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Caesarean Section Surgical Site Infection Surveillance

2017 Annual Report:

**Appendix D: Cardiff and
Vale UHB**

Includes data from 01/01/2017 – 31/12/2017

Version 1

Issued: 31/07/2018

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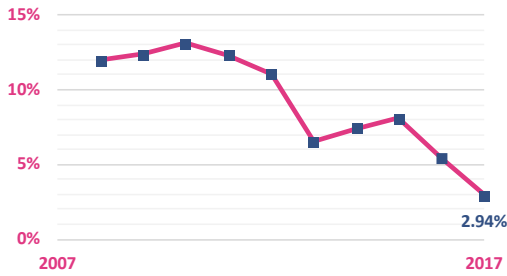
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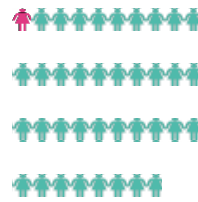
Summary

NOTE: The information in this annual report may differ from that found in the quarterly report due to delays in data arriving at Public Health Wales and amendments being made following the publication of the quarterly reports.

SSI rate

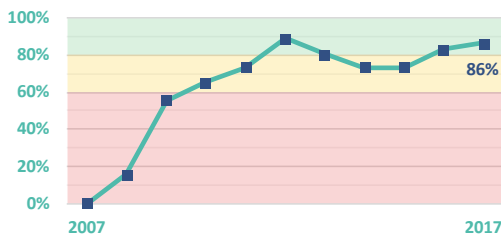


1 in 38 mothers had an SSI attributable to their C section procedure

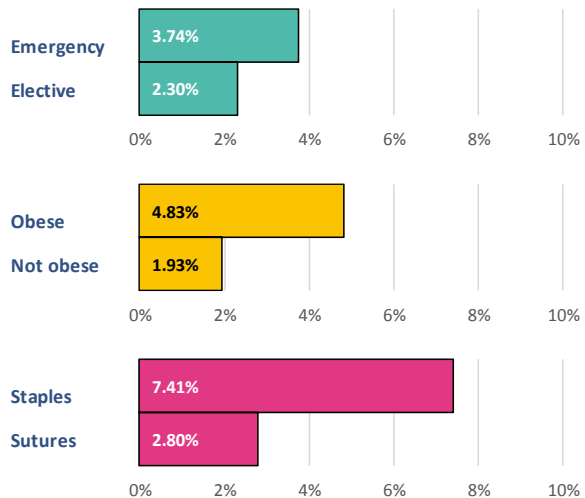


75% reduction in SSI rate since 2008, which equates to **651** infections prevented (based on 2008 rates)

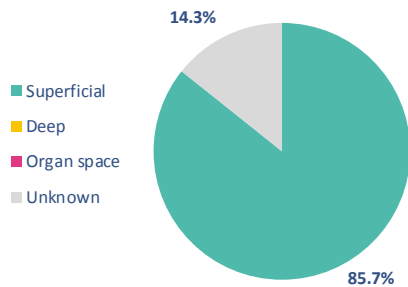
Compliance



Risk factors



Infection type



1229 procedures were performed in 2017 and forms were completed for 90% of these procedures (n=1108). Of these forms, 96% were valid forms that could be used for analysis (n=1063).

There were 28 SSIs reported in 2017, which equates to an SSI rate of 2.9%. 0 of these were complicated infections (deep or organ space), approximately 0% of all infections.

43% of procedures performed in 2017 were emergencies. The SSI rate in emergency procedures was not significantly higher than elective procedures.

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.

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

A valid procedure is one where an SSI is recorded, or one where there is confirmation of no SSI on both inpatient and post-discharge forms. "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

Following a drop between 2013 and 2015, compliance in this health board has increased. In 2017, the total forms received was 90%, with 86% of procedures having valid forms. This means the health board continues to have high compliance.

The peak between 2010 and 2013 could be artificially inflated as there were issues at the time with the PEDW dataset, and some hospitals reporting more procedures to us than existed in the PEDW dataset, which indicated that there were coding issues at the hospital.

Table 1 – Coverage of the C section SSI surveillance compared to the expected number of forms.

	2015	2016	2017
Expected number of forms*	1251	1303	1229
Surveillance forms returned	925	1108	1108
Valid surveillance forms	916	1081	1063
Forms returned	74%	85%	90%
Valid forms returned	73%	83%	86%

*Total number of procedures performed at hospital, irrespective of whether or not a form was received.

