



2019 NHSN Annual Training: Surgical Site Infections Group Exercise SSI Surveillance and Analysis

Jennifer Watkins
NHSN Protocol and Validation Team
Rebecca Yvonne Konnor
NHSN Methods and Analytics Team
Division of Healthcare Quality Promotion, CDC

SSI Group Exercise Scenario

- You will need to refer to the SSI Group Exercise Scenario in order to answer the questions
- In-person participants:
 - Please refer to the SSI Surveillance and Analysis Group Exercise in your Resource Manual
- Web-streaming participants:
 - Please download the slides for this presentation at <https://www.cdc.gov/nhsn/training/annualtraining/index.html>

SSI Protocol Case Scenario

Jennifer Watkins

Scenario Part 1

■ On 12/20/2018

- 30-year-old male admitted to the ED of an acute care hospital with 500 beds that is affiliated to the graduate medical school, following a motor vehicle accident.
- A CT of the abdomen/pelvis reported a moderate hemoperitoneum.
- Since the patient was hemodynamically stable, he was admitted to the inpatient unit for monitoring.
- Shortly after arriving to the unit, the patient became hemodynamically unstable and was rushed to the OR for an exploration of the abdomen.

Scenario Part 1, Continued

- **On 12/20/2018**
 - Procedures performed:
 - Splenectomy
 - Repair liver laceration
 - Colon resection with primary anastomosis
 - Drainage of abdominal wall hematoma
- **On 12/30/2018** – Patient is discharged home.

Scenario Part 1, Continued: *From the Operative Report:*

- Following the induction of general anesthesia, a laparotomy incision was carried down through the subcutaneous tissues to the midline fascia.
- Upon opening the fascia, a large abdominal wall hematoma was encountered. The peritoneum was entered and immediately encountered a couple hundred mLs of blood and fecal spillage.
- Prior to completion of the case, drains were placed into the right and left upper quadrants through separate stab incisions.
- The midline fascia was closed with a running suture. Subcutaneous tissues were irrigated and the skin was closed with staples.
- Based on the details of the procedure, the ICD-10-PCS codes mapped as NHSN COLO, SPLE, and BILL operative procedures.

Scenario Part 1, Continued: Denominator Details

- When you are filling out the Denominator for Procedure form, you locate the following procedure details in the medical record:
 - Wound class: CO
 - Height: 6 ft. 0 in.
 - Weight: 180 lbs.
 - ASA score: 2E
 - Procedure start: 12/20 at 0430
 - Procedure finish: 12/20 at 0700 (total procedure duration: 2 hours, 30 minutes)
 - No diagnosis of Diabetes

Question 1: (Scenario Part 1) Your hospital follows COLO and BILLI procedures in your monthly reporting plan. What procedures are you required to enter into NHSN?

- A. COLO
- B. COLO and BILLI
- C. COLO, BILLI, and SPLE

Rationale: NHSN only requires you to enter procedures included in the operative procedure categories that you have indicated you monitor on your monthly reporting plan. (Denominator Reporting Instruction #3)

Question 2: (Scenario Part 1) What does Trauma equal in this scenario?

A. Trauma = Yes

B. Trauma = No

Rationale: Blunt force injury occurred prior to the start of the operative procedure, and was the reason for performing the surgery (immediate trauma).

Question 3: (Scenario Part 1) What does Emergency equal in this scenario?

- A. ✓ Emergency = Yes
- B. Emergency = No

Rationale: You will select “Yes” if the procedure is documented per your facility’s protocol to be an emergency.

- In this scenario, the facility considers the “E” designation in the ASA score to denote an emergency operative procedure. (ASA = 2E)

Question 4: (Scenario Part 1) How is the procedure duration reported for each of the NHSN operative procedures (COLO, BILLI, SPLE)?

- A. Try to determine the exact duration for each separate procedure
- B. Split the total procedure duration evenly among the 3 procedures and report 1/3 of the time for each procedure
- ✓ C. Report the total procedure duration for each procedure

Rationale: If more than one NHSN operative procedure category is performed through the same incision during the same trip to the OR, report the combined duration of all procedures. (Denominator Reporting Instruction #4)

Scenario Part 2

- **On 1/5/2019**
 - Patient admitted to a different acute care hospital with abdominal pain and distension.
 - The patient is nauseous, diaphoretic, febrile (T=38.3°C), and hypotensive on arrival.
 - A CT of the abdomen/pelvis reports multiple fluid collections throughout the abdomen, which are suspicious for early abscess formation.

