GIG CYMRU NHS WALES
Iechyd Cyhoeddus Cymru
Public Health Wales

Caesarean Section Surgical Site Infection Surveillance

2022 Annual Report:

All Wales

Includes data from 01/01/2022 – 31/12/2022

Version 1

Issued: 16/08/2024

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https://phw.nhs.wales/

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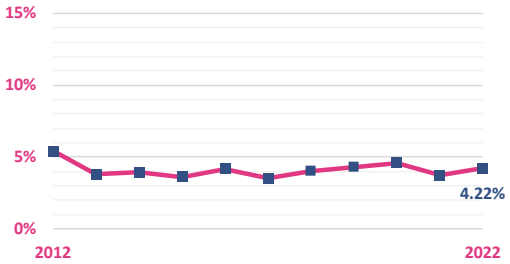
Summary

NOTE: The information in this annual report may differ from that found in the C-section quarterly reports. This annual report should be used when quoting annual figures and for comparison across countries.

NOTE: This report contains data for 2019-2022, where the Covid-19 pandemic may have impacted data quality and reporting of C-section SSIs.

SSI rate



1 in 24

mothers had an SSI attributable to their C section procedure

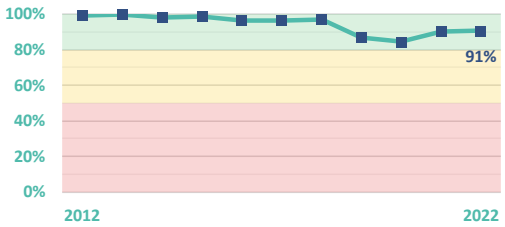
21%

reduction in SSI rate since 2012, which equates to

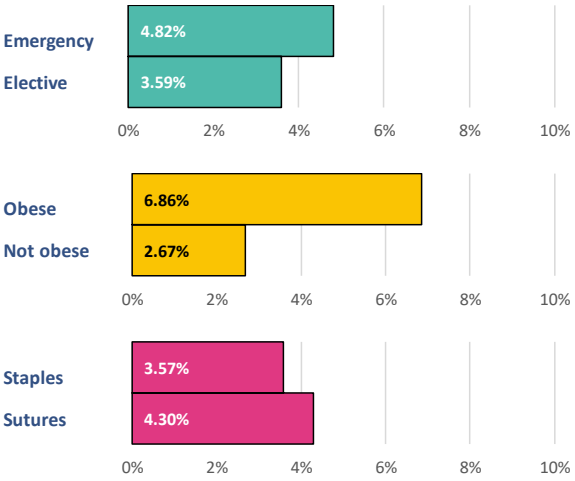
2489

infections prevented (based on 2012 rates)

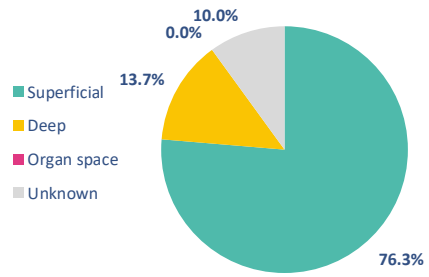
Compliance



Risk factors



Infection type



8127 procedures were performed in 2022 and, of these, 91% were valid forms that could be used for further analysis (n=7367).

There were 311 SSIs reported in 2022, which equates to an SSI rate of 4.2%. 41 of these were complicated infections (deep or organ space), approximately 13% of all infections.

58% of procedures performed in 2022 were emergencies. The SSI rate in emergency procedures was significantly higher than elective procedures.

Introduction

The Healthcare Associated Infections team at Public Health Wales Health Protection were instructed by the Welsh Government to develop and support the implementation of surveillance following Caesarean section procedures undertaken in NHS hospitals in Wales. This process has been mandatory since January 2006.

Surgical Site Infection (SSI) is an important area for surveillance and remains a complication of surgery where human and financial costs are high (Plowman, 2000; Jenks, Laurent, McQuarry & Watkins, 2014). Additionally, most infections are preventable (National Institute for Health and Care Excellence, 2019). An SSI is one of most common complications following a C-section (Zuarez-Easton et al. 2017; Zejnullahu et al. 2019).

Serious patient consequences can result from SSIs, including pain, suffering and, on some occasions, they require additional surgical interventions (Sykes, Brodribb, McLaws, & McGregor, 2005). It is important to recognise that SSIs can range from a relatively trivial wound discharge with no other complications, to a life-threatening condition. Other clinical outcomes of SSIs include poor scars that are cosmetically unacceptable, persistent pain and itching, restriction of movement and a significant impact on emotional wellbeing.

This report includes data captured both during hospital stay and post-discharge within the community. The surveillance incorporates data collected by clinical teams and midwives and uses internationally agreed definitions (Horan, Gaynes, Martone, Jarvis, & Emori, 1992), allowing Welsh data to be compared with and incorporated into other international databases, such as the ECDC European SSI database. This report details results obtained for surveillance data capture in 2018.

From 2022, there has been an update to some of the outputs included in the report, as listed below.

- **Table 1 –** No longer calculating the number of expected forms from data provided by PEDW due to inaccuracies identified in the PEDW dataset.
- **Figure 1 –** The total number of forms has been removed from the graph, focusing on the percentage of valid forms returned.
- Removal of the table showing the completion rates of the SSI field (along with its associated type and infection data fields).
- **Table 2 –** Removal of rows showing the number of inpatient and post-discharge SSIs, as this has been moved to the body of text.
- **Table 3** – Addition of a table showing the incidence of SSIs grouped by their time to onset of infection, with early onset being classified as 0-5 days and late onset being 6-14 days.
- **Figure 2 –** Removal of lines showing SSI by operation type from the graph.
- **Table 4 –** Removal of a breakdown of SSIs by operation type.
- **Figure 3 –** Removal of dotted lines showing 10%, 25% and 50% projection for SSIs from the previous year.
- **Figures 4-8, 10, 13 and 17 –** Proportion and SSI rate displayed for each category for demographics, details of surgical procedure and post-procedure details. *Proportion is calculated as the number of procedures within the category divided by the total number of procedures for which an age is recorded.*
- **Figures 9, 11 and 14 –** Proportions displayed for the last 10 years for timing of antibiotics prophylaxis and type of skin closure used.
- **Table 11 –** Presenting the information around the provision of prophylactic antibiotics as proportions of all procedures instead of SSI rates.

- **Figures 12 and 15** – Addition of graphs showing the SSI rates for the last ten years for type of skin closure used.
- Removal of graph showing spread of risk score across all procedures.
- **Figure 16** – Addition of a bar graph outlining the organisms reported from wound swab results where an SSI occurred.
- **Figure 17 and Table 14** – Re-categorisation of length of hospital stay from '0-5 days', '6-9 days' and 10+ days' to '0-2 days', '3-5 days', '6-9 days' and '10-14 days' and the addition of confidence intervals to the graph.
- Removal of graph and table showing length of midwifery care.
- **Figure 18** – Transformation of the graph showing time to onset of infection from a cumulative bar graph to an area chart.

Data interpretation

Surgical site infection (SSI) rates in this report are calculated as the number of infections (inpatient and post-discharge) as a proportion of valid procedures. This is reported as a rate per 100 procedures.

$$SSI\ rate\ = \frac{number\ of\ SSI}{number\ of\ valid\ procedures} \times 100\%$$

A valid procedure is one where an SSI is recorded, or one where there is confirmation of no SSI in both inpatient and post-discharge SSI fields. "Number of procedures" refers only to valid procedures, unless otherwise specified.

In keeping with the regular reports, all SSI rates reported in this document are those that occurred up to 14 days post-procedure. Due to the different discharge policies and treatment plans in place at all health boards, we are confident in the consistency of rates up to 14 days, but we are unable to guarantee consistency between hospitals after this point.

Section 1: Data completeness

Compliance

The proportion of valid forms being returned has improved compared to 2021, with 91% of the total number of forms being valid.

Table 1 - Proportion of valid C-section SSI surveillance forms

	2020	2021	2022
Total number of surveillance forms	6278	7955	8127
Number of valid surveillance forms	5304	7176	7367
Valid forms returned*	84%	90%	91%

*A valid form is a procedure where an SSI is recorded, or one where there is confirmation of no SSI on both inpatient and post-discharge SSI fields.