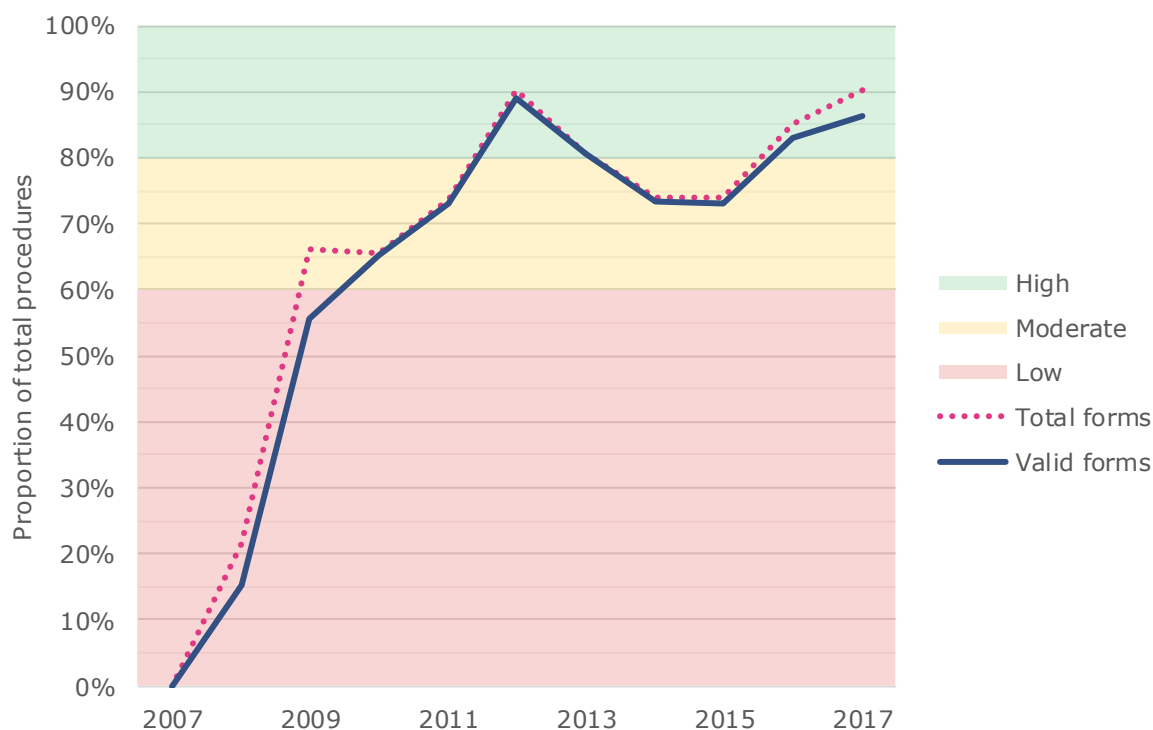


Figure 1 – Trend rate for compliance 2007-2017

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 1029 of forms having a completed SSI field (of 1108 forms, 92.9%). Following on from these inpatient forms, 84.5% of post-discharge forms were received (936/1108) with the remaining 15.5% either not sent in at all, or being sent in blank. Of the post discharge forms that were sent in, 98.4% 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. 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.

Table 2 – Completion rates of the SSI field (along with its associated type and infection date fields).

Data Item	Expected	Completed	Proportion
Inpatient SSI (Yes/No)	1108	1029	92.9%
If yes, SSI type	3	2	66.7%
If yes, infection date	3	3	100.0%
Post-discharge SSI* (Yes/No)	936	921	98.4%
If yes, SSI type	49	45	91.8%
If yes, infection date	49	42	85.7%

Section 2: SSI rate

Incidence of inpatient, post-discharge and overall SSI

The following table provides the SSI rates separated out as an inpatient and a post-discharge rate. A total of two inpatient SSIs were recorded, giving an inpatient SSI rate of 0.21%. The vast majority of SSIs (93%) occurred following hospital discharge, giving a rate of 2.73%.

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 a result, fewer inpatient SSIs are being identified than previously, and these are instead being picked up in the community.

Table 3 – Incidence of inpatient and post-discharge SSIs.

	No. of procedures	SSI	SSI rate (95% CI)
Inpatient	953	2	0.21% (0.00-0.50)
Post-discharge	953	26	2.73% (1.69-3.76)
Overall	953	28	2.94% (1.87-4.01)