- **On 1/5/2019**
 - Patient taken to the OR for a re-exploration of the abdomen under general anesthesia.
 - Procedures performed:
 - Exploratory laparotomy
 - Colon re-anastomosis
 - Abdominal washout
 - Drain placement

Scenario Part 2, Continued: [From the Operative Report:](#)

- The abdomen was entered through the prior midline incision.
- Upon entering the abdominal cavity a large amount of murky fluid consistent with peritonitis was encountered. The abdominal fluid was aspirated and sent for culture.
- The abdomen was explored and evidence of breakdown was found at the prior colon anastomosis site, which was repaired. The abdomen was copiously irrigated and suctioned. JP drain placed.
- Due to concern for post-operative edema, the surgeon elected to leave the fascial layer of the incision open and loosely approximate the superficial (skin) layer of the incision with intermittent staples, with wound packing placed between staples.
- Based on the details of the procedure, the ICD-10-PCS codes map as an NSHN COLO procedure.
- The abdominal fluid culture resulted positive for *E. coli* and *E. faecium*.

Scenario Part 2, Continued: Denominator Details

When you are filling out the Denominator for Procedure form, you locate the following procedure details in the medical record:

- Wound class = CC
- ASA score = 2
- Height = 6 ft. 0 in.
- Weight = 200 lbs.
- Procedure start = 1/15 at 1210
- Procedure finish = 1/15 at 1320 (total procedure duration: 1 hour, 10 minutes)
- No diagnosis of Diabetes

Question 5: (Scenario Part 2) The wound class was reported as CC – clean contaminated. Based on the operative procedure details, the IP thinks a higher wound class should be entered into NHSN. What wound class should the IP enter?

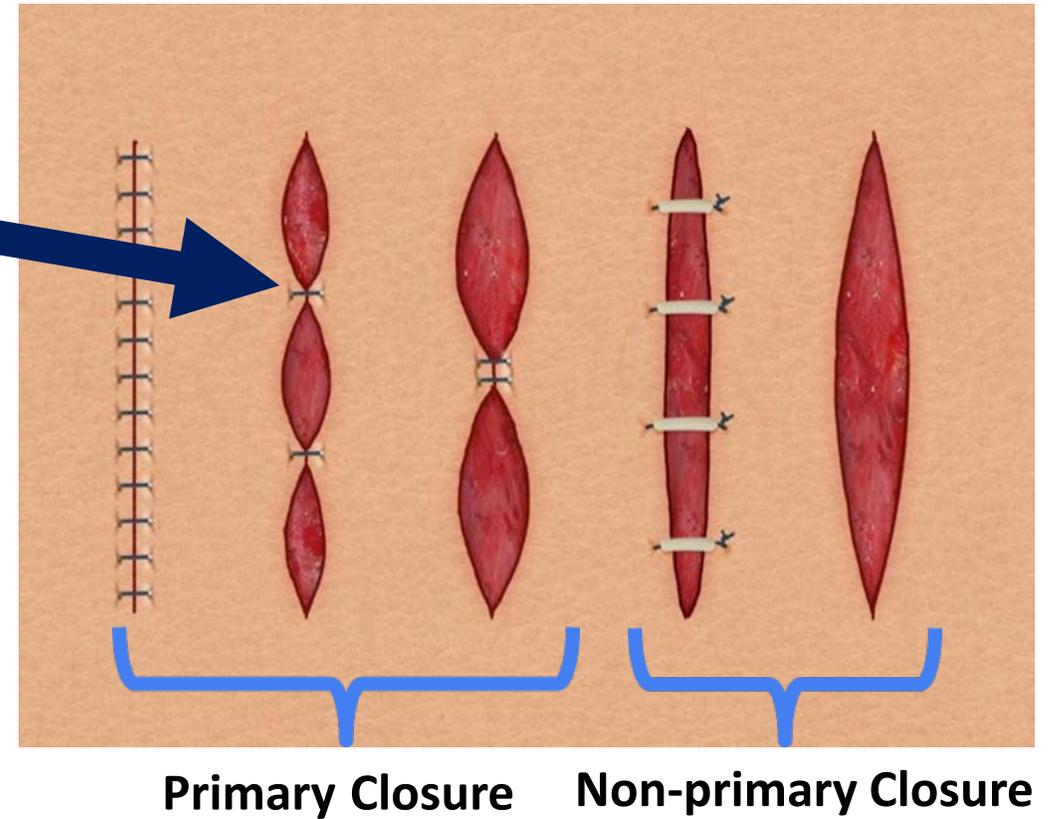
- A.** ✓ The IP should enter CC – Clean-contaminated
- B.** The IP should enter the wound class that they think is correct based on the details of the operative report
- C.** The IP should leave the wound class field blank

Rationale: Wound class should be documented by someone who is part of the surgical team, based on the findings of each specific case according to the wound class schema that they have adapted within their organization.

