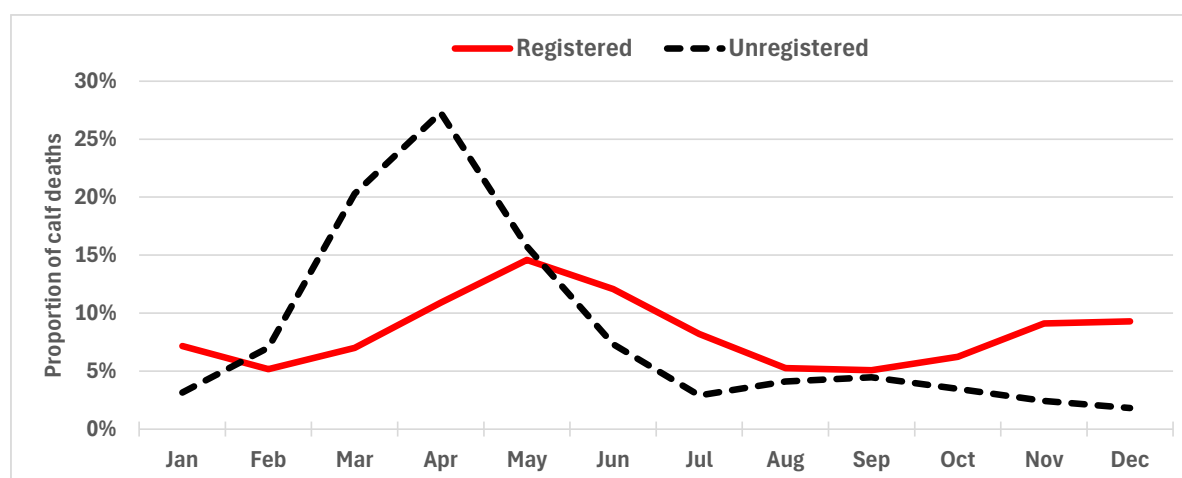
21. Figure 5 shows the distribution of calf births by month of the year (all years 2016 to 2020) for unregistered and registered calves in businesses that were part of the BES. Unsurprisingly, the pattern is very similar to the calving profile of all Scottish dams (see Section 3 Seasonality of Calving). The slightly higher proportion of unregistered deaths in January – March may reflect earlier calving of heifers – but that would need further investigation.

Figure 5 Beef Efficiency Scheme calf births by month, registered and unregistered (dead) calves, 2016-2020



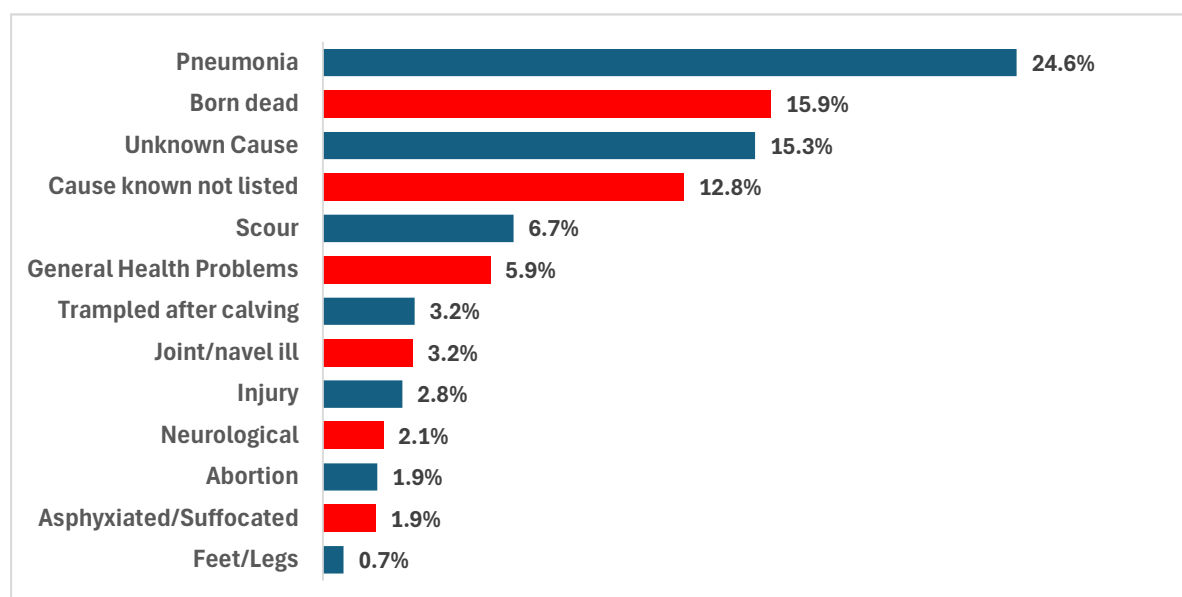
22. Figure 6 shows the proportion of BES calves that died under 1 year of age, by month of the year. The pattern of unregistered calf deaths clearly follows the broad calving pattern of cows, whereas the deaths of calves that were tagged and registered follow a different pattern. The spring uplift in Figure 6 relates to neonatal mortality and infection triggers such as calf scour, joint ill, navel ill, and pneumonia – as well as calves being trampled. The uplift in the winter months relates to pneumonia events in housed calves.

Figure 6 Beef Efficiency Scheme calf deaths (under 365 days of age) by month, registered and unregistered calves, 2016-2020



23. Figure 7 details the cause of death reported by the BES participants for calves born between 2016-2020 that were under 1 year old at the time of death. The data shown includes both officially registered and unregistered calves as some unregistered calves may have been born alive but died pre-registration. A quarter of the calf deaths were reported as being caused by pneumonia, with a further 16% reported as being born dead. Unknown causes accounted for 15% of calf deaths, with a further 13% where the cause was known but not listed in the scheme options. Calf scour accounted for 7% of calf mortality, with general health problems a further 6%.