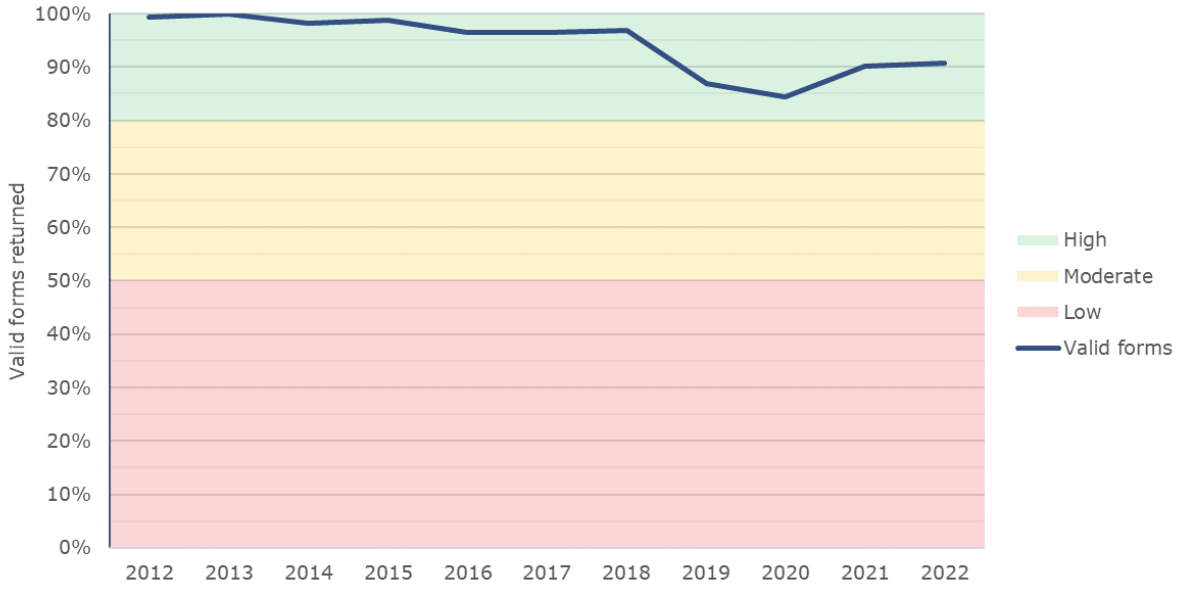


Figure 1 - Trend rate for valid forms over the last 10 years, 2012-2022.

Completion rates of surveillance forms

The vast majority of inpatient forms received at Public Health Wales have a completed SSI status field (where either yes or no are selected), with 7999 of forms having a completed SSI field (of 8127 forms, 98.4%). Following on from these inpatient forms, 99.4% of post-discharge forms were received (8078/8127) with the remaining being sent in blank. Of the post discharge forms that were sent in, 91.2% (7367/8078) had a completed SSI field.

The additional information on post-discharge SSIs (type and date) is provided in most cases, with only a small number of forms missing this information. Of the forms where a post-discharge SSI is reported, 93.2% provide the SSI type and 96.6% provide an infection date. The additional information is provided less often in the case of inpatient SSIs, however, the numbers involved are too small to extrapolate any real meaning from them.

Section 2: SSI rate

Incidence of inpatient, post-discharge, and overall SSI

Table 2 - Overall number of procedures, SSIs, and SSI rate, 2022.

	No. of procedures	SSI	SSI rate (95% CI)
C-section surveillance	7367	311	4.22% (3.77-4.71)

Of the 7367 valid procedures reported, 311 reported an inpatient or post-discharge SSI, giving an SSI rate of 4.22% which has increased since the previous year where the SSI rate was 3.71%.

The following table provides the SSI rates separated out as 'early onset', from 0 to 5 days, and 'Late onset' from 6-14 days. Early onset are infections that may occur when the patient is still in hospital or following the first 2 to 3 days after discharge. Late onset are the infections that occur, typically, in the community. A total of 34 inpatient SSIs were recorded, giving an inpatient SSI rate of 0.46%. The vast majority of SSIs (277, 89.1%) occurred following hospital discharge, giving a rate of 3.76%. A total of 30 early onset SSIs were recorded, giving an early onset SSI rate of 0.41%. The vast majority of SSIs (255, 82.0%) occurred in the late onset period, giving a rate of 3.5%.

The length of hospital stay is shorter now than it was at the start of the surveillance period as more of an emphasis is being placed on community midwifery care, as well as shorter hospitalisations for labour and delivery during the Covid-19 pandemic. As a result, fewer early onset SSIs are being identified than previously, and these are instead being picked up as late onset. Although the overall SSI rate is 4.22%, the majority are late onset so they are happening in the community rather than following discharge in the early days.

All SSIs are captured up to 14 days post procedure.

Table 3 - Incidence of SSIs, 2022.

Time to onset of infection	SSI	SSI rate
Early onset (0-5 days)	30	0.41%
Late onset (6-14 days)	255	3.46%

*26 procedures reporting an SSI did not provide or provided an invalid infection date, preventing the calculation of time to onset of infection.

Annual SSI rates

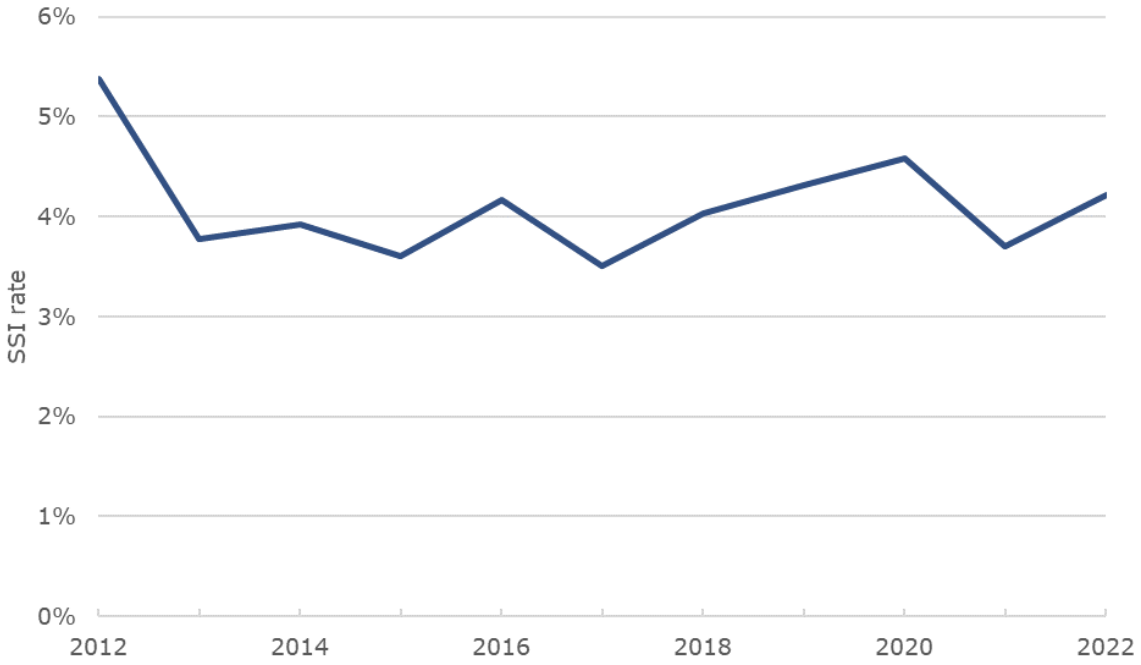


Figure 2 - Overall SSI rates for 2012-2022.

Table 4 - Overall SSI rates for the last five years. (Unknowns excluded).

Operation type	Year	No. of procedures	SSI	SSI rate (95% CI)
All C-section procedures	2022	7367	311	4.22% (3.76-4.68)
	2021	7176	266	3.71% (3.27-4.14)
	2020	5304	243	4.58% (4.02-5.14)
	2019	5846	252	4.31% (3.79-4.83)
	2018	7362	297	4.03% (3.58-4.48)

The SSI rate across Wales has increased this year from 3.71% in 2021 to 4.22% in 2022, with an increase in the number of procedures reported to PHW in 2022 compared to 2021. The number of procedures in 2021 and 2022 compared to 2019 and 2020 show the numbers returning to those seen before the COVID-19 pandemic. The SSI rate back in 2012 was 5.38% and, when using this rate as a baseline, there has been a reduction of 21%. This represents an estimated 2,489 mothers who have been saved from an infection (Figure 2).

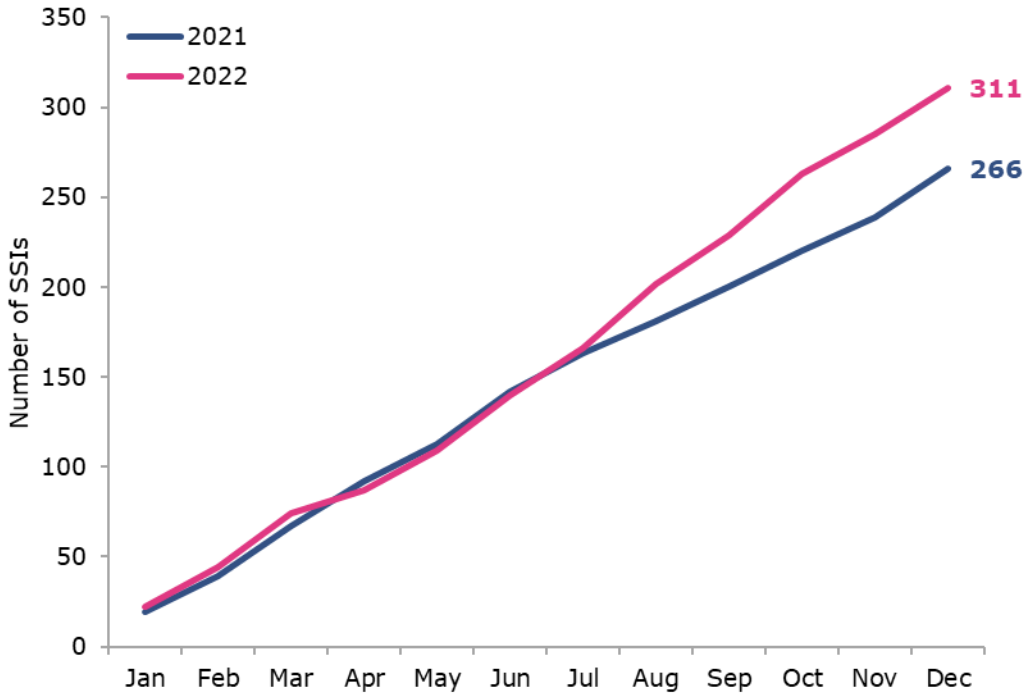


Figure 3 - Cumulative SSI number for 2022, compared to the previous year.