Question 6: (Scenario Part 2) Is this procedure primarily closed?

- ✓ A. Yes
- B. No

Rationale: If any portion of the incision is closed at the skin level by any manner, a designation of primary closure should be assigned to the procedure.

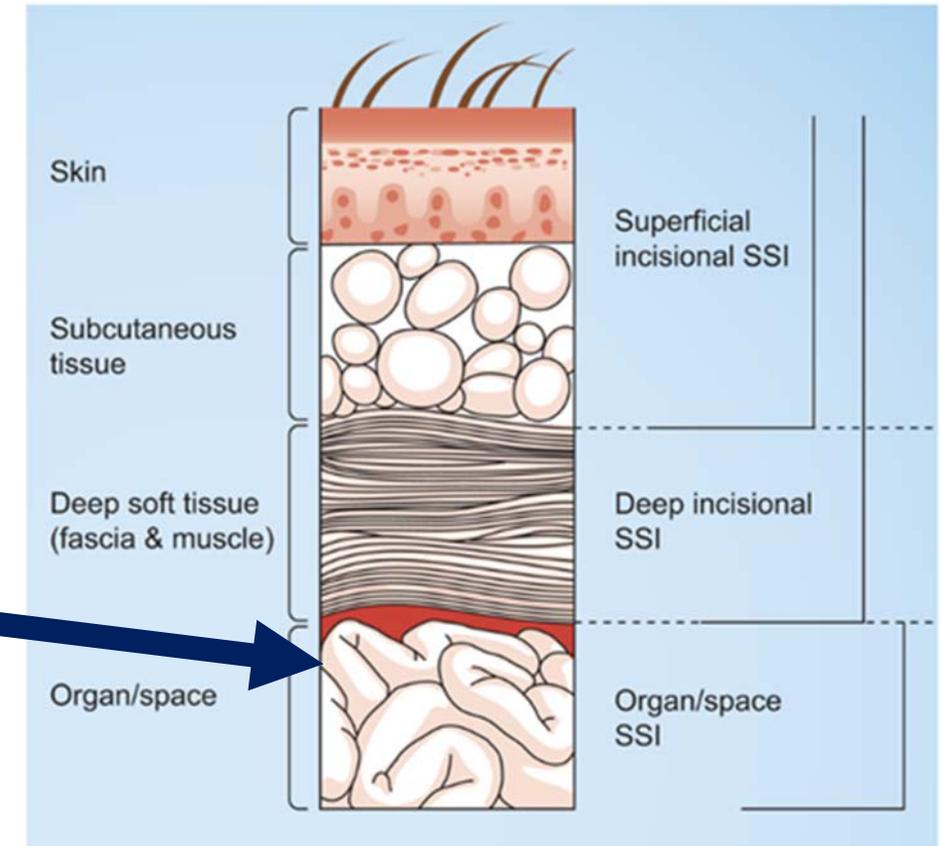


Question 7: What SSI criteria would be most appropriate to apply?

- A. Not an SSI
- B. Organ/space SSI – IAB
- C. Organ/space SSI – OREP
- D. Deep incisional SSI

Rationale:

- Organisms were identified from fluid from the **general intraabdominal space**
- Based on this, you would apply **O/S SSI criteria** and **IAB criteria** to the infection



Question 8: Which procedure is the SSI attributed to?

- A ✓ 12/20 COLO
- B. 12/20 BILI
- C. 12/20 SPLE
- D. 1/5 COLO

Rationale:

- COLO, BILI, and SPLE procedures performed
- Source of the SSI is not apparent
- Refer to **Table 4** to select the operative procedure to which the SSI should be attributed
- COLO is the procedure with the highest risk
- Assign the SSI to the **COLO procedure**
- (SSI Reporting Instruction #9)

Table 4. NHSN Principal Operative Procedure Category Selection List
(The categories with the highest risk of SSI are listed before those with lower risks.)