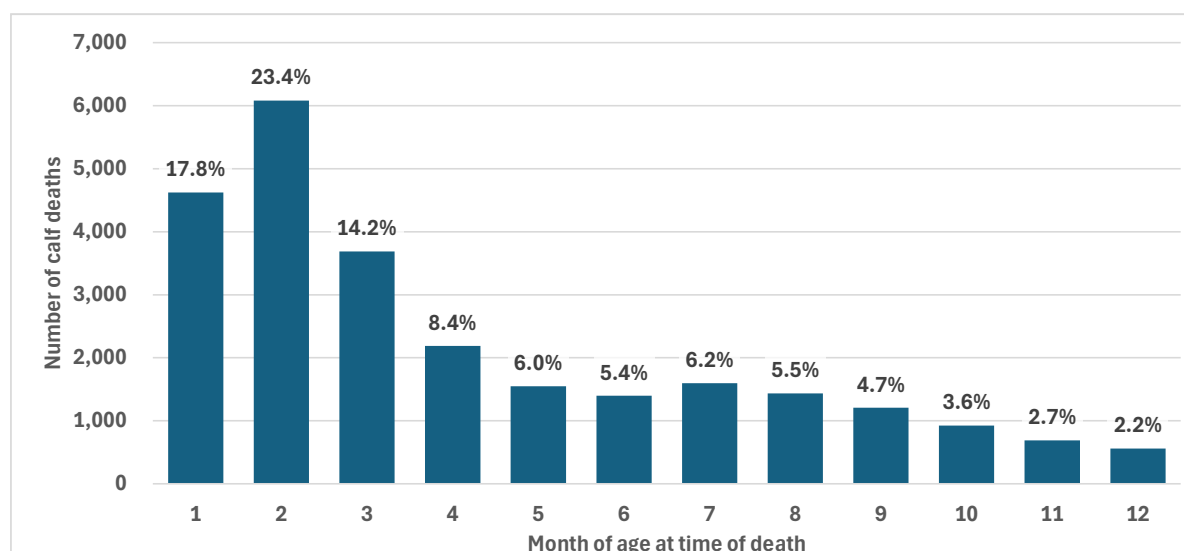
Figure 7 Cause of death of registered and unregistered Beef Efficiency Scheme calves under 365 days old (2016 – 2020)



24. The age at death of registered calves, under 1 year of age, is shown in Figure 8. 23% of registered calf deaths occurred in the second month after birth (30-60 days) with

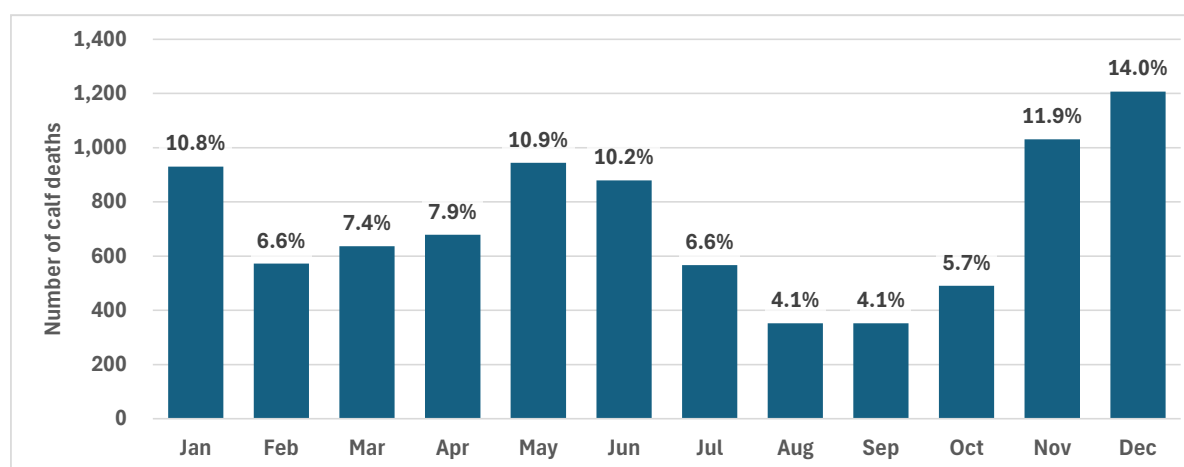
18% in the first month and 14% in the third month. These post-calving periods are therefore important to identify illnesses in calves and treat them appropriately to minimise the risks of calf mortality. These calf losses come with significant economic and emotional costs to producers.

Figure 8 Age bracket (month of life) for Beef Efficiency Scheme calf deaths (registered calves), 2016-2020



25. Figure 9 shows the number and proportion of BES calves born between 2016 and 2020 lost to pneumonia under 1 year of age. The increase in winter pneumonia deaths is apparent, with housed calves of all ages susceptible to infection. 14% of the deaths associated with pneumonia occurred in December, with 12% in November and 11% in January. Late spring / early summer also has a higher incidence of pneumonia (11% in May and 10% in June) that affects younger calves.

Figure 9 Beef efficiency scheme registered calf deaths due to pneumonia by month of death for calves under 1 year of age, 2016-2022



3 Seasonality of Calving

26. During the Scottish Government's Scottish Suckler Beef Support Scheme (SSBSS) Reform Stakeholder Group discussions there was general interest in the impacts of seasons on calving intervals of dams. Figure 10 shows the proportion of non-dairy cows and heifers on holdings associated with BRNs in receipt of SSBSS mainland and island support in 2023. Table 5 also provides the raw data extract. Of c.335k dams with 2023 calf registrations two-thirds had calves registered in March, April or May, re-emphasising the dominance of spring calving in the beef herd.
27. On the islands (SSBSSI) three-quarters of the total c.36k dams with calves registered had calf registrations between March and May, with a further 14% spread evenly between February (7%) and June (7%). On the mainland (SSBSSM), c.64% of all dams (c.299k) in 2023 had calves registered between March and May, with only c.4% of dams registering calves in each month between July and October before a winter tailing off.

Figure 10

Proportion of 2023 non-dairy dams on SSBSS holdings by calf registration month

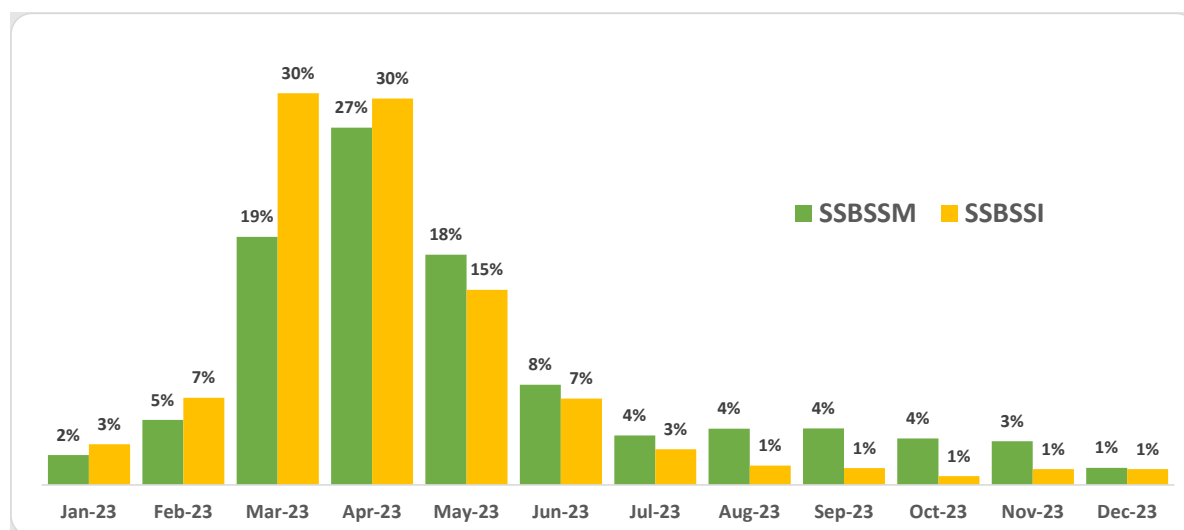


Table 5 Non-dairy breed heifers on holdings associated with BRNs with SSBSS claims by month of calf registration, 2023