Throughout Wales, there were 311 SSIs reported in 2022. When compared to the previous year's 266 SSIs, this is an increase of 17% from the 2021 SSI numbers (i.e. without factoring in the denominator) and means there were 45 more infections in 2022 than in 2021. Cumulative SSI numbers for 2021 and 2022 are found in Figure 3.

Incidence of SSI by infection type

The type of SSI recorded on the surveillance form can be categorised into either superficial, deep seated or organ space infections. These all have specific definitions and diagnostic criteria and remain standardised across Europe. The following tables show the split between different SSI types, and their corresponding rates.

Table 5 - Types of SSI in C-section procedures by proportion, 2022.

SSI type	n	%
Superficial infection	229	76.3%
Deep infection	41	13.7%
Organ space infection	0	0.0%
Unknown	30	10.0%

Table 6 - SSI rates broken down by type, (n procedures = 7367), 2022.

SSI type	SSI	SSI rate (95% CI)
Superficial infection	229	3.11% (2.71-3.50)
Deep infection	41	0.56% (0.39-0.73)
Organ space infection	0	0.00% (0.00-0.00)
Unknown	30	0.41% (0.26-0.55)

The split between different types of infection is as expected – the vast majority of infections reported are superficial (76.3%), followed by deep infections (13.7%), and no organ space infections (0.00%).

Section 3: Demographics

This section provides information about the mother which is not affected by the current procedure itself and is known beforehand, namely age, BMI, and the number of prior C-section procedures.

Incidence of SSI by age

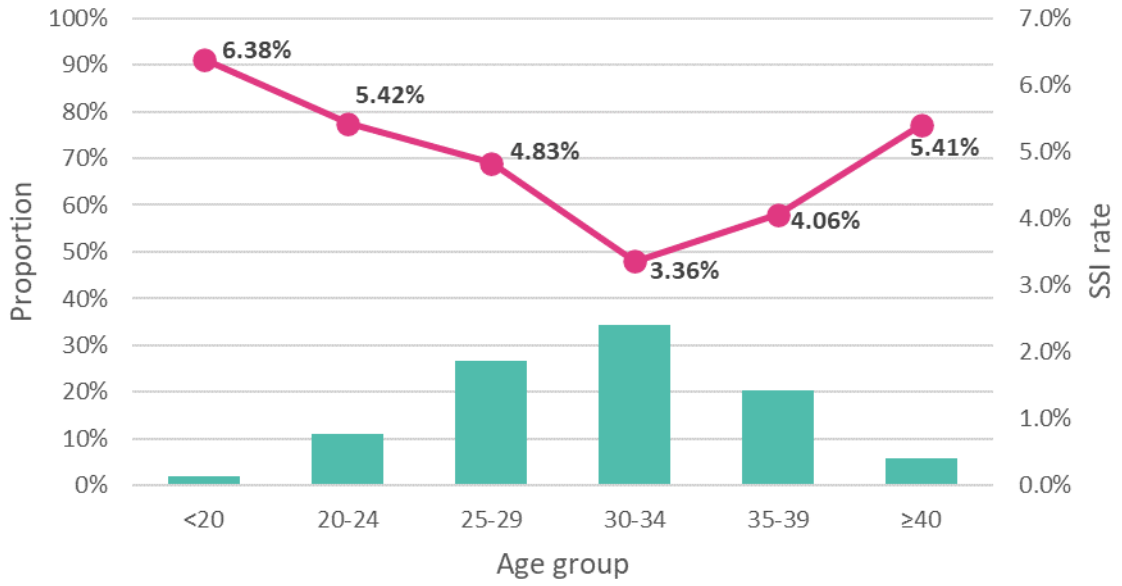


Figure 4 - Graph showing the incidence of SSI by age group, 2022.

Table 7 - Incidence of SSI by age group, 2022.

Age group	No. of procedures	SSI	SSI rate (95% CI)
<20	141	9	6.38% (2.96-11.77)
20-24	793	43	5.42% (3.95-7.23)
25-29	1904	92	4.83% (3.91-5.89)
30-34	2469	83	3.36% (2.69-4.15)
35-39	1454	59	4.06% (3.10-5.20)
≥40	407	22	5.41% (3.42-8.07)
Unknown	199	3	1.51% (0.31-4.34)

The primary axis in Figure 4 represents the proportion of procedures in each category, calculated as the number of procedures within the category divided by the total number of procedures for which an age is recorded. The secondary axis displays the SSI rate as a percentage, calculated as the number of procedures in the given category where an SSI is recorded, divided by the total number of procedures in that category. This is the case for all further graphs where the proportion and SSI rate are both shown in one graph.

In 2022, there was a higher SSI rate in women below the age of 20 (6.38%), and also in women aged between 20 and 24 (5.42%), closely followed by women aged over 40 (5.41%). However, as seen in Figure 4, the proportion of mother's in those age groups is lower than those in the other age groups. The mean age for all procedures was 31.0 but this reduced to 30.2 when only those with an SSI were included. Age was a significant factor in the probability of having an SSI (P=0.037).

Incidence of SSI by BMI

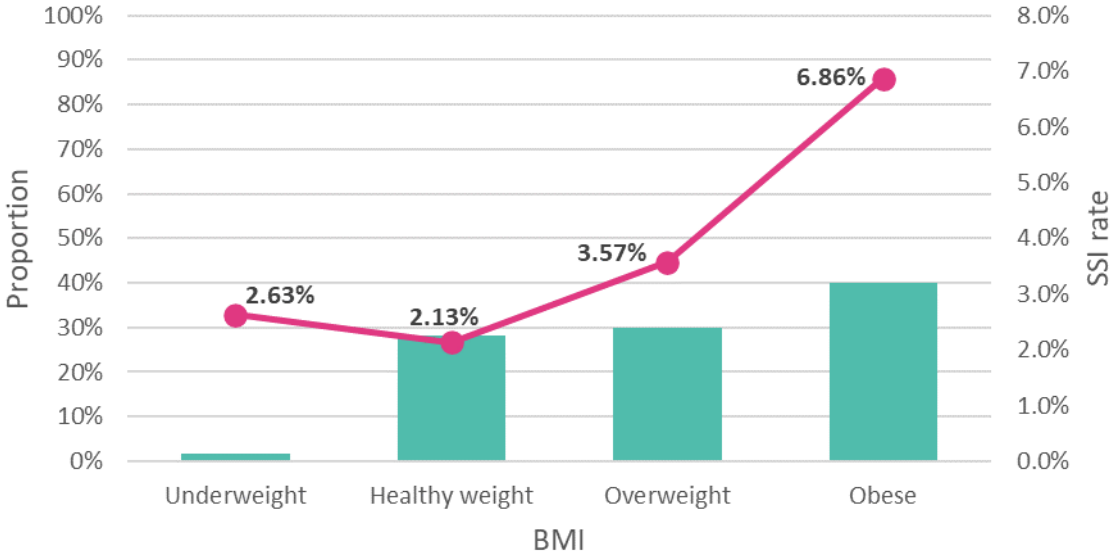


Figure 5 - Graph showing the incidence of SSI by BMI category, 2022.

Table 8 - Incidence of SSI by BMI category, 2022.

BMI		No. of procedures	SSI	SSI rate (95% CI)
Underweight	<18.5	114	3	2.63% (0.55-7.50)
Healthy weight	18.5-24.9	1921	41	2.13% (1.54-2.88)
Overweight	25.0-29.9	2045	73	3.57% (2.81-4.47)
Obese	≥30.0	2724	187	6.86% (5.94-7.88)
Unknown		563	7	1.24% (0.50-2.54)

In 2022, there was a very clear association between BMI and the probability of having an SSI. The mean BMI for all procedures was 29.0 (median 28.0), this went up to 33.1 (median 32.4) when only those with an SSI were included. Figure 5 shows a similar proportion of procedures performed in mother's whose BMIs are classified as healthy, overweight, and obese. When comparing BMI groups, the SSI rate in overweight mothers (including obese mothers) was significantly higher (P<0.001), and this was also true when comparing obese mothers to all other BMI groups (P<0.001). While the SSI rate in underweight mothers was lower, this group was very small compared to the other groups, so this was not significant (P=0.339).