Priority	Category	Abdominal Operative Procedures
1	LTP	Liver transplant
2	COLO	Colon surgery
3	BILI	Bile duct, liver or pancreatic surgery
4	SB	Small bowel surgery
5	REC	Rectal surgery
6	KTP	Kidney transplant
7	GAST	Gastric surgery
8	AAA	Abdominal aortic aneurysm repair
9	HYST	Abdominal hysterectomy
10	CSEC	Cesarean section
11	XLAP	Laparotomy
12	APPY	Appendix surgery
13	HER	Herniorrhaphy
14	NEPH	Kidney surgery
15	VHYS	Vaginal hysterectomy
16	SPLE	Spleen surgery
17	CHOL	Gall bladder surgery
18	OVRY	Ovarian surgery

Question 9: What would you assign PATOS as?

A. PATOS = Yes

B. PATOS = No

Rationale:

- PATOS = evidence of infection seen during the index operative procedure
- Fresh trauma resulting in a contaminated case does not necessarily meet the PATOS requirement
- 12/20 operative procedure note: no documentation of infection or abscess
- (SSI Event Reporting Instruction #3)

Question 10: Which hospital would report the SSI to NHSN, and what designation would be selected in the “Detected” field on the SSI Event form?

- A. Second hospital, A (during admission)
- B. First hospital, P (post-discharge surveillance)
- C. First hospital, RO (readmission to facility other than where procedure was performed)
- D. Second hospital, RF (readmission to facility where procedure was performed)

Rationale:

- SSIs are reported by the facility that performed the NHSN operative procedure
- For SSI identified on readmission to a different facility, the index facility selects Detected = RO when reporting the SSI
- (SSI Event Reporting Instruction #8)

Question 11: The IP notes that the index operative procedure was performed in December 2018 and the SSI occurred in January 2019. Which SSI surveillance protocol should the IP use to evaluate the SSI?

- A. 2019 protocol
- B. 2018 protocol

Rationale: SSIs will be included in the numerator of an SIR based on the date of procedure, not the date of event. This is because the procedure carries the risk for the infection/SSI. (Refer to Additional Notes about SSI SIRs, SSI Chapter.)

SSI Analysis

Rebecca Yvonne Konnor

Question 1: What is the procedure to event days in the above scenario, between the first procedure and event?

A. 16

B. 17

C. 20

Rationale: Counting the procedure date as Day 1, the number of days between the procedure to the day the event was identified is 17

Question 2: Which of the missing denominator details listed below will result in the exclusion of the procedure from the SSI SIR?

- A. Wound class
- B. Height
- C. Weight
- D. ASA score
- E. Procedure duration
- F. Diabetes
- G. All of the above, regardless of whether it is used in the risk adjustment of the SIR denominator
- H. Any of the above, if it is used in the risk adjustment of the SIR denominator

Question 2: Which of the missing denominator details listed below will result in the exclusion of the procedure from the SSI SIR?

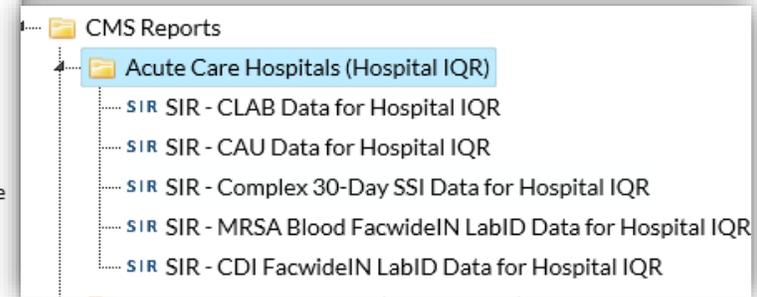
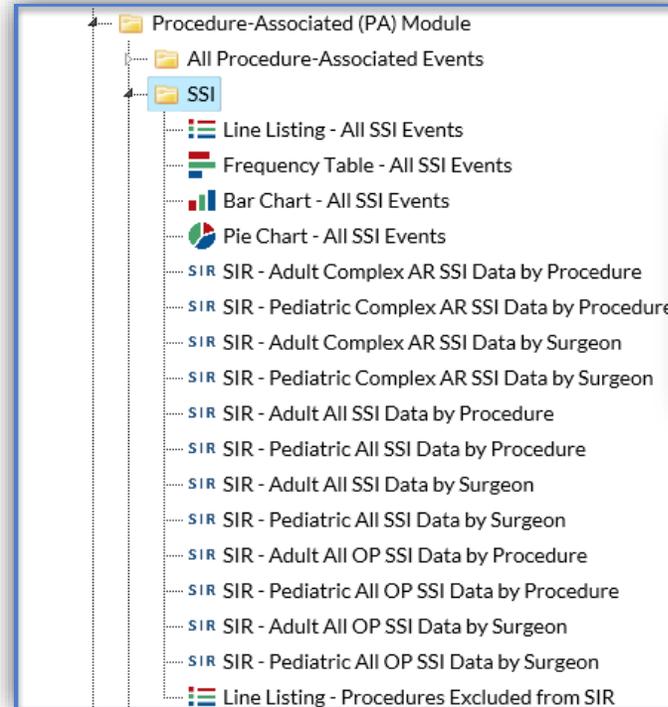
Rationale: Procedures with missing data are excluded from the SSI SIR if the missing data is used in the risk adjustment of the SIR denominator (number of predicted infections).