	All SSBSS Dams		SSBSS Mainland Dams		SSBSS Island Dams	
	Head	% Dams	Head	% Dams	Head	% Dams
Jan-23	7,973	2.4%	6,837	2.3%	1,136	3.1%
Feb-23	17,355	5.2%	14,917	5.0%	2,438	6.7%
Mar-23	67,939	20.3%	56,984	19.1%	10,955	30.2%
Apr-23	92,895	27.7%	82,086	27.5%	10,809	29.8%
May-23	58,361	17.4%	52,908	17.7%	5,453	15.0%
Jun-23	25,438	7.6%	23,025	7.7%	2,413	6.6%
Jul-23	12,325	3.7%	11,331	3.8%	994	2.7%
Aug-23	13,458	4.0%	12,920	4.3%	538	1.5%
Sep-23	13,412	4.0%	12,944	4.3%	468	1.3%
Oct-23	10,902	3.3%	10,657	3.6%	245	0.7%
Nov-23	10,448	3.1%	10,009	3.4%	439	1.2%
Dec-23	4,355	1.3%	3,914	1.3%	441	1.2%
TOTAL	334,861		298,532		36,329	

28. Feedback from industry stakeholders suggested that first-calving heifers may, in some instances, have different calving periods to the main herd. Therefore, considering heifers with calf registrations in isolation, Figure 11 and Table 6 show heifers by month of calf registration for holdings associated with BRNs claiming SSBSS mainland and island support. Whilst the 2023 monthly trends were similar to all dams (above) there were marginally higher proportions of heifers with calf registrations in winter months (January and February – November and December), albeit often low absolute numbers of calved heifers in each of these months.

Figure 11 Proportion of 2023 non-dairy heifers on SSBSS holdings by calf registration month

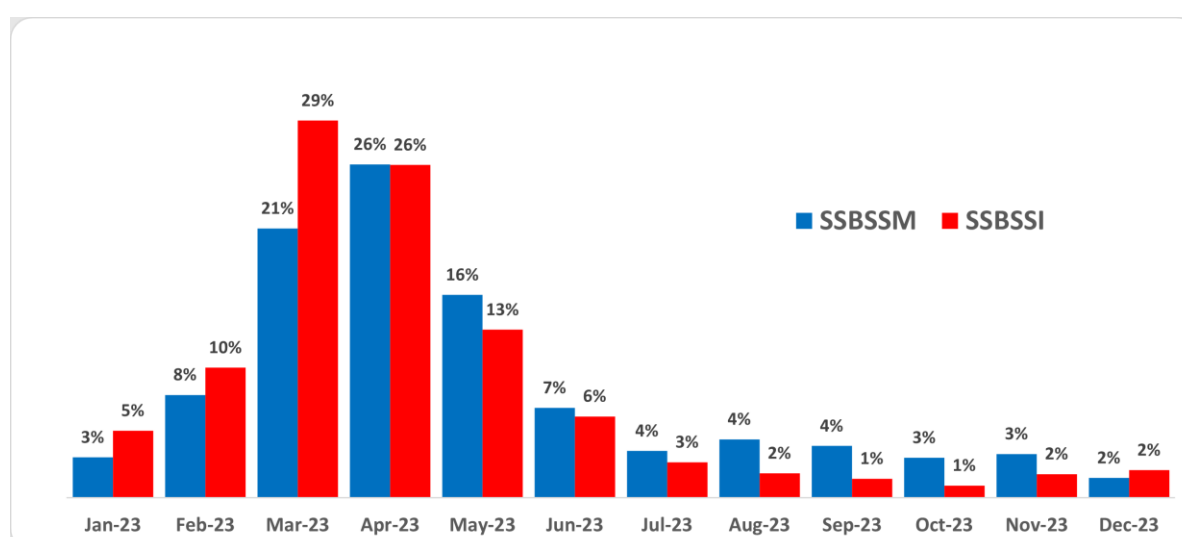


Table 6 Non-dairy breed heifers by calf registration month on holdings associated with BRNs claiming SSBSS, 2023

	All SSBSS Heifers		SSBSS Mainland Heifers		SSBSS Island Heifers	
	Head	% Heifers	Head	% Heifers	Head	% Heifers
Jan-23	1,886	3.3%	1,584	3.1%	302	5.2%
Feb-23	4,635	8.1%	4,049	7.9%	586	10.0%
Mar-23	12,295	21.6%	10,595	20.7%	1,700	29.0%
Apr-23	14,618	25.7%	13,118	25.7%	1,500	25.6%
May-23	8,737	15.3%	7,980	15.6%	757	12.9%
Jun-23	3,902	6.9%	3,535	6.9%	367	6.3%
Jul-23	1,998	3.5%	1,838	3.6%	160	2.7%
Aug-23	2,408	4.2%	2,298	4.5%	110	1.9%
Sep-23	2,119	3.7%	2,033	4.0%	86	1.5%
Oct-23	1,628	2.9%	1,573	3.1%	55	0.9%
Nov-23	1,829	3.2%	1,722	3.4%	107	1.8%
Dec-23	900	1.6%	776	1.5%	124	2.1%
TOTAL	56,955		51,101		5,854	

29. To make the comparison between cows that previously had a calf registered and first-calving heifers easier, Table 7 shows the monthly proportion of cows and heifers with calf registrations on holdings associated with BRNs claiming SSBSS in 2023. This re-emphasises a higher proportion of island heifers (19.1%) had calves registered in January, February, November and December compared to of cows (11.4%). On the mainland the main difference between cows and heifers appears in January and February where 11% of heifers had calves registered in 2023 compared to 6.8% of previously calved cows. These data suggest that a proportion of heifers were calved earlier than the main suckler cow herd.
30. Caldow et al (2005)¹⁰ reported that *“even young cows, when given the opportunity, will achieve calving intervals below 365 days and repeat this for the next breeding season, which means that despite the obvious constraints, the physiology of beef cows is not a barrier to achieving the requisite level of reproductive performance in a nine-week breeding season.”* Given this, it would appear that a proportion of producers make active decisions to give heifers longer recovery periods post-calving, or heifers are calved earlier to provide more opportunities for intervention and post-calving management. Whilst Caldow et al (2005) did note that there was a higher rate of dystocia (difficult calving) in heifers and that dystocia affects calf survival rates, a *“heifer management programme will have a beneficial effect in this area, but that is only half of the solution. The paternal influence on dystocia can be managed by careful bull selection.”*

¹⁰ Caldow G, Lowman B, Riddell I. Veterinary intervention in the reproductive management of beef cow herds. In Pract 2005;27:406–11 <https://doi.org/10.1136/inpract.27.8.406>

