**Supplementary Material**

**Title**: Surgical site infection risk following Cesarean deliveries covered by Medicaid or private insurance

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| **Author names** | **Institutional affiliation(s)** |
| Sarah H. YI, PhD1 | 1Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, GA USA  2Rollins School of Public Health, Department of Epidemiology, Emory University, Atlanta, GA USA |
| Kiran M. PERKINS, MD, MPH1 |
| Sophia V. KAZAKOVA, MD, MPH, PhD1 |
| Kelly M. HATFIELD, MSPH1 |
| David G. KLEINBAUM, PhD1,2 |
| James BAGGS, PhD1 |
| Rachel B. SLAYTON, PhD, MPH1 |
| John A. JERNIGAN, MD, MS1 |

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| **Corresponding author** | |
| Name | Sarah H. Yi |
| Address | 1600 Clifton Road, MS H16-3 |
|  | Atlanta, GA 30329-4027 |
| Telephone | work: 404-639-4068 |
| Fax | 404-471-8309 |
| e-mail | sarahyi@cdc.gov |

**Supplementary Material 1. Methods: administrative codes used to identify procedures and diagnoses.**

| **Category** | **ICD-9-CM code type(s)** | **Code(s)** | **Sources(s)** |
| --- | --- | --- | --- |
| Cesarean delivery | Procedure | 74.0 (Classical C-Section),  74.1 (Low Cervical C-Section),  74.2 (Extraperitoneal C-Sect),  74.4 (Cesarean Section Nec),  74.91 (Hysterotomy To Termin Pg),  74.99 (Cesarean Section NOS) | CDC NHSN  CDC NCHS |
| Previous Cesarean delivery | Diagnosis | 654.2x | Moore 2014  Yasmeen 2006 |
| Multiple gestation | Diagnosis | 651.xx, 652.6x, 660.5x, 662.3x, V27.2-V27.7 | Moore 2014  Yasmeen 2006 |
| Premature rupture of membranes | Diagnosis | 658.1x | Moore 2014  Yasmeen 2006 |
| Infection of amniotic cavity  (e.g., chorioamnionitis) | Diagnosis | 658.4x, 659.3x | Moore 2014  Yasmeen 2006 |
| Antepartum hemorrhage | Diagnosis | 641.1, 641.3, 641.8, 641.9 | Moore 2014  Yasmeen 2006 |
| Perioperative blood transfusion | Procedure | 99.0x | CDC DRH |
| Hypertension complicating pregnancy | Diagnosis | 642.x | Moore 2014  Yasmeen 2006 |
| Diabetes (including gestational diabetes and abnormal glucose) | Diagnosis | 249.x–250.x, 357.2, 362.0x, 366.41, 648.0x, 648.8x | CCW  Moore 2014  Yasmeen 2006 |
| Antepartum anemia | Diagnosis | 280.x, 281.x, 283.x, 284.x, 285.0, 285.8, 648.21, 648.23 | CCW  Moore 2014  Yasmeen 2006 |
| Depression | Diagnosis | 296.2x, 296.3x, 296.5x, 296.6x, 296.89, 298.0, 300.4, 309.1, 311 | CCW |
| Obesity | Diagnosis | 278.0, 278.00, 278.01, 278.03, V85.3x, V85.4x, V85.54, 649.1x | CCW  Yasmeen 2006 |
| Alcohol abuse | Diagnosis and procedure | DX: 291.xx, 303.xx, 305.0x, 357.5, 425.5, 535.3x, 571.0-571.3,  760.71, 980.0, V65.42, V79.1, E860.0  PR: 94.6, 94.61-94.63, 94.67-94.69 | CCW  Yasmeen 2006 |
| Drug abuse | Diagnosis and procedure | DX: 292.xx, 304.xx, 305.2x, 305.3x, 305.4x, 305.5x, 305.6x, 305.7x, 305.8x, 305.9x, 648.3x, 655.5x, 760.72, 760.73, 760.75, 779.5, 965.0x, V65.42, E850.0, E850.1, E850.2, E854.1, E935.0, E935.1  PR: 94.6, 94.64-94.69 | CCW  Yasmeen 2006 |
| Tobacco use | Diagnosis | 305.1, 649.0x, 989.84 | CCW  Yasmeen 2006 |

*Select abbreviations: CDC, Centers for Disease Control and Prevention; CCW, Chronic Conditions Data Warehouse; DX, diagnosis; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; NHSN, National Healthcare Safety Network; PR, procedure.*