Incidence of SSI by number of previous C-sections

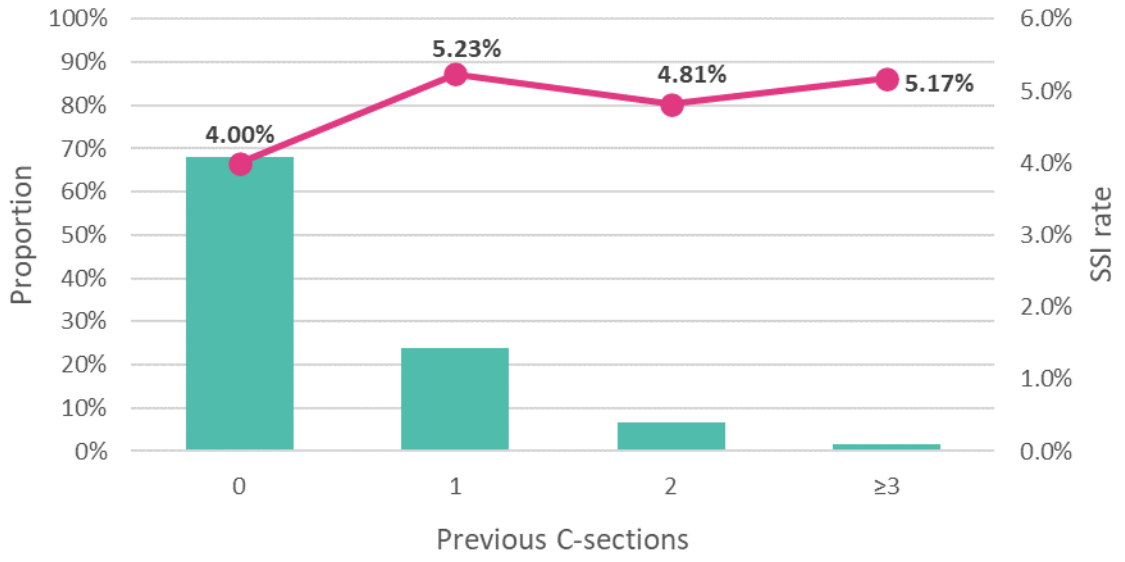


Figure 6 - Graph showing incidence of SSI by the number of previous C-sections, 2022.

Table 9 - Incidence of SSI by the number of previous C-sections, 2022.

Previous C sections	No. of procedures	SSI	SSI rate (95% CI)
0	4774	191	4.00% (3.46-4.60)
1	1681	88	5.23% (4.22-6.41)
2	457	22	4.81% (3.04-7.20)
≥3	116	6	5.17% (1.92-10.92)
Unknown	337	4	1.19% (0.32-3.01)

The proportion of procedures in each category steadily decreases as the number of previous c-sections a mother has had increases, but when comparing the number of C-sections a mother has undergone prior to the current procedure, there are no apparent trends in SSI rate. The SSI rate is highest among mothers who had undergone 1 previous C-Section (5.23%), which differs to findings from the previous year, where a higher rate was seen in mothers who had undergone 2 previous C-sections (6.21% in 2021).

Section 4: Details of the surgical procedure

The following section provides information on the variables relating to the procedure itself (including procedure type, prophylaxis, and skin closure).

Incidence of SSI by procedure type

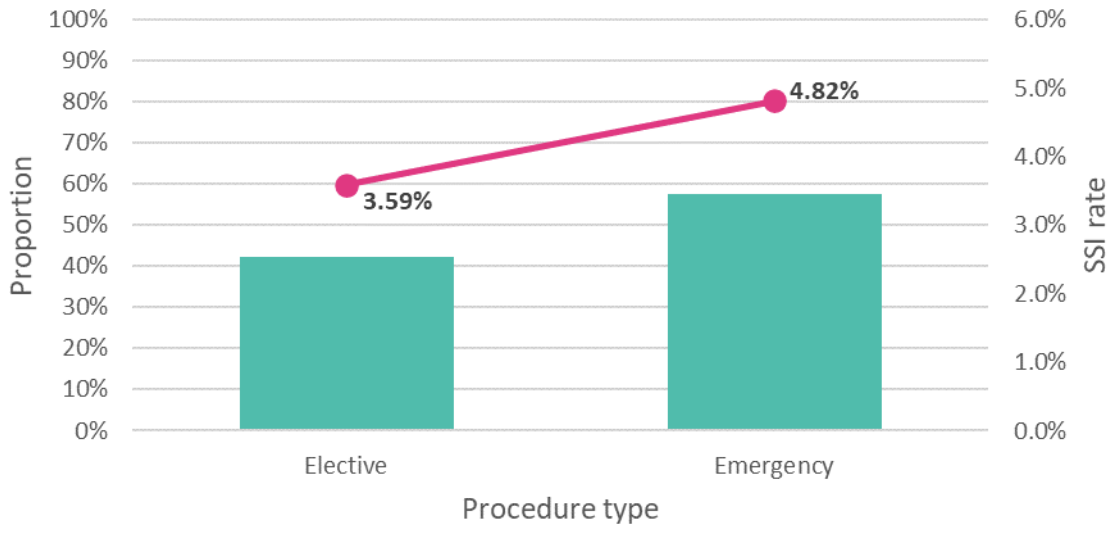


Figure 7 - Graph showing incidence of SSI by type of procedure, 2022.

Table 10 - Incidence of SSI by procedure type, 2022.

Procedure type	No. of procedures	SSI	SSI rate (95% CI)
Elective	3038	109	3.59% (2.96-4.31)
Emergency	4131	199	4.82% (4.18-5.51)
Unknown	198	3	1.52% (0.31-4.36)

In 2022, the SSI rate in emergency procedures was significantly higher than in elective procedures (34% increase, P=0.01). The split of procedures is also fairly even, with just over half (57.6%) of procedures being classed as emergencies (CS1, CS2 and CS3) and the remaining 42.4% being classed as elective (CS4).[1]

[1] CS1 – Immediate threat to life of woman or foetus, e.g. cord prolapse, significant placental abruption or maternal cardiorespiratory distress.
CS2 – Late foetal heart rate decelerations, CS pre-booked to avoid vaginal delivery but woman presents in advanced labour.
CS3 – Deteriorating but compensated maternal medical condition.
CS4 – Operation at short notice but no clinical urgency, Elective.

Incidence of SSI by antibiotic prophylaxis

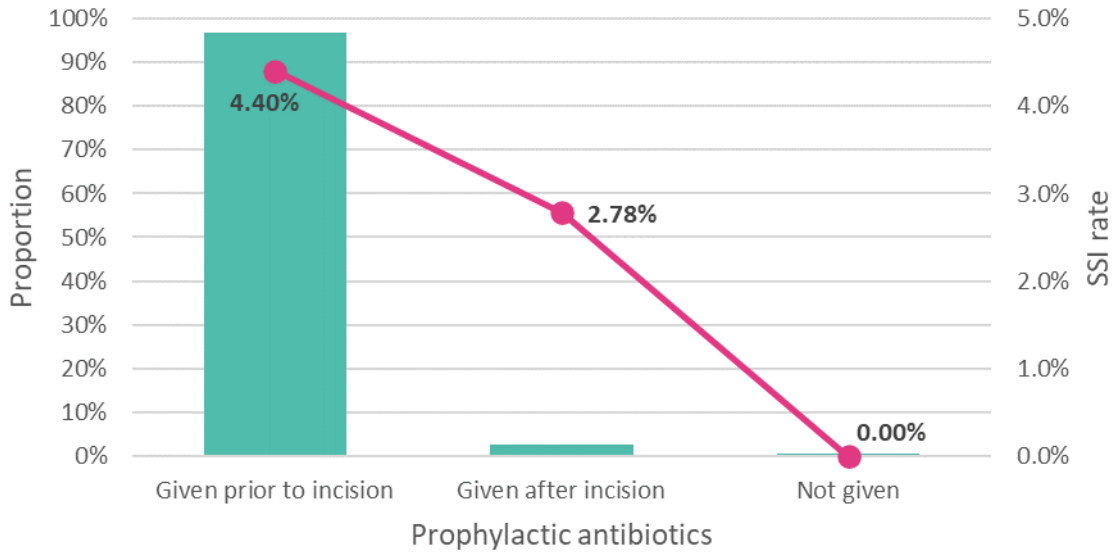


Figure 8 - Graph showing proportion of procedures and incidence of SSI by timing of prophylactic antibiotics, 2022.