Table 7 Proportion of non-dairy breed cows and heifers by calf registration month on holdings associated with BRNs claiming SSBSS, 2023

	SSBSS		SSBSSM		SSBSSI	
	Heifers	Cows	Heifers	Cows	Heifers	Cows
Jan-23	3.3%	1.8%	3.1%	1.8%	5.2%	2.3%
Feb-23	8.1%	3.8%	7.9%	5.0%	10.0%	6.7%
Mar-23	21.6%	16.6%	20.7%	19.1%	29.0%	30.2%
Apr-23	25.7%	23.4%	25.7%	27.5%	25.6%	29.8%
May-23	15.3%	14.8%	15.6%	17.7%	12.9%	15.0%
Jun-23	6.9%	6.4%	6.9%	7.7%	6.3%	6.6%
Jul-23	3.5%	3.1%	3.6%	3.8%	2.7%	2.7%
Aug-23	4.2%	3.3%	4.5%	4.3%	1.9%	1.5%
Sep-23	3.7%	3.4%	4.0%	4.3%	1.5%	1.3%
Oct-23	2.9%	2.8%	3.1%	3.6%	0.9%	0.7%
Nov-23	3.2%	2.6%	3.4%	3.4%	1.8%	1.2%
Dec-23	1.6%	1.0%	1.5%	1.3%	2.1%	1.2%

31. The patterns of monthly calf registrations to dams shown above for 2023 were broadly similar over the last decade, as illustrated in Figure 12 for all dams and Figure 13 for heifers. In both the mainland and islands the April peak of calf registration grew over time. It is, however, worth noting that the proportion of late summer and autumn calving dams fell gradually on the mainland - with a corresponding increase in spring calving. On the islands, whilst there was also a decline in autumn calving there was also a noticeable increase in the proportion of calves registered in March (the flattening of the spring peak).
32. Similarly the patterns of calf registration months for heifers gradually changed over the decade (see Figure 13) with a growth in the proportion of calf registrations to heifers around the spring peaks of March on the islands and April on the mainland (with corresponding decreases in August to January registered calves).

Figure 12 Proportion of SSBSS non-dairy dams on SSBSS associated mainland and island holdings, by month of calf registration (2015-2023)

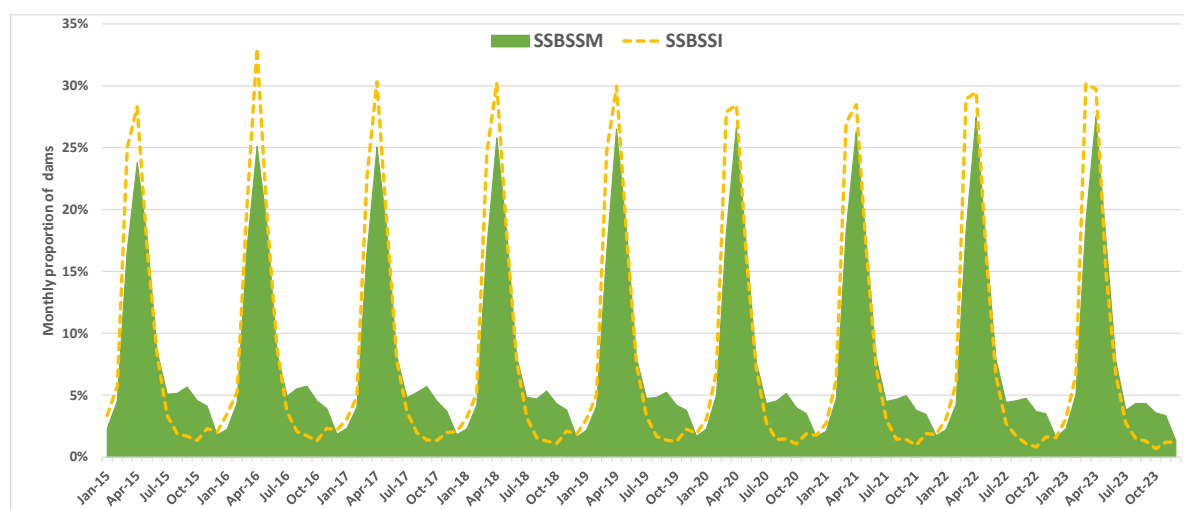
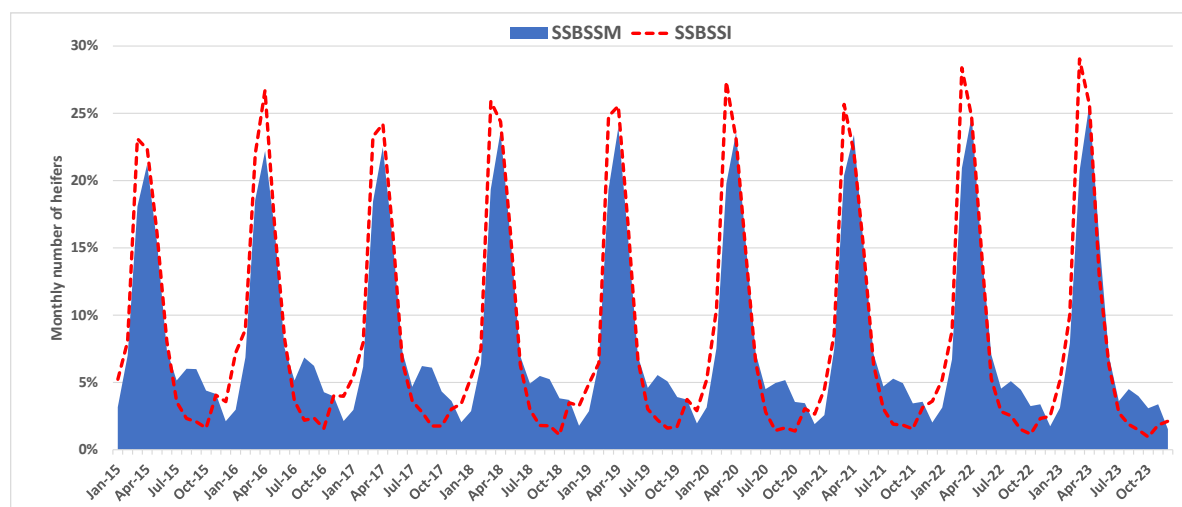


Figure 13 Proportion of SSBSS non-dairy heifers on SSBSS associated mainland and island holdings, by month of calf registration (2015-2023)