Annual SSI rates

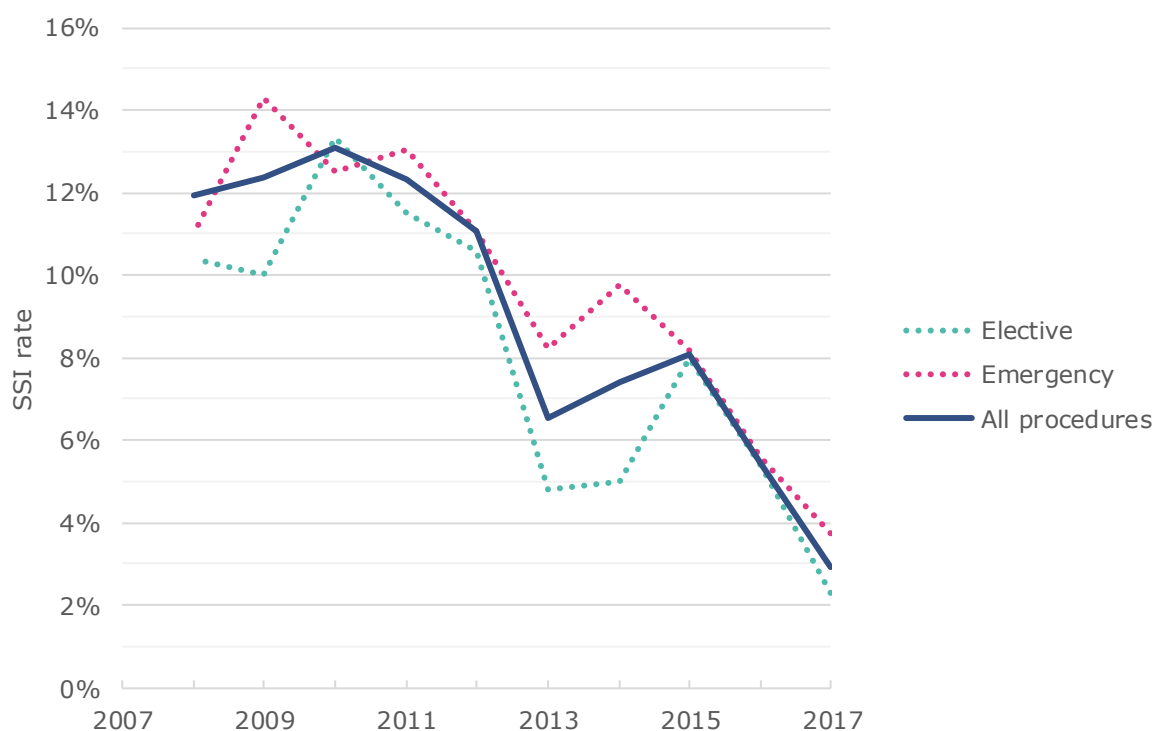


Figure 2 – Overall, elective and emergency SSI rates for 2007-2017

Table 4 – Overall, elective and emergency SSI rates for the last five years. (Unknowns excluded).

Operation type	Year	No. of procedures	SSI	SSI rate (95% CI)
All C-section procedures	2017	953	28	2.94% (1.87-4.01)
	2016	1067	58	5.44% (4.08-6.80)
	2015	916	74	8.08% (6.31-9.84)
	2014	849	63	7.42% (5.66-9.18)
	2013	995	65	6.53% (5.00-8.07)
Elective	2017	522	12	2.30% (1.01-3.58)
	2016	539	29	5.38% (3.48-7.29)
	2015	502	40	7.97% (5.60-10.34)
	2014	421	21	4.99% (2.91-7.07)
	2013	479	23	4.80% (2.89-6.72)
Emergency	2017	401	15	3.74% (1.88-5.60)
	2016	503	28	5.57% (3.56-7.57)
	2015	403	33	8.19% (5.51-10.87)
	2014	420	41	9.76% (6.92-12.60)
	2013	498	41	8.23% (5.82-10.65)

The SSI rate at the health board decreased this year and this follows the general downward trend in rates that has occurred since the health board joined the surveillance scheme back in 2008 (except for a brief period of increase in 2014 and 2015). The SSI rate back in 2008 was 11.95% and, when using this rate as a baseline, there has been a reduction of 75% in the years following. This represents an estimated 651 mothers who have been saved from an infection.

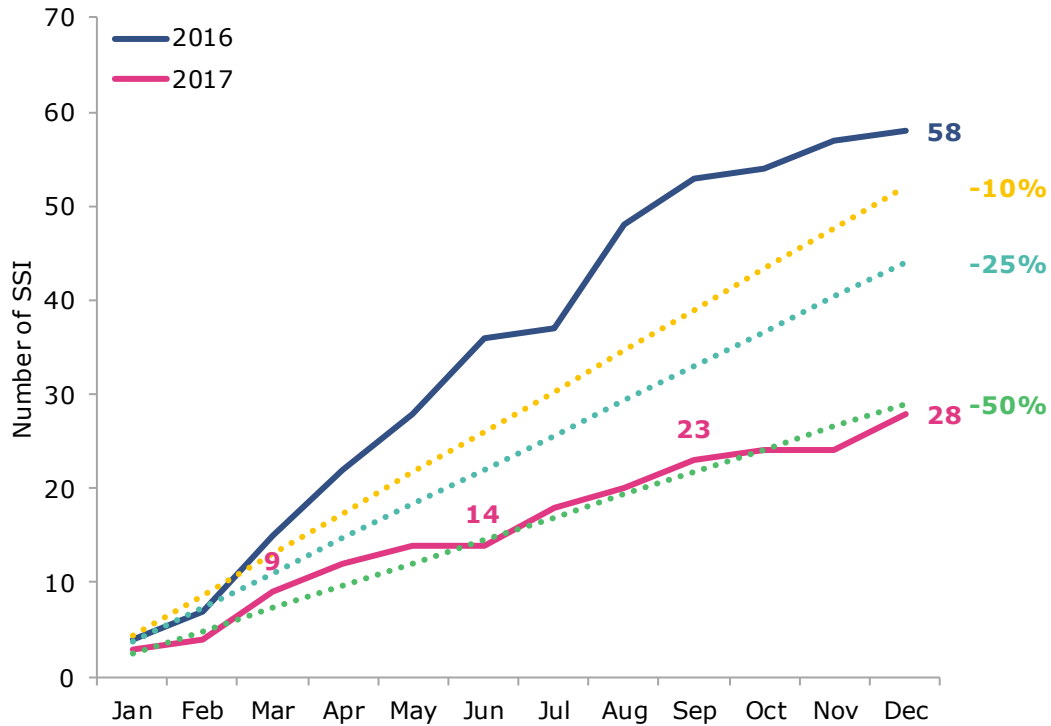


Figure 3 – Cumulative SSI number for the year, and their relative change compared to the previous year.

Throughout the health board, there were 28 SSIs reported in 2017. When compared to the previous year’s 58 SSIs, this is a reduction of 52% in raw SSI numbers (i.e. without factoring in the denominator) and means there were 30 fewer infections in 2017 than in 2016.

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.

SSI type	n	%
Superficial infection	24	85.7%
Deep infection	0	0.0%
Organ space infection	0	0.0%
Unknown	4	14.3%

Table 6 – SSI rates broken down by type.

SSI type	No. of procedures	SSI	SSI rate (95% CI)
Superficial infection	953	24	2.52% (1.52-3.51)
Deep infection	953	0	0.00% (0.00-0.00)
Organ space infection	953	0	0.00% (0.00-0.00)
Unknown	953	4	0.42% (0.01-0.83)

In 2017, the health board only reported superficial infections, with no deep or organ space infections.