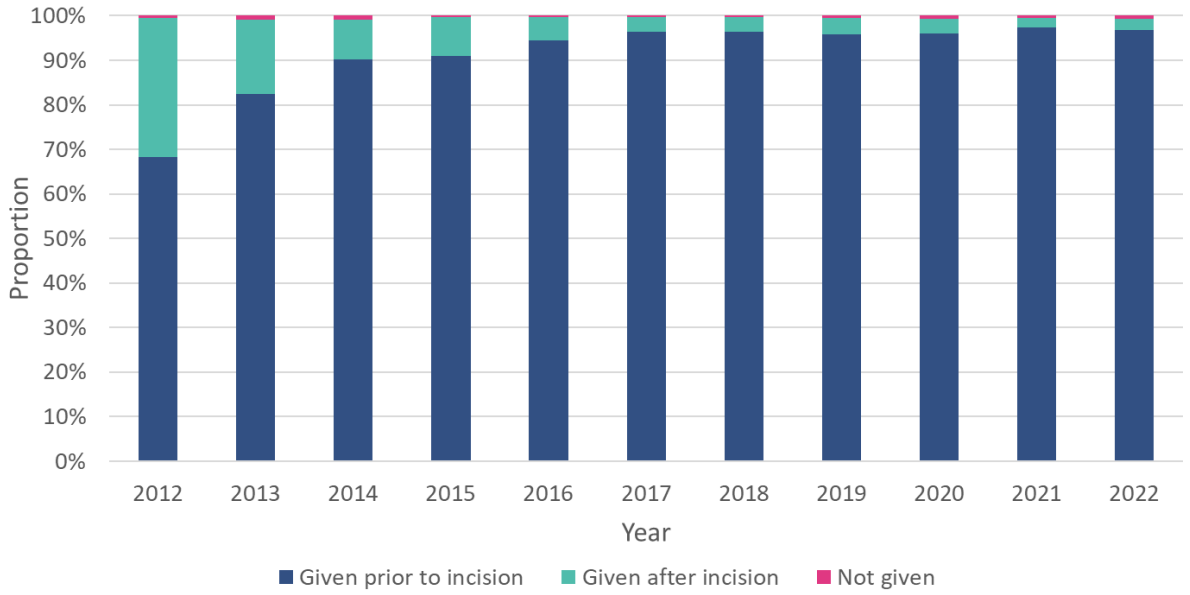


Figure 9 - Graph showing proportion of procedures by timing of prophylactic antibiotics, 2012 - 2022.

Table 11 – Proportion of procedures by timing of prophylactic antibiotics, 2022.

Prophylactic antibiotics	No. of procedures	Proportion
Given prior to incision	6706	96.80%
Given after incision	180	2.60%
Not given	41	0.59%

For procedures where timing of antibiotic prophylaxis was recorded, 99.4% of mothers were given prophylactic antibiotics and, of these, 97.4% were given prior to surgical incision. In contrast to previous years, there is a higher SSI rate when antibiotics are administered prior incision, but this was not significant (58% increase, P=0.29307). As seen in Figure 9, it should be noted that the overall proportion of procedures where antibiotics were given prior to incision has increased, in line with guidance recommendations. Therefore, the comparison of SSI rate is difficult due to the smaller proportion of procedures where prophylactic antibiotics are administered after the incision.

We continue to recommend that antibiotics are administered prior to incision where possible, in accordance with NICE guidelines (National Institute for Health and Care Excellence, 2019). It is also worth taking into consideration that the serum half-life of Cefuroxime is 80 minutes, and NICE recommend that a repeat dose is administered when the length of the procedure exceeds this time. (In the case of mothers on second line antibiotics, both Clindamycin and Gentamicin have a serum half-life of two hours).

1st line	If allergic to penicillin
Cefuroxime 1.5g IV	**Clindamycin 600mg IV/PO**
+	**+**
Metronidazole 500mg IV	**Gentamicin 1.5mg/kg IV**

Incidence of SSI by skin closure type

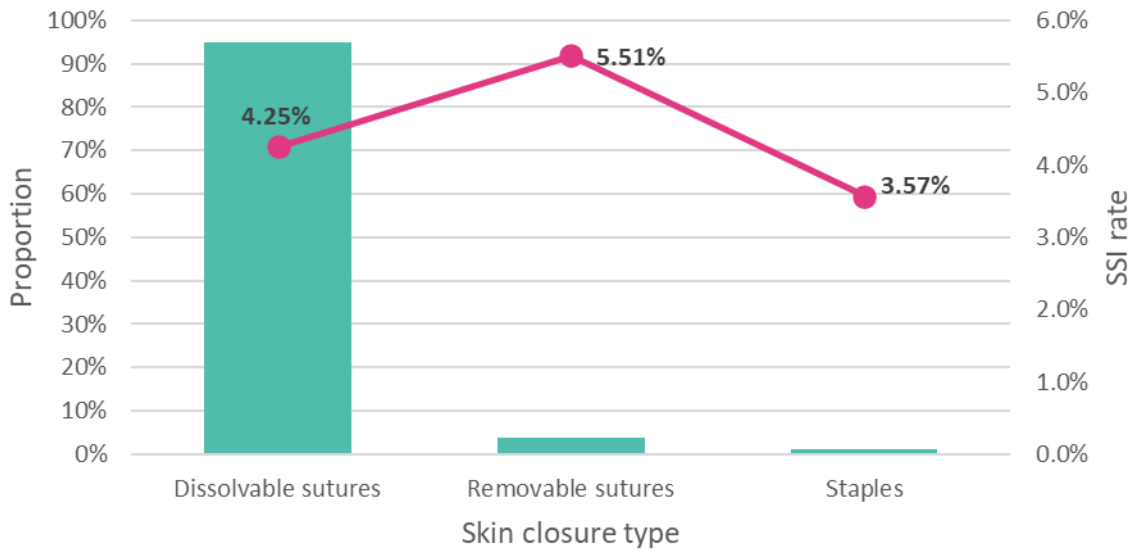


Figure 10 - Graph showing proportion of procedures and incidence of SSI by type of skin closure used, 2022.

In 2022, dissolvable sutures were used in the majority (95.02%) of procedures, with just 3.80% using removable sutures and 1.17% using staples. Although the SSI rate appears lowest when staples are used, it is important to highlight that there are very few procedures where staples were used as the method of skin closure, so this increased rate was not significant (P=0.74239).

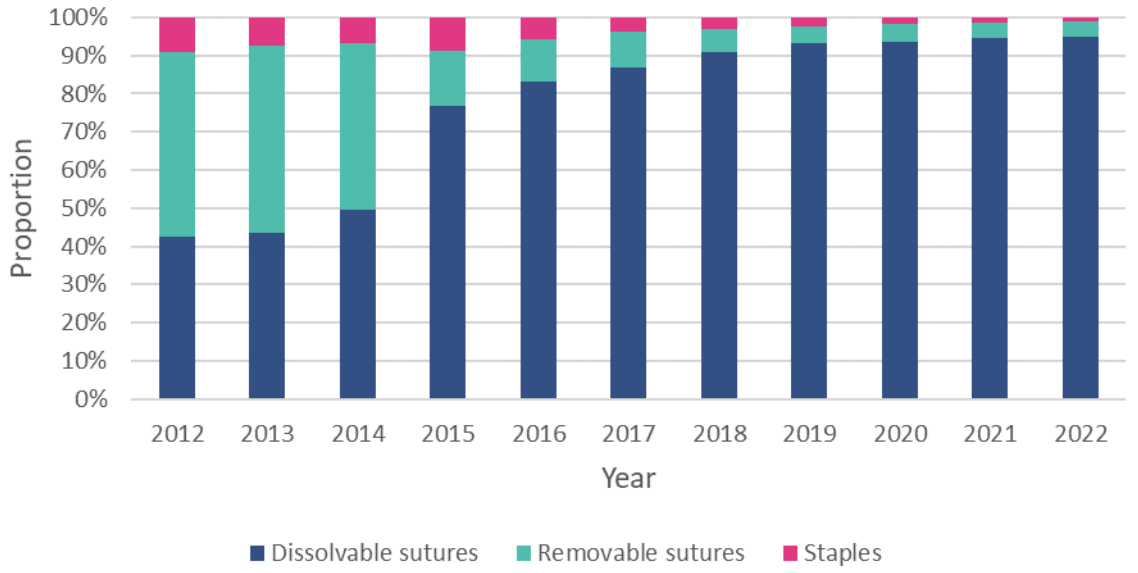


Figure 11 - Graph showing proportion of procedures by type of skin closure used, 2012 - 2022.

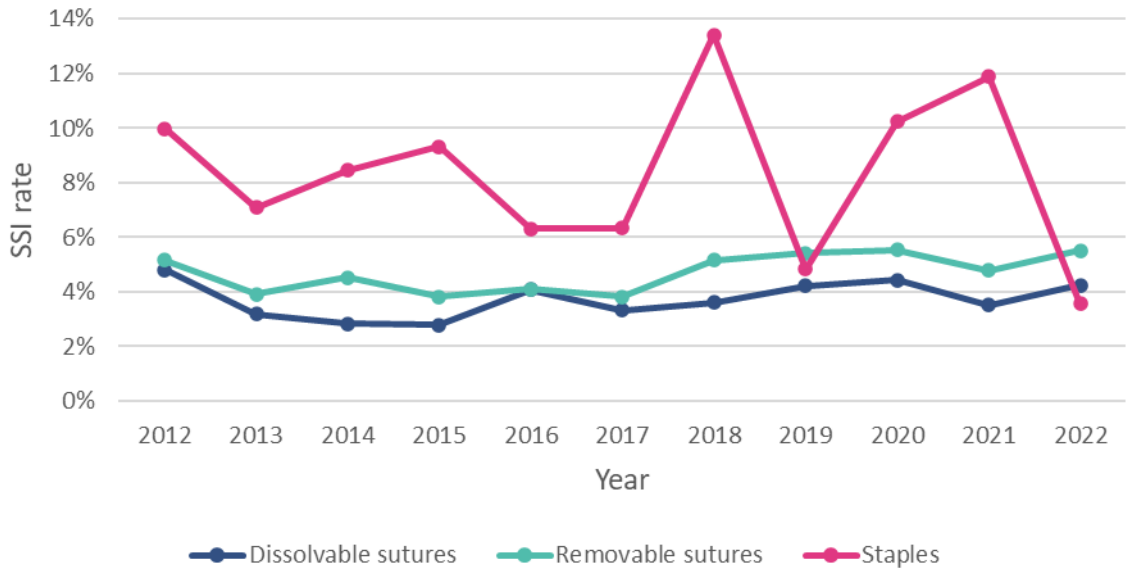


Figure 12 - Graph showing incidence of SSI by type of skin closure used, 2012 - 2022.