For example, if duration of labor is missing from C-section procedure record, the procedures will be excluded because duration of labor is used in the risk adjustment of the C-section SSI SIR for both All and Complex AR SSI SIR models.

Note: Although rare, data can be imported into NHSN with missing data. **When this happens, the record will be included in the Incomplete Procedures list under your Alerts screen**

Question 3: Which SSI SIR reports will the first COLO procedure and SSI be included in?

- A. Adult All SSI Data
- B. Pediatric All SSI Data
- C. Adult Complex AR SSI Data
- D. Pediatric Complex AR SSI Data
- E. Complex 30-day (CMS) SSI Data
- F. A and E
- G. None of the above
- H. All of the above

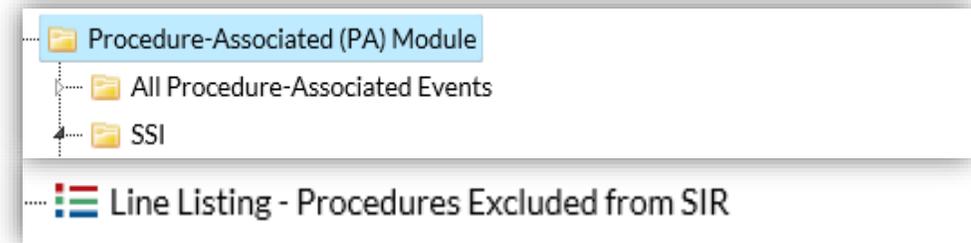
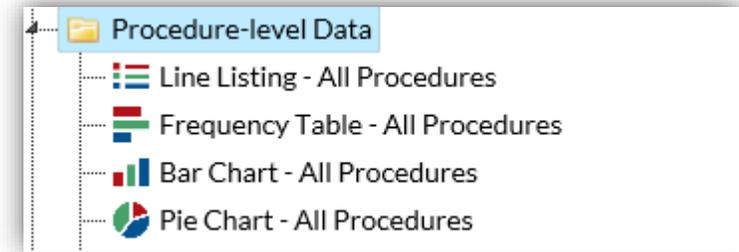


Question 3: Which SSI SIR reports will the first COLO procedure and SSI be included in?

Rationale: The procedure is in an adult so it will be included in the Adult SSI SIR reports. And since the event was detected at a different facility other than where the procedure was performed, this procedure/event will be excluded from the Complex Admission/Readmission report. It will be included in the Adult All SSI SIR and the Complex 30-day SSI SIR reports

Question 4: Which analysis report can you use to gather details on this patient's COLO procedure in a table form?

- A. Line Listing –All Procedures
- B. Frequency Table – All Procedures
- C. Line Listing – Procedures Excluded from SIR
- D. Search the database
- E. Bar or Pie Chart

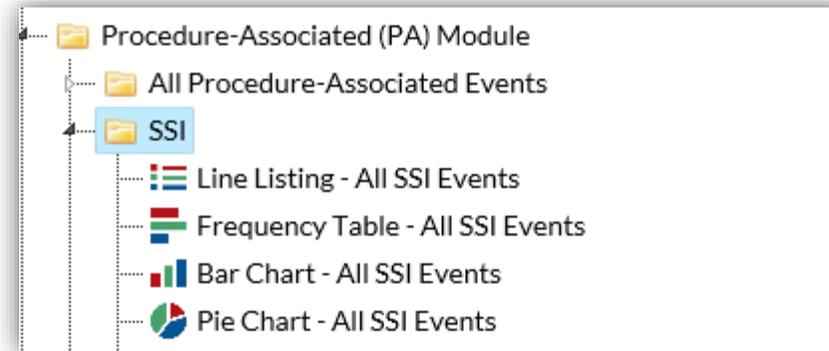


Rationale: The line listing –All procedure report contains all procedures and their corresponding details

The Line Listing – Procedures Excluded from SIR is a subset of the All Procedures report reserved for procedures meeting the universal exclusion criteria

Question 5: Which analysis report can you use to gather details on the SSI event resulting from the patient's COLO procedure?