Section 3: Demographics

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

Incidence of SSI by age

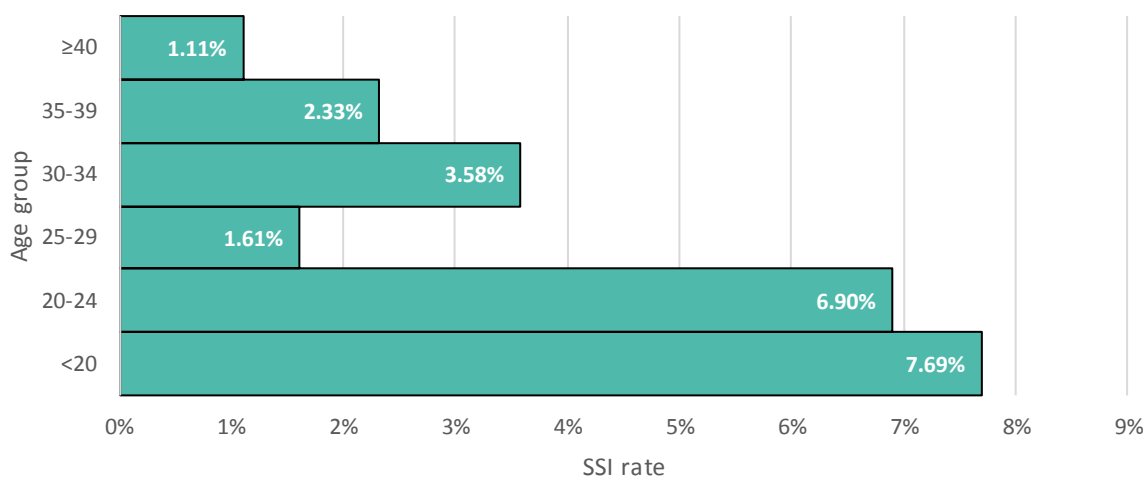


Figure 4 – Graph showing the incidence of SSI by age group.

Table 7 – Incidence of SSI by age group

Age group	No. of procedures	SSI	SSI rate (95% CI)
<20	13	1	7.69% (0.19-36.03)
20-24	87	6	6.90% (2.57-14.41)
25-29	186	3	1.61% (0.33-4.64)
30-34	307	11	3.58% (1.80-6.32)
35-39	258	6	2.33% (0.86-4.99)
≥40	90	1	1.11% (0.03-6.04)
Unknown	12	0	0.00% (0.00-26.46)

In 2017, there was a substantially higher SSI rate in younger women. There appears to be a trend where the SSI rate reduces with age, with a mean age of 32.3 in the sample group (median 33), but a lower mean age of 30.7 when an SSI has occurred (median 32.5). This trend is not significant at the health board level (P=0.152).

Incidence of SSI by BMI

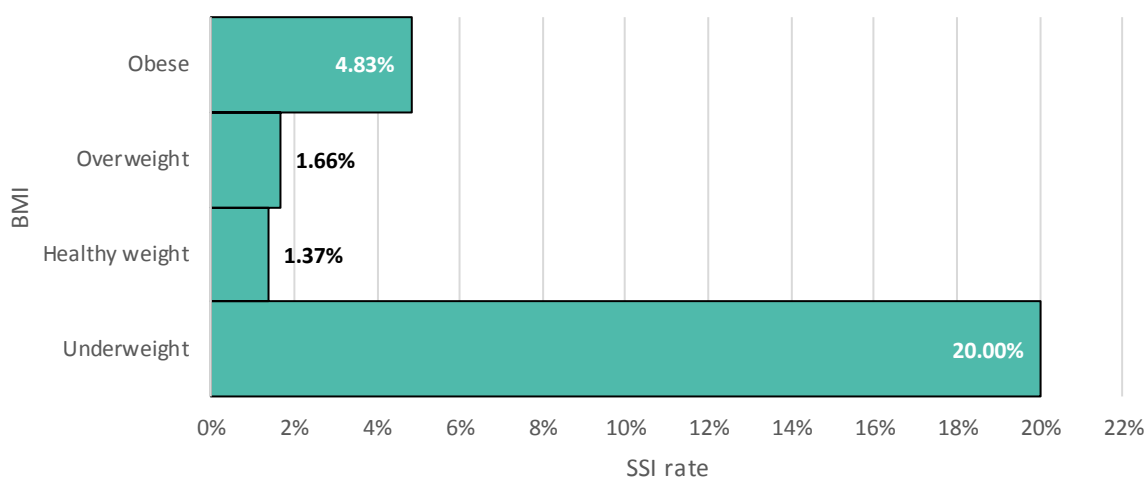


Figure 5 – Graph showing the incidence of SSI by BMI category.

Table 8 – Incidence of SSI by BMI category.

BMI	No. of procedures	SSI	SSI rate (95% CI)
Underweight	<18.5	15	20.00% (4.33-48.09)
Healthy weight	18.5-24.9	292	1.37% (0.37-3.47)
Overweight	25.0-29.9	301	1.66% (0.54-3.83)
Obese	≥30.0	331	4.83% (2.79-7.73)
Unknown		14	0.00% (0.00-23.16)

In 2017, the trend in terms of BMI is less clear at the health board level than the Wales level: The mean BMI in the sample group is 28.6 (median 27), with a higher BMI of 29.9 when an SSI has occurred (median 31.5). This trend is not significant ($P=0.354$). The SSI rates in obese patient (compared to all other groups) and underweight patients are significantly higher ($P=0.014$ and $P<0.001$, respectively).