4 Calving seasonality and 410-day calving interval criteria.

33. Caldow et al (2005)¹¹ suggested that “*extending the breeding season can hide poor conception rates and prolonged periods of anoestrus. For instance, while this increases the number of calves born, these animals are younger and therefore under weight at weaning or sale. For maximum efficiency, cows must produce a calf per year at an intercalving interval of close to 365 days in a breeding season that is restricted to nine weeks.*”
34. The month of calf registration appears to impact of calving interval, likely due to bull management, bull fertility, cow fertility and herd management decisions¹². Figure 14 shows the proportion of dams (cows and heifers) that met a 410-day calving interval criteria in 2023 by the month of calf registration. It is noticeable that 93-94% of dams that calved in March and April 2023 achieved a 410-day calving interval. On the islands, 87-89% of those dams calving in December, January and February met the 410-day calving interval criteria – compared to only 75-77% of dams calving on the mainland in January and December 2023. On the islands only 58-60% of dams that calved in July and August 2023 met a 410-day calving interval criteria, while on the mainland there was generally a lower proportion of dams achieving 410-day calving interval criteria in 2023.
35. The number of total dams, and previously calved cows alongside the proportion achieving a 410-day calving interval criteria in 2023 are shown in Table 8 for 2023. This reinforces that over 90% of cows calving in the peak spring months in 2023 met a 410-day criteria. This contrasts with only 53% and 47% of island cows that calved

¹¹ Caldow G, Lowman B, Riddell I. Veterinary intervention in the reproductive management of beef cow herds. In Pract 2005;27:406–11 <https://doi.org/10.1136/inpract.27.8.406>

¹² [Managing the Suckler cow's return to calf | Department of Agriculture, Environment and Rural Affairs \(daera-ni.gov.uk\)](https://daera-ni.gov.uk/)

in July and August 2023 meeting the criteria, albeit with relatively small numbers of cows calving during those months.

Figure 14 Proportion of dams meeting 410-day calving interval criteria by calf registration month on holdings associated with SSBSS mainland and island claims, 2023

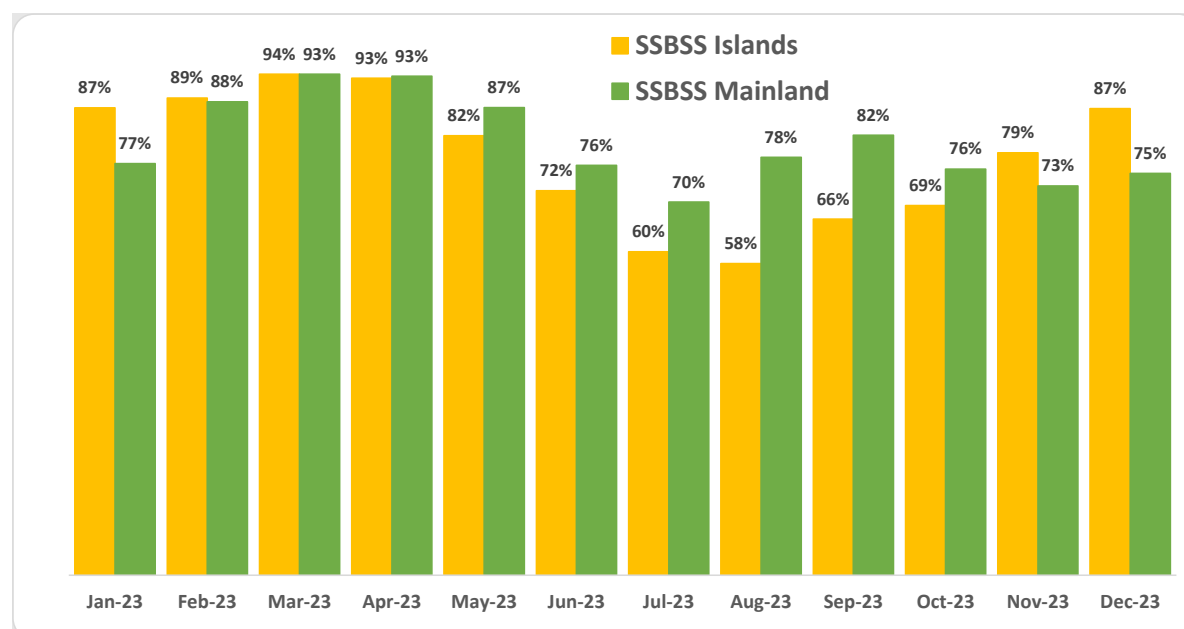


Table 8 Number of total dams and previously calved cows by calf registration month on holdings associated with SSBSS mainland and island claims, 2023 including % meeting 410 calving interval criteria

	SSBSS Islands				SSBSS Mainland			
	Total dams		Total Cows		Total dams		Total Cows	
	Head	% 410 CI	Head	% 410 CI	Head	% 410 CI	Head	% 410 CI
Jan-223	1,136	87%	834	83%	6,837	77%	5,253	70%
Feb-23	2,438	89%	1,852	86%	14,917	88%	10,868	84%
Mar-23	10,955	94%	9,255	92%	56,984	93%	46,389	92%
Apr-23	10,809	93%	9,309	92%	82,086	93%	68,968	92%
May-23	5,453	82%	4,696	79%	52,908	87%	44,928	85%
Jun-23	2,413	72%	2,046	67%	23,025	76%	19,490	72%
Jul-23	994	60%	834	53%	11,331	70%	9,493	64%
Aug-23	538	58%	428	47%	12,920	78%	10,622	73%
Sep-23	468	66%	382	59%	12,944	82%	10,911	79%
Oct-23	245	69%	190	60%	10,657	76%	9,084	72%
Nov-23	439	79%	332	72%	10,009	73%	8,287	67%
Dec-23	441	87%	317	82%	3,914	75%	3,138	69%

36. Figure 15 and Figure 16 show the monthly proportion of cows and total dams that achieved a 410-day calving interval between 2015 and 2023. The grey area in both graphs represents the cows that had previously had a calf registered against it, whereas the red and orange lines reflect total dams that had a calf registration within a month (i.e. the coloured lines include heifers that the Scottish Government have

announced will automatically qualify for the 410-day calving interval condition in 2025). The pattern shown above for 2023 is shown to be consistent over the last decade, albeit there were some subtle changes to the annual patterns. For example, the low points in 2019 are likely a result of the ‘Beast from the East’ in 2018 where, during a prolonged period of low temperatures and snow, winter fodder became extremely scarce and spring grass growth was late – thereby affecting body condition of cows in some localities and therefore decline in cow fertility (i.e. it took longer for thin cows to get back in oestrus).