- A. ✓ Line Listing – All SSI Events
- B. Frequency Table – All SSI Events
- C. Search the database
- D. Bar or Pie Chart



Rationale: The line listing –All SSI Event report contains all SSI events and their corresponding details

Question 6: Are trauma = 'Yes' COLOs excluded from the Complex 30-day SSI SIR calculation, used for CMS Hospital IQR results?

A. Yes

 B. No

Rationale: Procedures reported with trauma = yes are NOT excluded from any of the SSI SIR reports because they are trauma procedures. They are included in the reports (if they meet the inclusion criteria).

BONUS Question: How would the Complex 30-day SSI COLO SIR be impacted if the closure technique had been incorrectly reported as other than primary instead of primary?

- A. The procedure risk for the patient will reduce
- B. The procedure risk for the patient will increase
- C. There would be no impact

Hint: Calculate the Complex 30-day procedure risk for the patient using closure technique as primary and again using closure technique as other than primary to determine which is higher.

BONUS Question: How would the Complex 30-day SSI COLO SIR be impacted if the closure technique had been incorrectly reported as other than primary instead of primary?

- Calculate the two sets of procedure risk for the affected records; one using primary closure vs. closure other than primary and compare the values
- $\text{logit}(\hat{p}) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_i X_i$

Where α = intercept
 β_i = parameter estimate
 X_i = presence of risk factor
 (For these risk factors, if present = 1; if not = 0)

COLO Surgery: Complex 30-day Risk Model to Predict SSI*			
Risk Factor	Parameter Estimate	Patient 1- Scenario 1	Patient 1- Scenario 2
Intercept	-3.6601		
Age10	<u>-0.1396</u>	30	30
Diabetes (Y)	<u>0.0821</u>	No	No
ASA (1,2, 3/4/5)	<u>0.3028</u>	2	2
BMI ≥ 30	<u>0.1259</u>	24.41	24.41
Closure technique: OTH than PRI	<u>0.2383</u>	Primary (PRI)	Other than primary (OTH)
Gender: Male	<u>0.1036</u>	Male	Male
Oncology Hospital=Yes	<u>0.5437</u>	No	No

Bonus Question: Answer: *Scenario 1 using Closure technique = OTH*

- $\text{Logit}(\hat{P}) = -3.6601 + (3.0 * -0.1396)(1) + 0.0821(0) + (2 * 0.3028)(1) + 0.1259(0) + 0.2383(1) + 0.1036(1) + 0.5437(0)$
- $\text{Logit}(\hat{P}) = -3.6601 + (-0.4188)(1) + 0.0821(0) + (0.6056)(1) + 0.1259(0) + 0.2383(1) + 0.1036(1) + 0.5437(0) = -3.1314$
- Solve for \hat{p} : $\hat{p} = e^{\text{logit}(\hat{p})} / (1 + e^{\text{logit}(\hat{p})})$
 $\hat{p} = e^{-3.1314} / (1 + e^{-3.1314}) = 0.04183$ or 4.183% risk of infection

Bonus Question: Answer: Scenario 2 using Closure technique = PRI

- $\text{Logit}(\hat{P}) = -3.6601 + (3.0 * -0.1396)(1) + 0.0821(0) + (2 * 0.3028)(1) + 0.1259(0) + 0.2383(0) + 0.1036(1) + 0.5437(0)$
- $\text{Logit}(\hat{P}) = -3.6601 + (-0.4188)(1) + 0.0821(0) + (0.6056)(1) + 0.1259(0) + 0.2383(1) + 0.1036(1) + 0.5437(0) = -3.3697$
- Solve for \hat{p} : $\hat{p} = e^{\text{logit}(\hat{p})} / (1 + e^{\text{logit}(\hat{p})})$
 $\hat{p} = e^{-3.3697} / (1 + e^{-3.3697}) = 0.033256$ or **3.326% risk of infection**

Thank You !

Questions

NHSN@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