Table 12 - Incidence of SSI by type of skin closure, 2022.

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	7065	304	4.30% (3.83-4.78)
Dissolvable sutures	6792	289	4.26% (3.79-4.76)
Removable sutures	273	15	5.49% (3.11-8.90)
Staples	84	3	3.57% (0.74-10.08)
Unknown	218	4	1.83% (0.50-4.63)

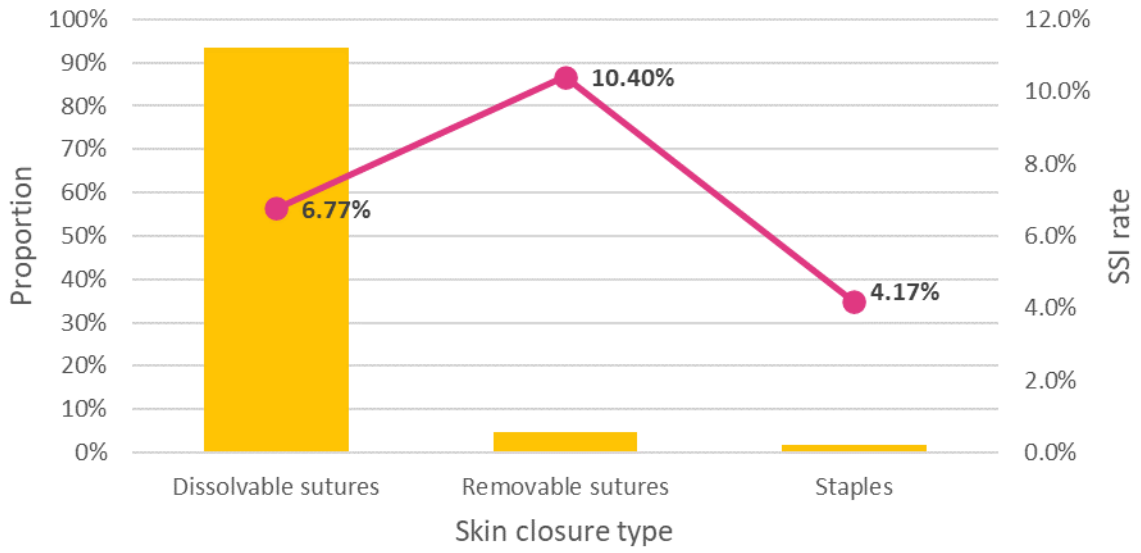


Figure 13 - Graph showing the incidence of SSI by skin closure in mothers with BMI≥30, 2022.

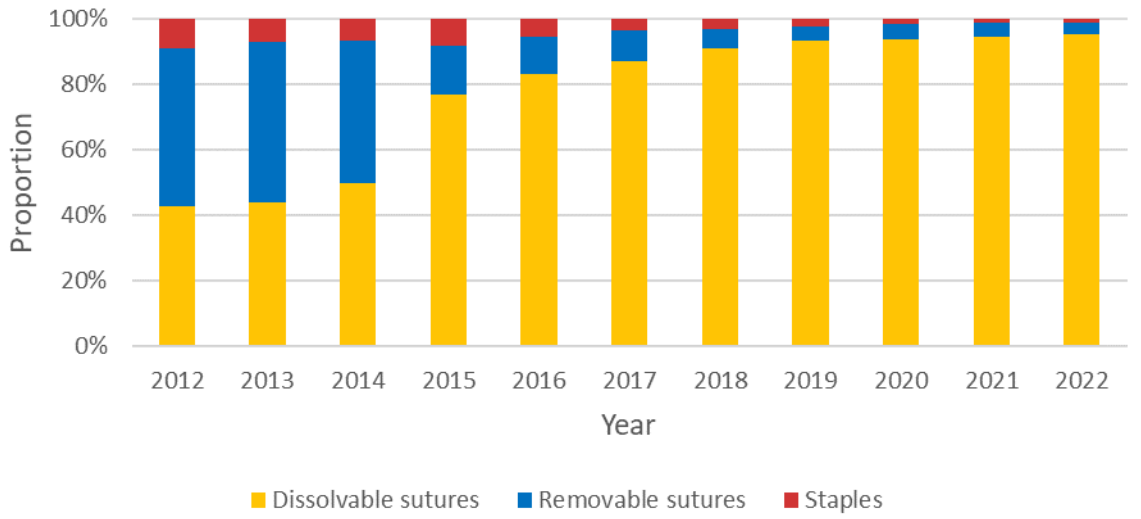


Figure 14 - Graph showing proportion of all procedures by type of skin closure used in mothers with BMI≥30, 2012 – 2022.

In 2022, when the mother is obese (BMI>30) 93.63% of procedures are closed with dissolvable sutures with just 1.77% being closed with staples. There are fewer instances where staples are used as the method of closure for C-section procedures. For example, in 2021 staples were used for 101 procedures with an 11.88% SSI rate and in 2022 they were used for 84 procedures with an SSI rate of 3.57%.

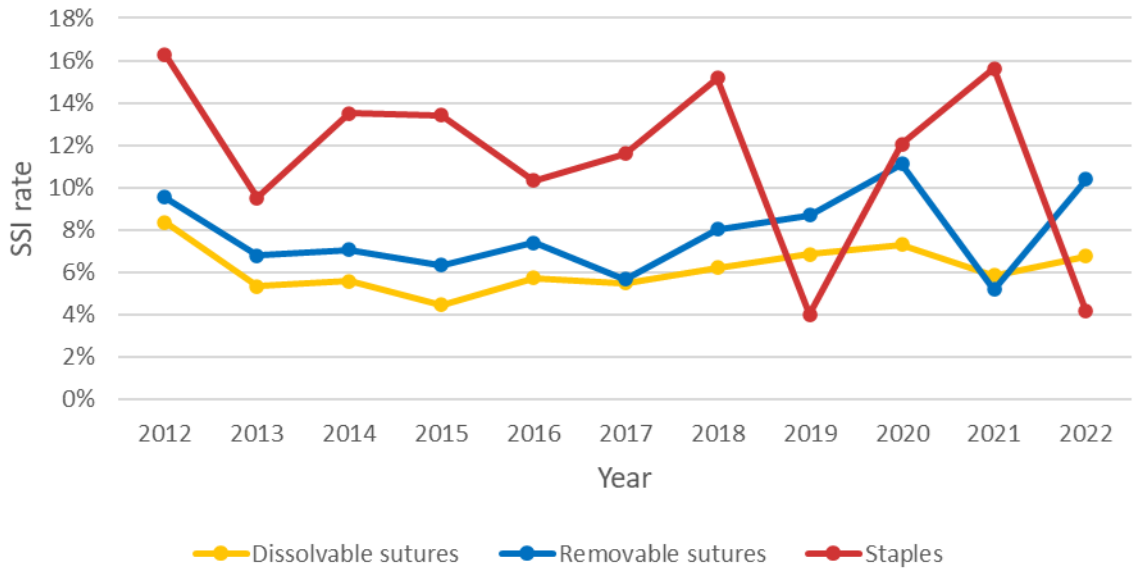


Figure 15 - Graph showing incidence of SSI by type of skin closure used in mothers with BMI≥30, 2012 - 2022.

Table 13 - Incidence of SSI by type of skin closure in mothers with BMI≥30, 2022.

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	2667	184	6.90% (5.94-7.86)
Dissolvable sutures	2542	171	6.73% (5.78-7.77)
Removable sutures	125	13	10.40% (5.65-17.13)
Staples	48	2	4.17% (0.51-14.25)
Unknown	9	1	11.11% (0.28-48.25)

Figures 12 and 15 show the trend in SSI rates by skin closure type from 2012 to 2022. The peaks in SSI rate for staple use in 2018 and 2021 occurred as a result of increased staple use, which was discussed with the relevant hospitals resulting in a drop in staple use and SSI rate in the subsequent following years.

Section 5: Details of the microbiological results

This section provides information about the types of organisms and the proportion reported for SSIs.