Incidence of SSI by number of previous C sections

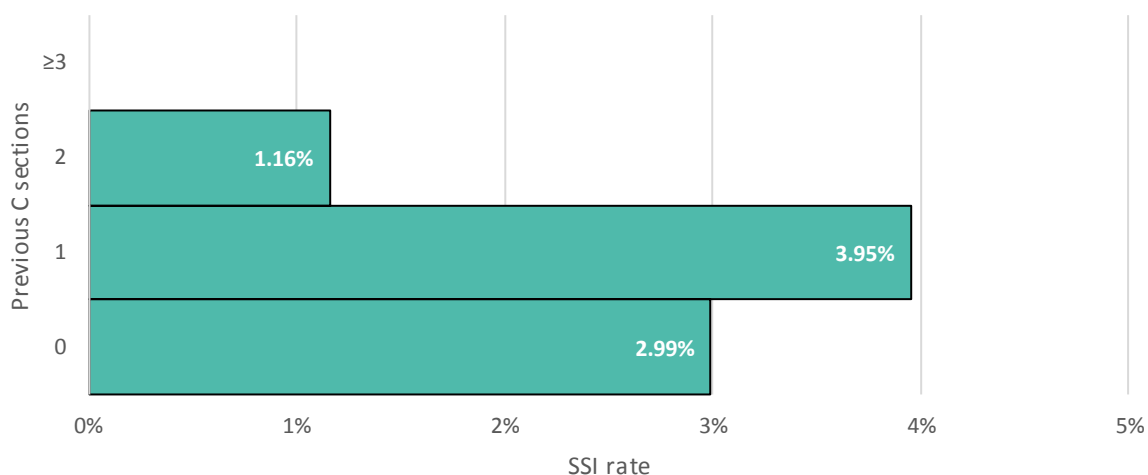


Figure 6 – Graph showing incidence of SSI by the number of previous C sections.

Table 9 – Incidence of SSI by the number of previous C sections.

Previous C sections	No. of procedures	SSI	SSI rate (95% CI)
0	568	17	2.99% (1.75-4.75)
1	253	10	3.95% (1.91-7.15)
2	86	1	1.16% (0.03-6.31)
≥3	32	0	0.00% (0.00-10.89)
Unknown	14	0	0.00% (0.00-23.16)

The SSI rate in mothers who have previously had two or more C sections is lower, however, the small sample sizes and wide confidence intervals indicate that this is not a significant trend.

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).

SSI risk score

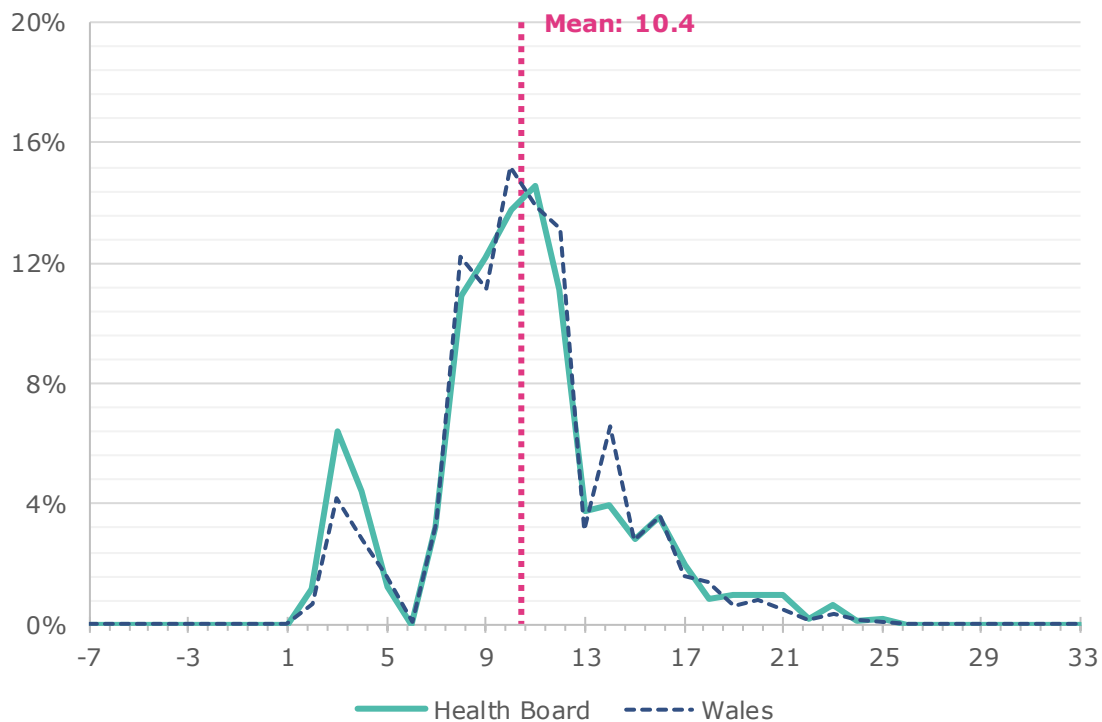


Figure 7 – Graph showing spread of risk score across all procedures (as percentage of all procedures reported). The score has a theoretical range of -7 to 33 for C section procedures in Wales.