Figure 15 Proportion of non-dairy breed cows and total dams meeting 410 calving interval criteria by calf registration month on holdings associated with SSBSS mainland claims, 2015-2023

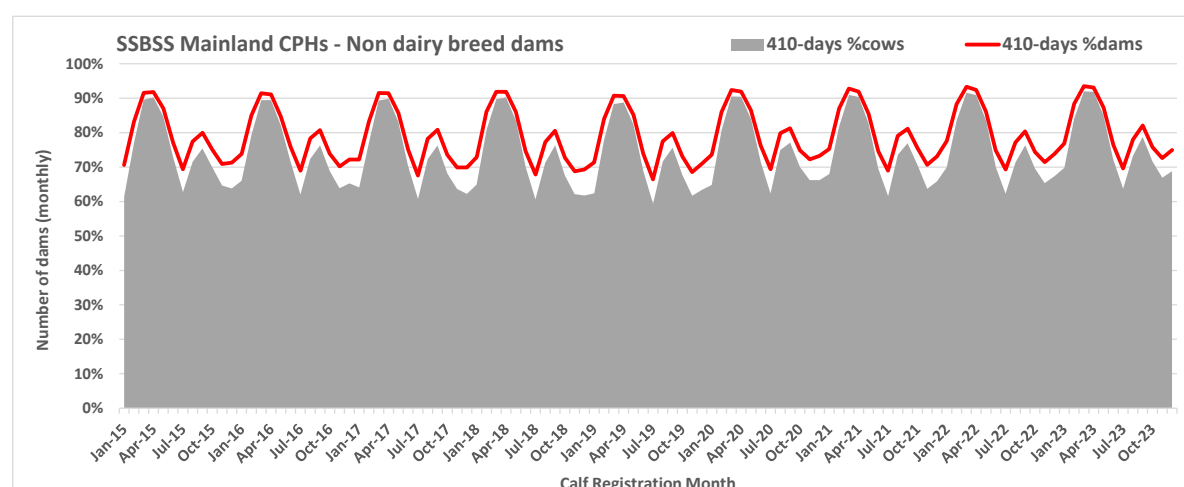
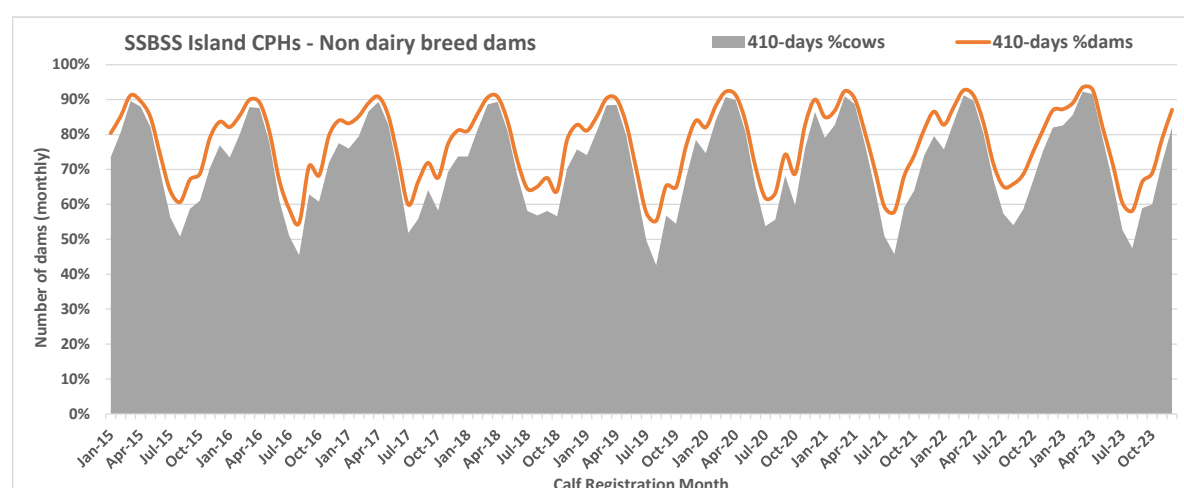


Figure 16 Proportion of non-dairy breed cows and total dams meeting 410 calving interval criteria by calf registration month on holdings associated with SSBSS island claims, 2015-2023



4.1 Second last calving month and 410-day calving interval criteria

37. Industry stakeholders requested that the calving interval based on second last calving date be assessed. As such, Figure 17 and Table 9 show the monthly proportion of cows that had previously calved in 2021 that subsequently met a 410-day calving

interval criteria for their next calf¹³. Using this approach a similar pattern is observed as reported above (for the last calving month) in that cows that had their second last calf in March to May 2021 had the highest probability of meeting a 410-day calving interval for its subsequent calf (87-90% on islands and 85%-88% on mainland). In contrast, those cows that previously calved in January or December 2021 had the lowest probability of their subsequent calf meeting a 410-day calving interval (63-65% on the islands and 64-69% on the mainland).

Figure 17 Proportion of previously calved cows meeting 410-day calving interval criteria by second last calf registration month on holdings associated with SSBSS mainland and island claims, 2021 second last calving date