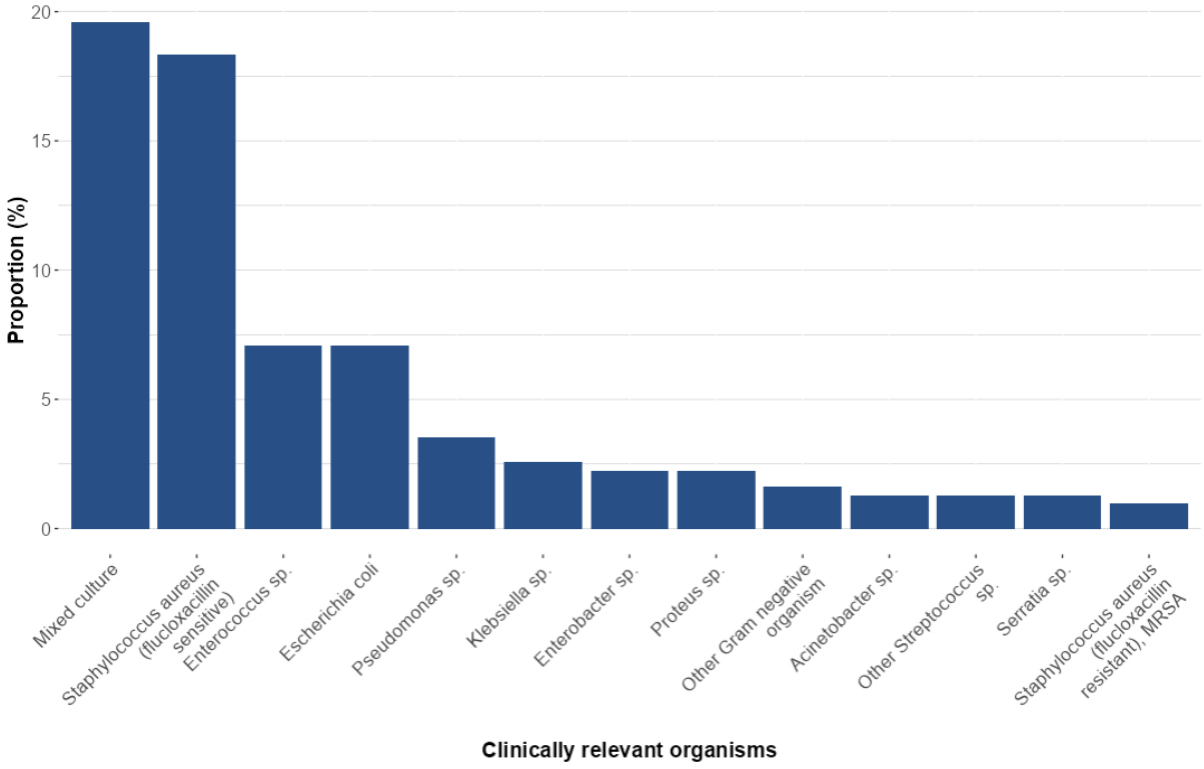


Figure 16 - Graph showing proportion of organism results for SSIs reported, 2022.

* Clinically relevant organisms have been classified as those that are known microbiological pathogens, excluding contaminants

Figure 11 shows the proportion of organism results from wound swabs taken where an SSI was reported. Of the SSIs reported, 19.8% had a swab results recorded as 'Mixed culture'. The second most commonly reported organism was *Staphylococcus aureus* (flucloxacillin sensitive) 18.5%. 7.1% had an organism result of *Enterococcus* sp and 7.1% had an organism result of *Escherichia coli.*

Section 6: Post-procedure details and onset of infection

This section deals with the time period after the procedure has occurred and the time to onset of infection.

Length of stay in hospital

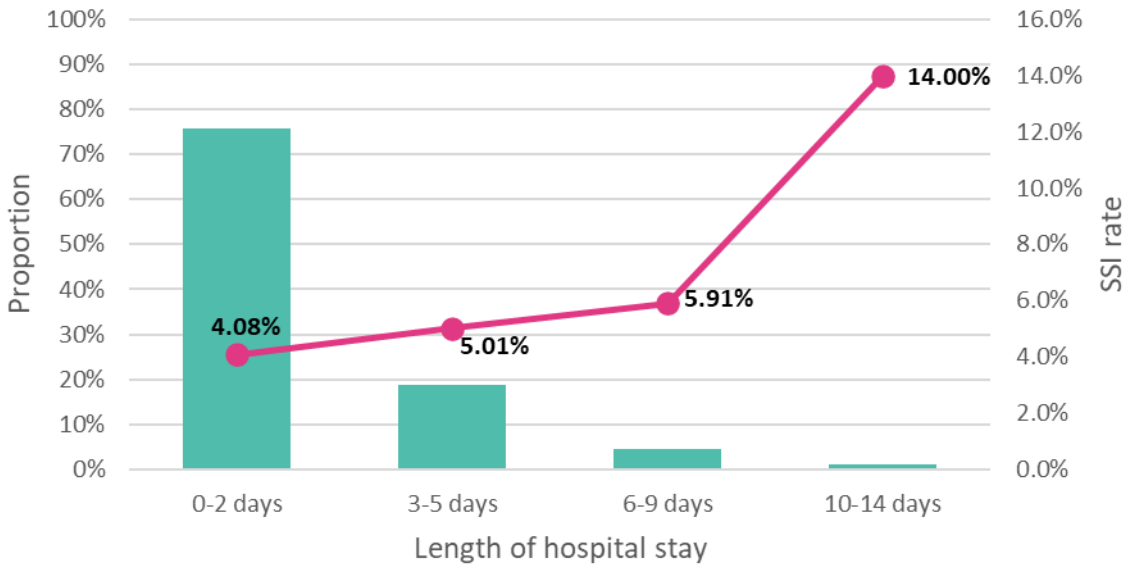


Figure 17 - Graph showing incidence of SSI by length of hospital stay, 2022.

Table 14 - Incidence of SSI by length of hospital stay, 2022.

Length of hospital stay	No. of procedures	SSI	SSI rate (95% CI)
0-2 days	3798	155	4.08% (3.50-4.76)
3-5 days	938	47	5.01% (3.79-6.60)
6-9 days	220	13	5.91% (3.49-9.85)
10-14 days	50	7	14.00% (6.95-26.19)
Unknown	2331	86	3.69% (3.00-4.53)

For all patients undergoing a C-section, the mean hospital stay following the procedure is 2.3 days (median of 2). When only mothers who have had an SSI are included, this increases to a mean of 2.9 days (median of 2). As the length of hospital stay increases, there is an associated increase in the SSI rate. This would suggest that those who have been discharged from the hospital later are more likely to develop an SSI, not necessarily because of the length of stay itself, but due to the same factors that resulted in the extended stay. In contrast to the previous year, the length of hospital stay resulted in a significantly higher SSI rate in 2022 (P=0.000), with the highest SSI rate seen where length of hospital stay was 10-14 days (14.00%). However, it is worth noting that the proportion of procedures in each group decreases as the length of stay increases, because most mothers are discharged between 0-2 days.

Time to onset of infection

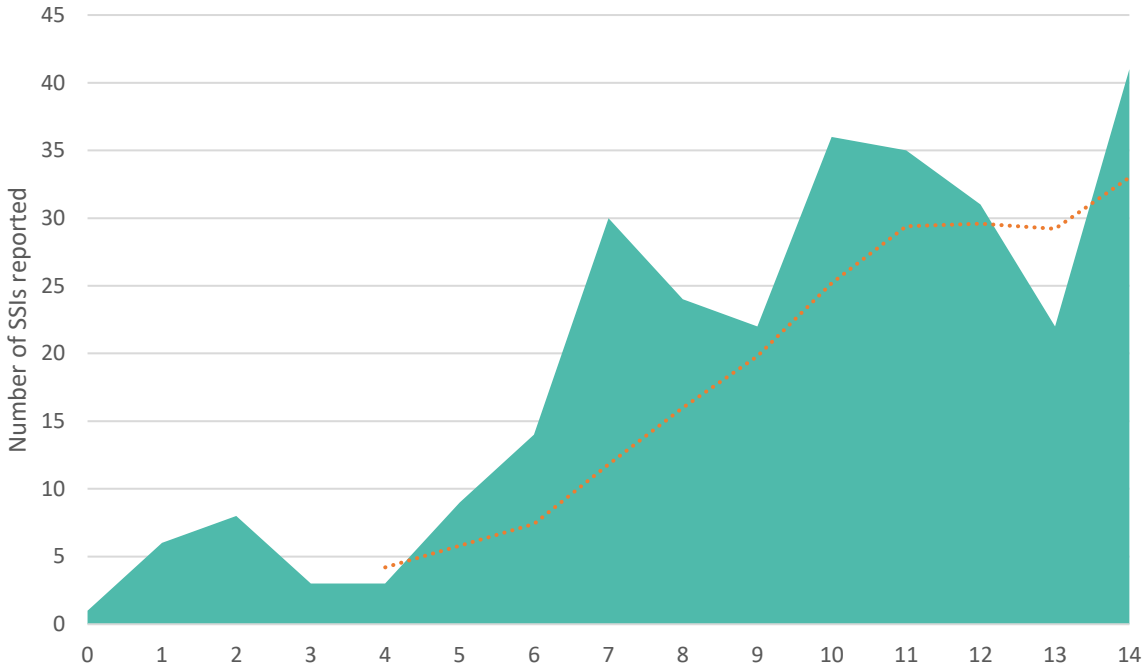


Figure 18 - Graph showing number of SSIs up to 14 days post-procedure. Blank infection dates excluded, 2022.