**Sources**

* Centers for Disease Control and Prevention (CDC), Division of Reproductive Health (DRH). Severe Maternal Morbidity Indicators and Corresponding ICD Codes during Delivery Hospitalizations. [www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm](http://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm); accessed November 5, 2018.
* CDC, National Center for Health Statistics (NCHS). International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). <https://www.cdc.gov/nchs/icd/icd9cm.htm>; November 5, 2018.
* CDC, National Healthcare Safety Network (NHSN). Operative Procedures. <http://www.cdc.gov/nhsn/PDFs/OperativeProcedures.pdf>; accessed November 5, 2018.
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* Moore JE, Witt WP, Elixhauser A. Complicating Conditions Associated With Childbirth, by Delivery Method and Payer, 2011: Statistical Brief #173. In: *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs.* Rockville (MD); 2014. <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb173-Childbirth-Delivery-Complications.jsp>
* Yasmeen S, Romano PS, Schembri ME, Keyzer JM, Gilbert WM. Accuracy of obstetric diagnoses and procedures in hospital discharge data. *American Journal of Obstetrics and Gynecology*. 2006 Apr 1;194(4):992-1001. https://doi.org/10.1016/j.ajog.2005.08.058

**Supplementary Material 2. Methods: additional detail on methods used in the study of SSI risk by payer among NHSN CDs linked with respective state inpatient discharge data.**

Linkage

The CMS Certification number (CCN) served as the hospital identifier for the primary linkage between NHSN and state inpatient discharge data. For the NHSN data, CCN was obtained using the NHSN facility file which contains both NHSN identifier and CCN. For the state data, CCN was obtained from the entity\_hospitals table of the IPRO Pellucid public database[[1]](#endnote-2) which contained both the state identifier and CCN for California and New York hospitals. Facilities in either the NHSN data or state data not matched to a CCN were hand matched using available facility identifiers, including facility name and address. In the event that multiple NHSN or state identifiers were assigned to the same CCN, the multiple NHSN or state identifiers were collapsed to the single CCN for the overall linkage as well as linkage with CMS tables containing facility-level data.

Exposure

For the CA cohort, we used the “Expected Source of Payment – Payer Category” variable,[[2]](#endnote-3) and for the NY cohort, we used the “Source of Payment 1” variable.[[3]](#endnote-4)

**Supplementary Material 3. Methods: case mix index (CMI) calculation.**

Method for calculating average MS-DRG weights (i.e., case mix index) for each facility year:

* State facility id, patient discharge date, and discharge MS-DRG code were extracted from each state inpatient discharge database for available years
* MS-DRG weights corresponding to each MS-DRG code by fiscal year were obtained from NBER’s compiled public use data files (<http://www.nber.org/data/drg.html>)
* CMI was calculated by taking the mean MS-DRG weight for each facility by calendar year of patient discharge

Evaluation of calculated CMI: comparison of four CMI variables:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **n** | **Min** | **Q1** | **Median** | **Mean** | **Q3** | **Max** |
| 1. CAcmi\_CMI | 291,556 | 0.57 | 1.110 | 1.22 | 1.22 | 1.33 | 2.08 |
| 2. stateCMI\_drgweight\_mean | 291,556 | 0.55 | 1.117 | 1.23 | 1.23 | 1.34 | 2.13 |
| 3. stateCMI\_drgweight\_median | 291,556 | 0.53 | 0.850 | 0.95 | 0.93 | 1.00 | 1.50 |
| 4. IF\_cmiv | 280,541 | 0.90 | 1.498 | 1.62 | 1.63 | 1.75 | 2.40 |

Description and data source for each variable:

1. State of CA table: CMI for all California hospital-years (“gold standard”)

Source: https://www.healthdata.gov/dataset/case-mix-index, accessed October 1, 2017

1. Calculated reference table: mean CMI for each hospital-year (used in analyses)

Source: Office of Statewide Health Planning & Development patient discharge database

1. Calculated reference table: median CMI for each hospital-year

Source: Office of Statewide Health Planning & Development patient discharge database

1. CMS Impact File (IF): CMI for CA IPPS hospitals

Source: http://www.nber.org/impact/&year./impact&year..csv, accessed September 1, 2017

**Supplementary Material 4. Table. Adjusted risk of SSI detected during index hospitalization by payer among NHSN CDs linked with state inpatient discharge data: California, 2011-2013.**