The SSI risk score [1] is based on a number of different factors; including procedure type, wound type, ASA class, BMI and procedure duration¹. This yields a score that categorises mothers by their risk of developing an SSI (with higher scores equating to higher risk).

In 2017, the mean risk score for all mothers undergoing C section at the health board was 10.4 (median 10). When counting only those who have developed an SSI, the mean risk score increases to 12.1 (median 11), which means that mothers who developed an SSI had a significantly higher aggregate risk score than those who did not ($P=0.017$). The risk profile of the health board was slightly lower than the Wales mean (10.6, median 10).

¹ There are additional metrics used in the calculation of this score which we are unable to use since they are not reported as part of our surveillance. These are the number of concurrent procedures, type of anaesthetic, smoking status, presence of metastatic cancer or peripheral vascular disease, and use of steroids.

Incidence of SSI by procedure type

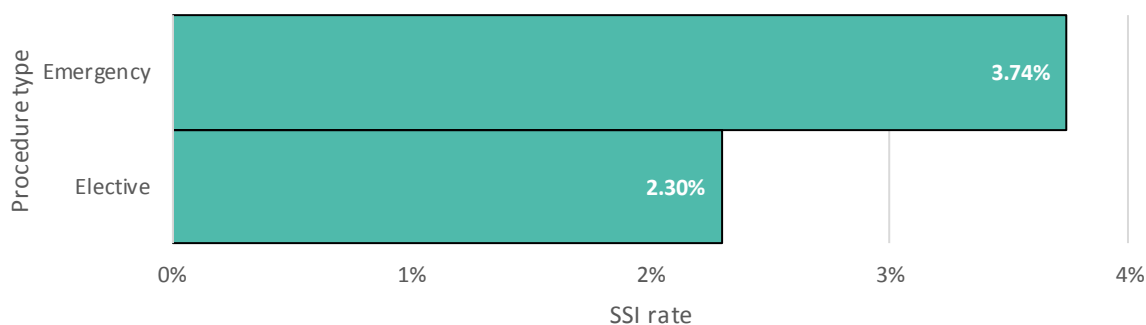


Figure 8 – Graph showing incidence of SSI by type of procedure.

Table 10 – Incidence of SSI by procedure type.

Age group	No. of procedures	SSI	SSI rate (95% CI)
Elective	522	12	2.30% (1.19-3.98)
Emergency	401	15	3.74% (2.11-6.09)
Unknown	30	1	3.33% (0.08-17.22)

In 2017, the SSI rate in emergency procedures was higher than in elective procedures, but not significantly so (63% increase, $P=0.198$). The split of procedures is weighted in favour of elective procedures, with 56.6% of procedures being classed as elective (CS4) and the remaining 43.4% classed as emergencies (CS1, CS2 and CS3). This is in contrast to Wales as a whole, where emergencies are more common.

Incidence of SSI by antibiotic prophylaxis

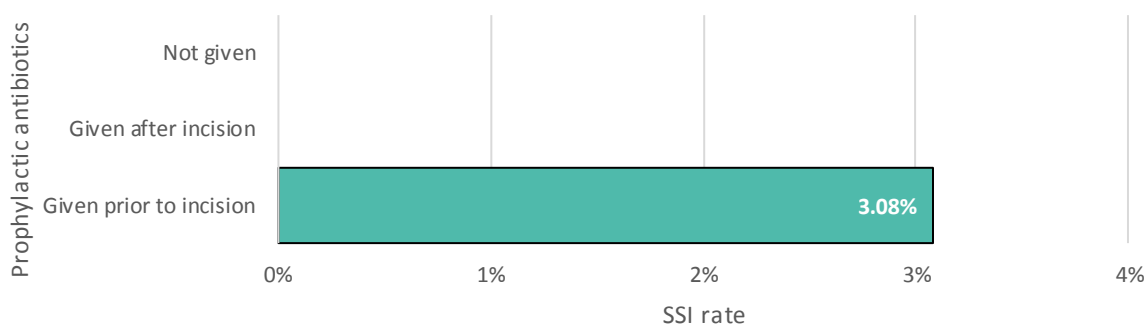


Figure 9 – Graph showing incidence of SSI by timing of prophylactic antibiotics.

Table 11 – Incidence of SSI by timing of prophylactic antibiotics.

Prophylactic antibiotics	No. of procedures	SSI	SSI rate (95% CI)
Given prior to incision	876	27	3.08% (2.04-4.45)
Given after incision	6	0	0.00% (0.00-45.93)
Not given	6	0	0.00% (0.00-45.93)
Unknown	65	1	1.54% (0.04-8.28)

99.3% of mothers were given prophylactic antibiotics and, of these, 99.3% were given prior to surgical incision. The number of patients given antibiotics after incision (or not at all) was so low that it is not possible to determine any trends from it.

We continue to recommend that antibiotics are administered prior to incision where possible, in accordance with NICE guidelines [2]. 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

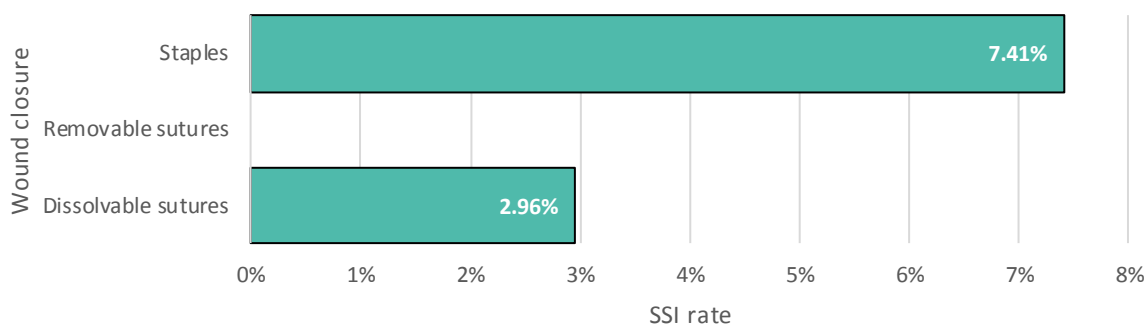


Figure 10 – Graph showing incidence of SSI by type of skin closure used.