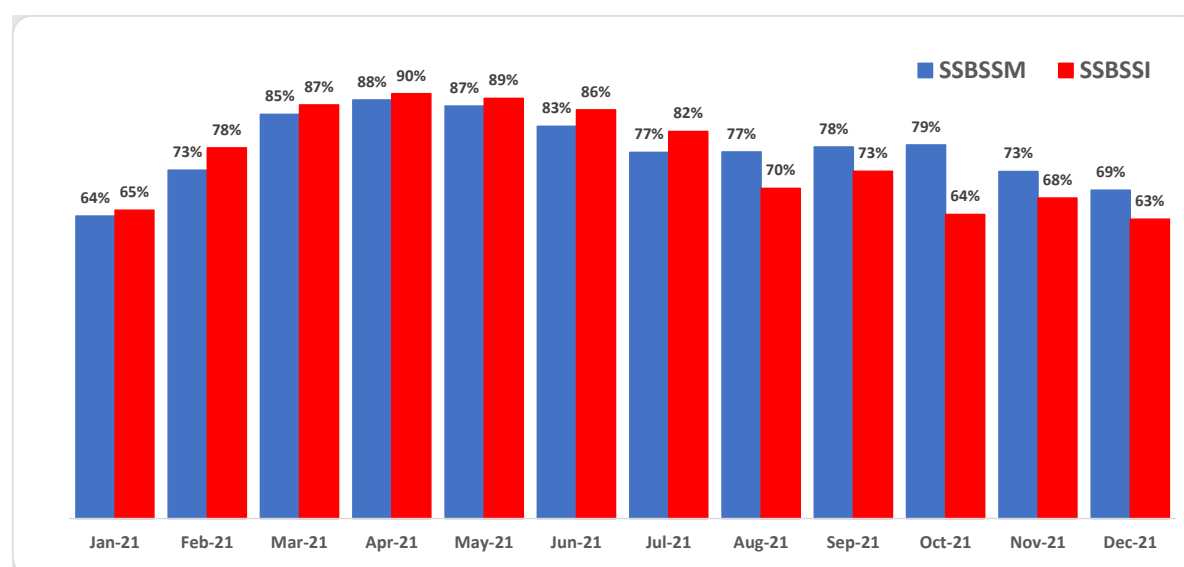


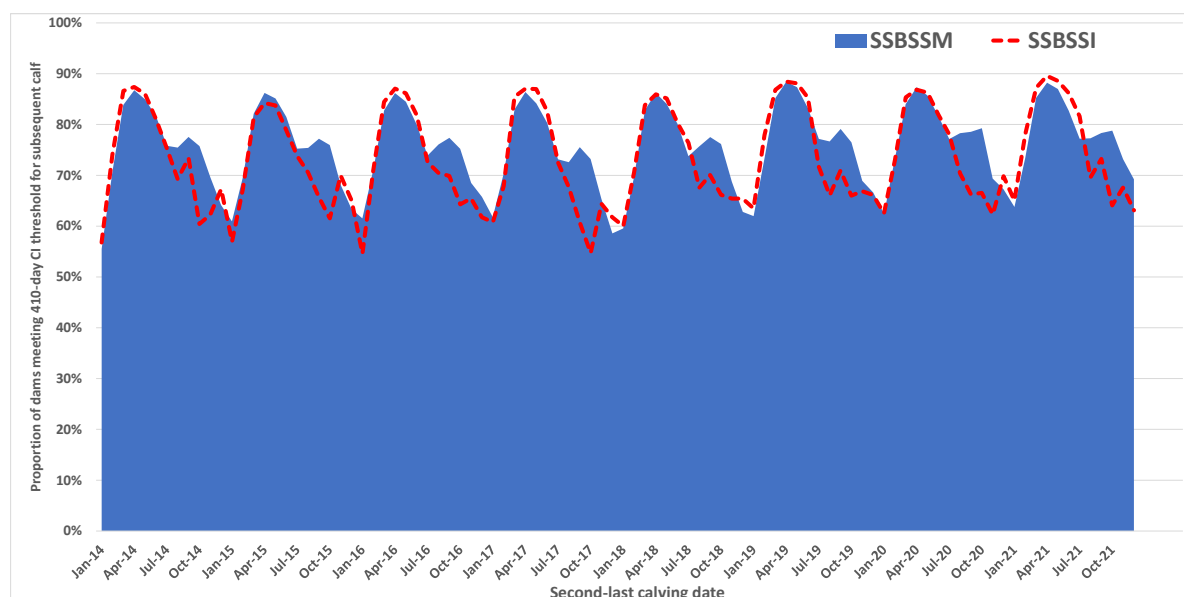
Table 9 Number and proportion of previously calved cows meeting 410-day calving interval criteria by second last calf registration month on holdings associated with SSBSS mainland and island claims, 2021 second last calving date

2 nd last calving date	SSBSSM			SSBSSI		
	Cows with calf	Cows meeting 410 CI	% 410 CI	Cows with calf	Cows meeting 410 CI	% 410 CI
Jan-21	5,649	3,602	64%	995	647	65%
Feb-21	12,325	9,052	73%	2,116	1,654	78%
Mar-21	48,111	41,006	85%	8,788	7,666	87%
Apr-21	67,078	59,194	88%	8,981	8,044	90%
May-21	42,508	36,977	87%	5,022	4,448	89%
Jun-21	18,535	15,333	83%	2,035	1,754	86%
Jul-21	10,240	7,906	77%	794	648	82%
Aug-21	11,091	8,572	77%	375	261	70%
Sep-21	11,681	9,149	78%	351	257	73%
Oct-21	8,718	6,869	79%	259	166	64%
Nov-21	7,745	5,668	73%	555	375	68%
Dec-21	3,942	2,729	69%	526	332	63%

¹³ Note 2021 was the last complete year this analysis could be conducted for as the CTS data extract currently runs to 31st December 2023. A cow calving with calf registered on 31/12/22 with a subsequent 370-day calving interval would not appear in CTS until January 2024.

38. Using the date of the second last calf registration date (x-axis), Figure 18 provides the proportion of cows that met a 410-day calving interval criteria (y-axis) from 2014 to 2021. There were improvements over the period – in particular relating to the seasonal low points – October to December on the islands and December and January on the mainland.

Figure 18 Proportion of non-dairy cows meeting 410 calving interval criteria / based on second last calving date on CPHs associated with BRNs claiming SSBSS, 2014-2021



5 Conclusion

39. This report has provided new insights into calf mortality rates and patterns as the Scottish Government looks to evolve the SSBSS to deliver greater public value from the annual £40 million scheme expenditure. Whilst there is already a 30-day calf retention period within the scheme was important to demonstrate the proportion of scheme calves that die on the holding of birth within their first year of life.
40. The daily patterns of registered calf mortality do not appear to follow a natural pattern in the 20-40 day period. Analysis of BES data suggests 1-2% of dams have a calf, but the calf is either born dead or does not survive to be registered. Within the SSBSS 410-day calving interval condition those dams will not have a registered calf rendering their next successful calf ineligible for support.
41. The bulk of SSBSS calves are spring born and dams calving in March to May have the highest probability of meeting the 410 calving interval criteria. Prolonged bulling periods likely lead to poor calving interval performance in certain months. Important messaging on herd fertility and bull management can support the industry make improvements where necessary.

Appendix 1 – Calf Mortality by Agricultural Region

Table 10 Number and proportion registered non-dairy calves on SSBSS associate holdings and the number of cumulative calf-death recordings on the holding of birth, by death age categories and Scottish Government agricultural regions