While SSIs can be reported on our forms up to 30 days post-procedure, we are only including those up to 14 days for consistency across Wales.

Any SSIs reported without an infection date are counted as occurring on day 0 and are included in the SSI rates. There were 26 (8%) infections where the date of onset was not recorded. Within the first 14 days, the mean time to infection was 9.6 days, with a median of 10. The greatest number of infections were reported on day 14 (n=41). The area graph indicates peaks in SSIs at day 7 (n=30), 10 (n=36) and 14 (n=14). This reflects the pattern of the days on which there is follow-up of midwifery care. The orange dotted line represents the 5-day moving average, showing a steady increase in SSIs from days 6 to 11.

Anonymised Hospital SSI rates

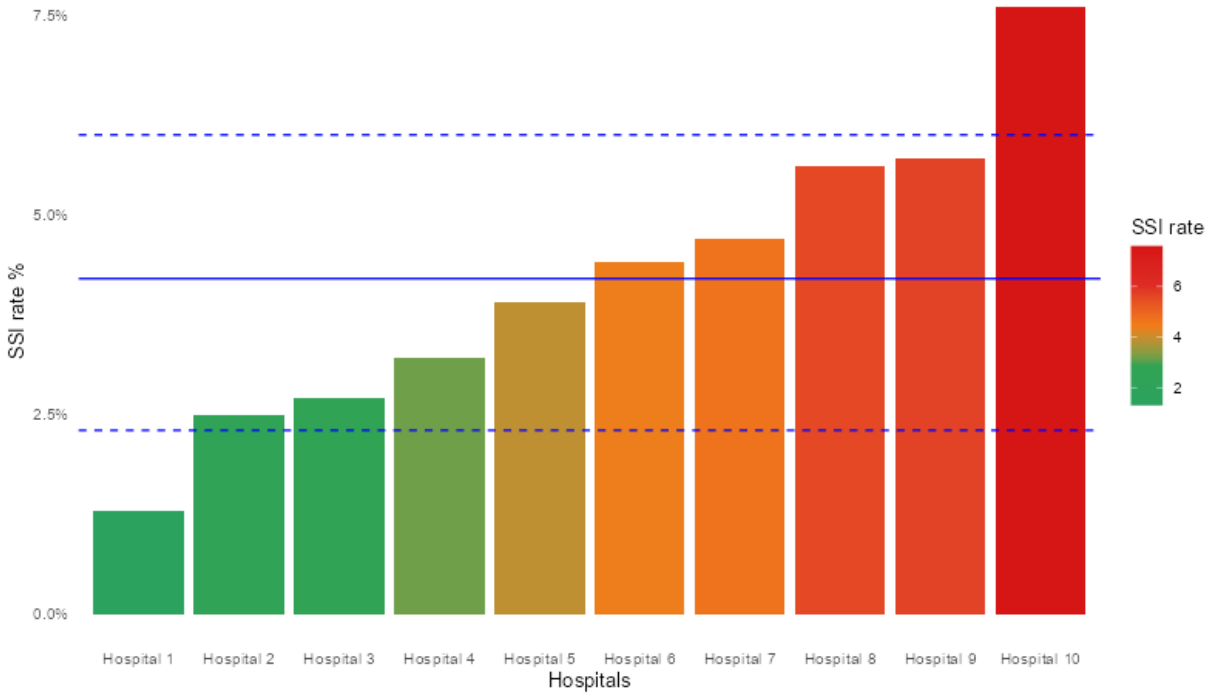


Figure 19 - Anonymised SSI rates for each Hospital participating in the C-section surveillance scheme as of 2022, from the lowest to highest rate.

Figure 13 shows anonymised SSI rates for each hospital reporting C-section procedures in 2022. The solid blue line represents the mean (4.2%) and the dashed blue lines represent the + and – standard deviation (1.8%). At the highest end the rate is 7.6%, compared to 1.3% at the lowest end. A total of 5 hospitals had an SSI rate above the mean.

Discussion

Compliance with the C-section SSI surveillance is now being measured by looking at the number of valid forms returned, with a valid form being defined as a procedure where an SSI is recorded, or one where there is confirmation of no SSI on both inpatient and post-discharge fields. In previous years, the PEDW figures have been used as a denominator but inaccuracies in the dataset could have led to overestimation of the numbers. Compliance has slightly improved in 2022 with 91% of valid forms being returned compared to the 90% returned in 2021.

The overall SSI rate for 2022 was 4.22%, which is an increase from 3.71% in 2021. The overall reduction over time has decreased to 21% (39% in 2021) and increased in real numbers, representing 2489 infections being prevented for mothers (2458 in 2021). Both elective and emergency procedures have seen an increase in SSI rates compared to 2021, from 3.91% to 4.82% for emergency procedures and 3.49% to 3.59% for elective procedures.

Time to onset of infection has been categorised into 'early onset' (0-5 days) and 'late onset' (6-14 days) in this year's report. In 2022, 30 SSIs were early onset with an SSI rate of 0.41% and 255 were late onset with an SSI rate of 3.46%. The majority of SSIs were diagnosed between the 6th and 14th day, which could indicate that the SSIs are occurring in the community rather than in the hospitals. The mean time to infection was 9.6 days, with the greatest number of SSIs being diagnosed on day 14 (n=41) followed by day 10 (n=36) and day 7 (n=30). Diagnosis of an SSI in the 6-14 day period could reflect the pattern of follow-up to midwifery care, where the mother can be assessed for any signs or symptoms of an SSI.

Across the years, a general trend has been observed in which higher BMIs are associated with an increased risk of SSI. In 2022, the mean BMI for all procedures was 29.0, when including only procedures that had an SSI associated with them, this increased to 33.1. Obese mothers have an SSI rate of 6.86% while healthy weight mothers have an SSI rate of 2.13%. Younger mothers <20 had an SSI rate of 6.38%, and those between 20 and 24 had an SSI rate of 5.42%. The SSI rate continues to decrease for mothers aged 25-29 (4.83%) and again to those aged 30-34 (3.36%) but then increases for those aged 35-39 (4.06%) and over 40 (5.41%). It should be noted that the <20 and >40 age groups are the smallest. A significant relationship was identified between age group and SSI risk ($p<0.05$), which was not observed in 2021.

Since 2015, Public Health Wales has been monitoring the use of staples in post procedure closure. There is only a small number of procedures where staples are used, with the majority being used in mothers with a BMI above 30. The SSI rate when staples are used is lower than when all types of sutures are used for all mothers and when only focusing on those with a BMI over 30. It is important to note that due to the small number of procedures where staples are used, the trends show no significant relationship between SSI rate and use of staples or sutures for all BMIs ($p=0.74239$) and BMI>30 ($p=0.45782$). The data over recent years indicates a positive shift towards the use of dissolvable sutures rather than removable sutures and staples and we continue to ***recommend that staples are not used as a routine method of closure.***

For procedures where timing of antibiotic prophylaxis was recorded, 99.4% of mothers in Wales were given antibiotic prophylaxis for their procedure, with 97.4% having it administered prior to incision. In comparison to previous years, the SSI rate was higher where antibiotics were administered prior to incision, which was not significant ($p=0.29307$). There are a small number of procedures where prophylactic antibiotics are not given (n=42) but in recent years, hospitals appear to be adopting the

recommendations in line with NICE and AWMSG and administering prophylactic antibiotics during the procedures. The overall number of procedures where antibiotics were given prior to incision appears to have decreased but there were 439 procedures where no data is given for the antibiotic prophylaxis in 2022 compared to only 175 unknowns in 2021.

The number of deep infections has decreased compared to previous years, with deep SSIs making up 13.67% of all infections (n=41), organ space SSIs remain rare, with 0 organ space infections reported in 2022.

A strong association was seen between time spent in hospital and the occurrence of an SSI in 2022 ($P<0.05$). The mean hospital stay following the procedure was 2.3 days and increased to 2.9 days when only mothers who have had an SSI were included. There is a higher SSI rate where length of hospital stay was 10-14 days (14.00%).

The microbiological results provided for procedures where an SSI was diagnosed were analysed according to their organism. The most common swab result was 'Mixed culture' (19.8%) which makes it difficult to attribute the infection to a particular organism. Avoiding recording swab results as 'Mixed culture' has been encouraged by the surveillance team going forward, to allow for further analysis of the causative organism. The second most common infection was *Staphylococcus aureus* (flucloxacillin sensitive) (18.5%), followed by *Enterococcus* sp (7.1%) and *Escherichia coli* (7.1%).

Data missingness for details of the surgical procedure and post-procedure increased in 2022, resulting in larger proportions of unknowns in the figures. Missing information can make it difficult to identify a significant relationship between a potential risk factor and the outcome. We encourage as much information as possible to be completed when capturing and submitting the data.

In conclusion, there was an increase in SSI rate in 2022 compared to 2021, (4.22% from 3.71%), this is a 21% reduction in infection numbers from 2012. Health boards in Wales have continued their excellent work in local infection prevention and the introduction of novel interventional methods. Despite still seeing a regular occurrence of SSIs (1 in 24) in mothers post-surgery, these rates are far below those in 2007/2008. Public Health Wales will continue to work together with all hospitals in Wales to strive to continue the progress we have made and reduce infections further.

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