Table 12 – Incidence of SSI by type of skin closure.

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	856	24	2.80% (1.70-3.91)
Dissolvable sutures	812	24	2.96% (1.90-4.37)
Removable sutures	44	0	0.00% (0.00-8.04)
Staples	54	4	7.41% (2.06-17.89)
Unknown	43	0	0.00% (0.00-8.22)

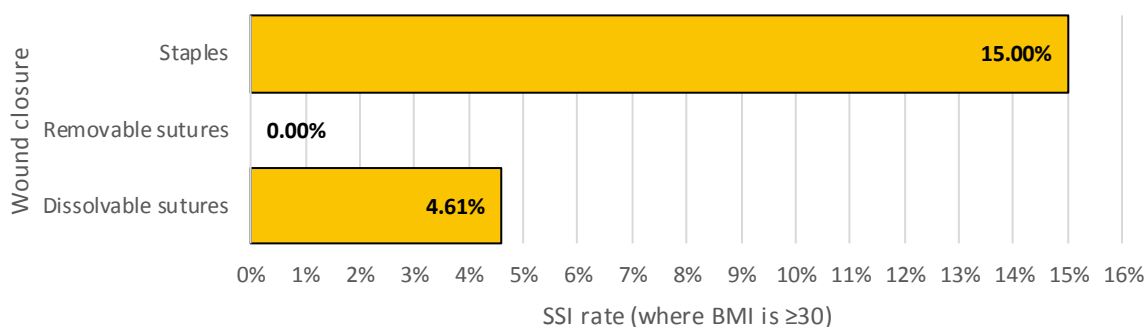


Figure 11 – Graph showing the incidence of SSI by skin closure in mothers with BMI ≥ 30.

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

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	299	13	4.35% (2.04-6.66)
Dissolvable sutures	282	13	4.61% (2.48-7.75)
Removable sutures	17	0	0.00% (0.00-19.51)
Staples	20	3	15.00% (3.21-37.89)
Unknown	12	0	0.00% (0.00-26.46)

In 2017, the SSI rate when staples were used as a method of skin closure was 164% higher than when sutures were used, but this was not significant. ($p=0.058$). When only obese patients are included, this becomes a significant increase of 245% ($P=0.035$).

Section 5: 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

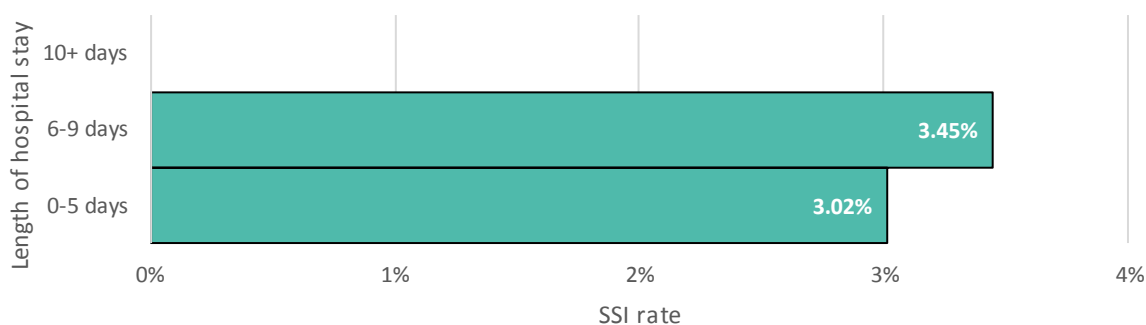


Figure 12 – Graph showing incidence of SSI by length of hospital stay.

Table 14 – Incidence of SSI by length of hospital stay.

Length of hospital stay	No. of procedures	SSI	SSI rate (95% CI)
0-5 days	696	21	3.02% (1.88-4.58)
6-9 days	116	4	3.45% (0.95-8.59)
10+ days	42	0	0.00% (0.00-8.41)
Unknown	99	3	3.03% (0.63-8.60)

For all patients undergoing a C section, the mean hospital stay following the procedure is 4.3 days (median of 2). When only mothers who have had an SSI are included, this was lower at a mean of 2.6 days (median 2). This trend was not significant (P=0.437).