	Registered calves	30 days	60 days	90 days	120 days	150 days	180 days	210 days	240 days	270 days	300 days	330 days	365 days
Argyll & Bute	16,729	92	203	291	360	416	449	508	560	618	686	751	787
Ayrshire	27,466	224	465	617	745	855	975	1074	1,192	1,280	1,363	1,464	1,544
Clyde Valley	25,211	194	388	550	645	738	817	912	1,009	1,101	1,198	1,260	1,325
Dumfries & Galloway	67,293	554	1,107	1,450	1,706	1,923	2,107	2,346	2,568	2,799	2,975	3,153	3,316
East Central	10,378	58	116	183	225	249	267	301	321	354	396	420	447
Eileanan an Iar	1,975	4	13	20	24	28	31	36	42	54	67	85	91
Fife	10,959	69	166	242	288	324	351	385	422	456	487	525	570
Highland	38,553	135	395	568	697	805	919	1,039	1,185	1,324	1,443	1,562	1,677
Lothian	11,747	91	177	229	265	306	335	369	405	437	471	506	542
NE Scotland	67,766	487	1,314	1,825	2,168	2,449	2,712	2,957	3,212	3,483	3,757	3,994	4,233
Orkney	24,478	47	293	457	536	608	656	731	801	879	982	1,080	1,150
Scottish Borders	37,901	183	414	564	637	707	820	980	1,123	1,264	1,355	1,462	1,589
Shetland	1,429	6	23	28	30	31	34	38	39	40	44	48	55
Tayside	26,890	206	415	556	630	698	747	827	909	968	1,068	1,150	1,209
Scotland	368,775	2,350	5,489	7,580	8,956	10,137	11,220	12,503	13,788	15,057	16,292	17,460	18,535
Argyll & Bute	16,729	0.5%	1.2%	1.7%	2.2%	2.5%	2.7%	3.0%	3.3%	3.7%	4.1%	4.5%	4.7%
Ayrshire	27,466	0.8%	1.7%	2.2%	2.7%	3.1%	3.5%	3.9%	4.3%	4.7%	5.0%	5.3%	5.6%
Clyde Valley	25,211	0.8%	1.5%	2.2%	2.6%	2.9%	3.2%	3.6%	4.0%	4.4%	4.8%	5.0%	5.3%
Dumfries & Galloway	67,293	0.8%	1.6%	2.2%	2.5%	2.9%	3.1%	3.5%	3.8%	4.2%	4.4%	4.7%	4.9%
East Central	10,378	0.6%	1.1%	1.8%	2.2%	2.4%	2.6%	2.9%	3.1%	3.4%	3.8%	4.0%	4.3%
Eileanan an Iar	1,975	0.2%	0.7%	1.0%	1.2%	1.4%	1.6%	1.8%	2.1%	2.7%	3.4%	4.3%	4.6%
Fife	10,959	0.6%	1.5%	2.2%	2.6%	3.0%	3.2%	3.5%	3.9%	4.2%	4.4%	4.8%	5.2%
Highland	38,553	0.4%	1.0%	1.5%	1.8%	2.1%	2.4%	2.7%	3.1%	3.4%	3.7%	4.1%	4.3%
Lothian	11,747	0.8%	1.5%	1.9%	2.3%	2.6%	2.9%	3.1%	3.4%	3.7%	4.0%	4.3%	4.6%
NE Scotland	67,766	0.7%	1.9%	2.7%	3.2%	3.6%	4.0%	4.4%	4.7%	5.1%	5.5%	5.9%	6.2%
Orkney	24,478	0.2%	1.2%	1.9%	2.2%	2.5%	2.7%	3.0%	3.3%	3.6%	4.0%	4.4%	4.7%
Scottish Borders	37,901	0.5%	1.1%	1.5%	1.7%	1.9%	2.2%	2.6%	3.0%	3.3%	3.6%	3.9%	4.2%
Shetland	1,429	0.4%	1.6%	2.0%	2.1%	2.2%	2.4%	2.7%	2.7%	2.8%	3.1%	3.4%	3.8%
Tayside	26,890	0.8%	1.5%	2.1%	2.3%	2.6%	2.8%	3.1%	3.4%	3.6%	4.0%	4.3%	4.5%
Scotland	368,775	0.6%	1.5%	2.1%	2.4%	2.7%	3.0%	3.4%	3.7%	4.1%	4.4%	4.7%	5.0%

Figure 19 Number of SSBSS non-dairy dams on SSBSS associated mainland and island holdings, by month of calf registration (2015-2023)

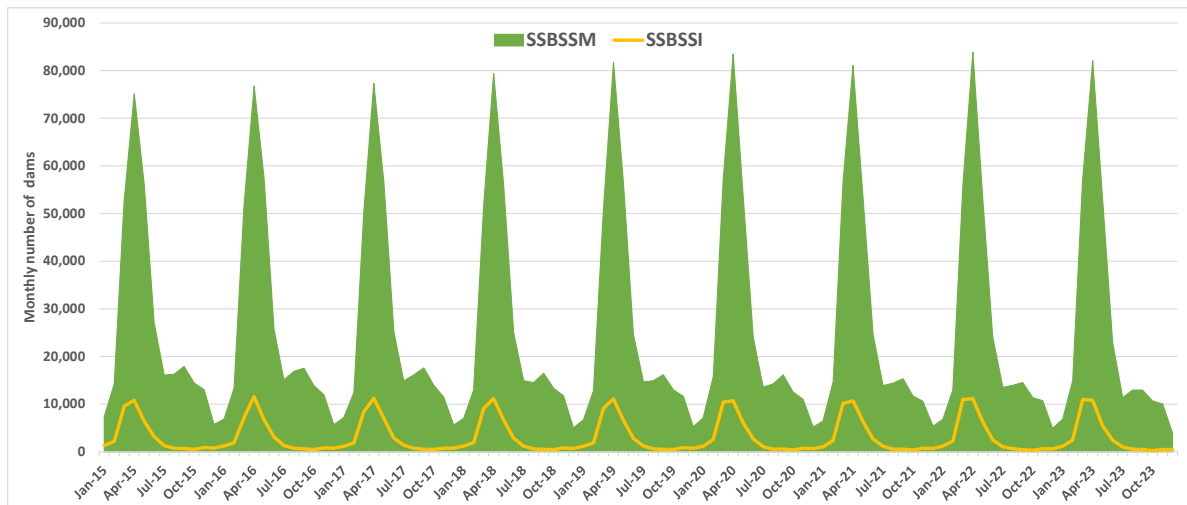
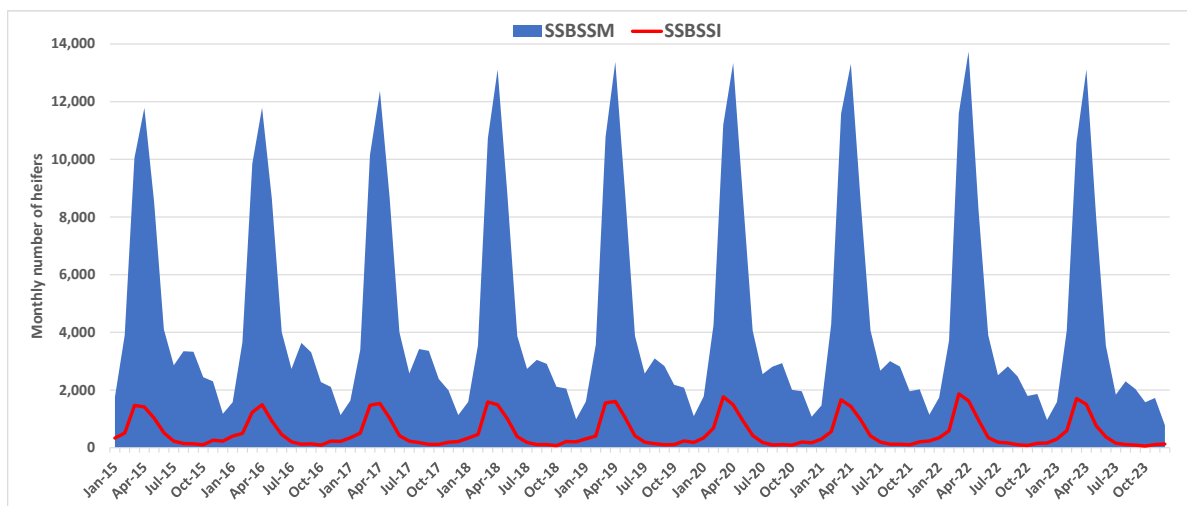


Figure 20 Number of SSBSS non-dairy heifers on SSBSS associated mainland and island holdings, by month of calf registration (2015-2023)





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