Length of midwifery care

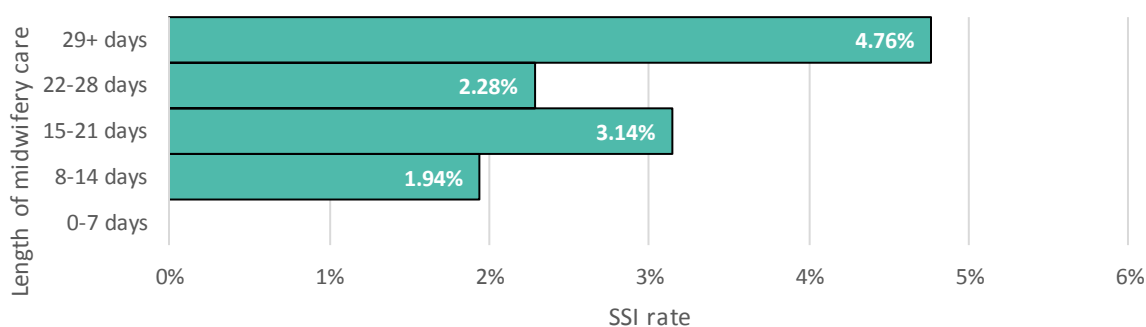


Figure 13 – Graph showing incidence of SSI by length of midwifery care post-procedure.

Table 15 – Incidence of SSI by length of midwifery care post-procedure.

Length of midwifery care	No. of procedures	SSI	SSI rate (95% CI)
0-7 days	40	0	0.00% (0.00-8.81)
8-14 days	103	2	1.94% (0.24-6.84)
15-21 days	350	11	3.14% (1.58-5.55)
22-28 days	219	5	2.28% (0.75-5.25)
29+ days	84	4	4.76% (1.31-11.75)
Unknown	157	6	3.82% (1.42-8.13)

NOTE: All SSIs in this report occurred in the first 14 days post-procedure. Even in mothers who spent 29 or more days in care, the SSI rate does not include any SSIs occurring day 15 or later.

Following the procedure, women spend a mean length of 20.4 days under the care of a midwife (median of 20), including both the time spent in the hospital and the time spent at home with regular visits from a community midwife. If there has been an SSI, this rises to a mean of 23.7 days (median of 21) indicating that SSIs are causing women to be under midwifery care for longer than they would be otherwise. At the health board level, this trend was not significant (P=0.064).

Time to onset of infection

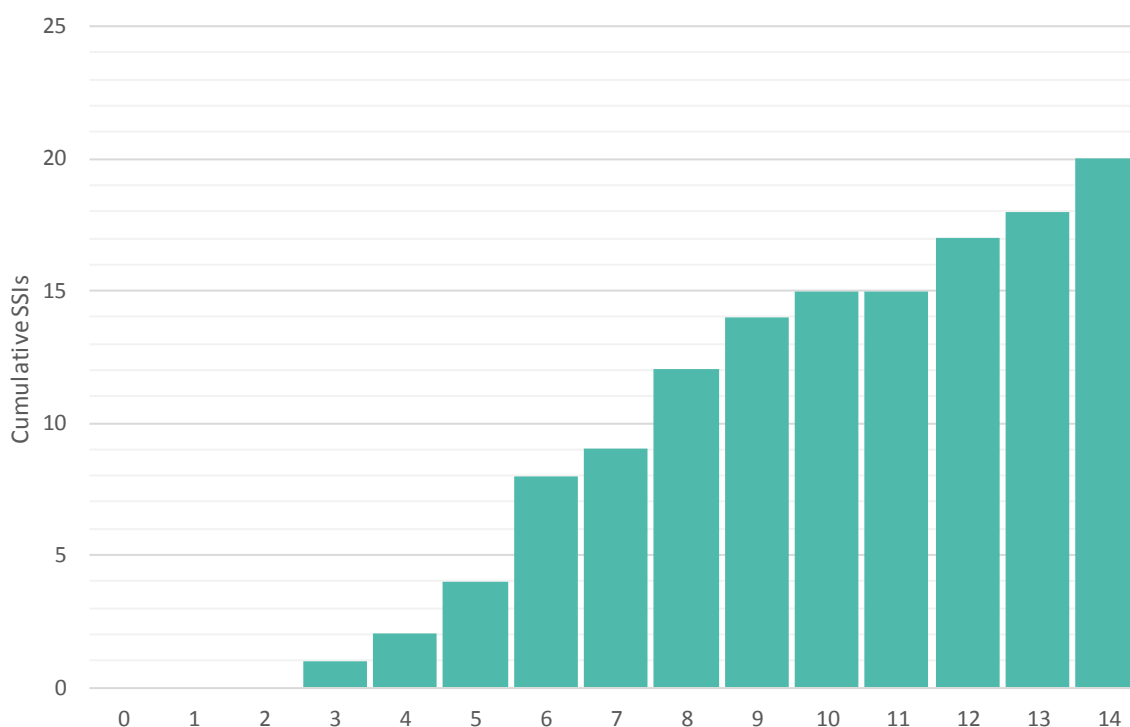


Figure 14 – Graph showing cumulative SSIs up to 14 days post-procedure. Blank infection dates excluded.

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. Despite this, we do request that hospitals continue reporting up to 30 days as normal, as infections occurring on days 15-30 are still counted and reported to the European Centre for Disease Prevention and Control (ECDC).

Any SSIs reported without an infection date are counted as occurring on day 0 and are included in the SSI rates. There were 8 (29%) infections where the date of onset was not recorded. Within the first 14 days, the mean time to infection was 8.3 days, with a median of 8. The greatest number of infections were reported on day 6 (n=4).

References

1. van Walraven C, Musselman R. The Surgical Site Infection Risk Score (SSIRS): A Model to Predict the Risk of Surgical Site Infections. PLoS One. 2013; 8(6): p. e67167.
2. National Institute for Health and Care Excellence. Surgical site infections: prevention and treatment. [Online].; 2017 [cited 2018 June 1. Available from: <https://www.nice.org.uk/guidance/CG74/chapter/1-Guidance>.