| **Label** | **Comparison** | | | **Estimate** | **Lower** | **Upper** | **ProbF** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Medicaid | 1 | vs | 0 | 0.8 | 0.5 | 1.2 | 0.33 |
| age\_4cat | 0 | vs | 3 | 0.8 | 0.5 | 1.4 | 0.0003 |
| age\_4cat | 1 | vs | 3 | 1.3 | 0.8 | 2.0 | 0.0003 |
| age\_4cat | 2 | vs | 3 | 1.3 | 0.8 | 2.1 | 0.0002 |
| SID\_race\_eth\_num\_4ca | 2 | vs | 1 | 1.6 | 0.9 | 2.7 | 0.08 |
| SID\_race\_eth\_num\_4ca | 3 | vs | 1 | 0.9 | 0.6 | 1.4 |  |
| SID\_race\_eth\_num\_4ca | 4 | vs | 1 | 0.7 | 0.4 | 1.2 |  |
| BMI\_4cat | 0 | vs | 1 | 0.8 | 0.5 | 1.3 |  |
| BMI\_4cat | 2 | vs | 1 | 0.8 | 0.5 | 1.4 |  |
| BMI\_4cat | 3 | vs | 1 | 1.5 | 1.0 | 2.3 |  |
| Table1\_PrevCD | 1 | vs | 0 | 0.7 | 0.5 | 1.1 | 0.53 |
| Table1\_MultiGest | 1 | vs | 0 | 1.2 | 0.6 | 2.3 | 0.001 |
| Table1\_PrematRupt | 1 | vs | 0 | 2.3 | 1.4 | 3.7 | 0.14 |
| Table1\_chorio | 1 | vs | 0 | 2.1 | 1.2 | 3.4 | 0.32 |
| Table1\_AnteHmrrhg | 1 | vs | 0 | 0.6 | 0.1 | 2.5 | <.0001 |
| hrLabor\_4cat | 1 | vs | 0 | 0.9 | 0.5 | 1.7 | 0.10 |
| hrLabor\_4cat | 2 | vs | 0 | 0.5 | 0.3 | 1.0 | 0.03 |
| hrLabor\_4cat | 3 | vs | 0 | 1.4 | 0.9 | 2.2 | 0.03 |
| SID\_admtype\_SchedEle | 1 | vs | 0 | 0.9 | 0.6 | 1.3 | 0.65 |
| NHSN\_emergency\_num | 1 | vs | 0 | 2.0 | 1.4 | 2.8 | 0.0001 |
| NHSN\_asa\_num\_1\_2\_345 | 2 | vs | 1 | 1.5 | 0.8 | 2.8 | 0.23 |
| NHSN\_asa\_num\_1\_2\_345 | 3 | vs | 1 | 1.9 | 0.9 | 3.8 | 0.06 |
| NHSN\_anesthesia\_num | 1 | vs | 0 | 1.6 | 1.0 | 2.6 | 0.40 |
| NHSN\_wound\_CODvCCC | 1 | vs | 0 | 1.4 | 0.6 | 3.1 | 0.06 |
| duration\_4cat | 1 | vs | 0 | 1.0 | 0.5 | 1.9 | 0.25 |
| duration\_4cat | 2 | vs | 0 | 1.5 | 0.9 | 2.7 | 0.01 |
| duration\_4cat | 3 | vs | 0 | 1.2 | 0.7 | 2.2 | 0.86 |
| Table1\_BldTransf | 1 | vs | 0 | 3.1 | 1.8 | 5.3 | 0.34 |
| SID\_year | 2012 | vs | 2011 | 0.9 | 0.6 | 1.5 |  |
| SID\_year | 2013 | vs | 2011 | 0.6 | 0.4 | 1.0 |  |
| quarter | 2 | vs | 1 | 0.8 | 0.5 | 1.2 |  |
| quarter | 3 | vs | 1 | 0.7 | 0.4 | 1.1 |  |
| quarter | 4 | vs | 1 | 0.7 | 0.4 | 1.0 |  |
| Table1\_AlcDrugAbuse | 1 | vs | 0 | 2.0 | 1.0 | 4.2 | 0.86 |
| Table1\_AnteAnemia | 1 | vs | 0 | 1.0 | 0.6 | 1.7 | 0.47 |
| Table1\_Depression | 1 | vs | 0 | 0.6 | 0.2 | 1.7 | 0.36 |
| Table1\_Diabetes | 1 | vs | 0 | 1.2 | 0.8 | 1.9 | 0.39 |
| Table1\_Htn | 1 | vs | 0 | 1.2 | 0.8 | 1.8 | 0.64 |
| Table1\_Tobacco | 1 | vs | 0 | 1.3 | 0.5 | 3.3 | 0.01 |
| gagne\_3cat | 0 | vs | 1 | 0.7 | 0.1 | 5.1 |  |
| gagne\_3cat | 2 | vs | 1 | 1.5 | 1.0 | 2.3 |  |
| pssurv\_facowner\_num | 1 | vs | 0 | 2.2 | 1.2 | 3.8 |  |
| pssurv\_facowner\_num | 2 | vs | 0 | 1.3 | 0.7 | 2.6 |  |
| cr\_DSH\_YN\_num | 1 | vs | 0 | 0.8 | 0.5 | 1.3 |  |
| pssurv\_medAff\_num | 1 | vs | 0 | 1.8 | 1.1 | 2.7 |  |
| cr\_URBAN\_RURAL | 1 | vs | 2 | 0.6 | 0.2 | 1.4 |  |
| Beds\_4cat | 0 | vs | 1 | 2.1 | 1.1 | 4.1 |  |
| Beds\_4cat | 2 | vs | 1 | 2.9 | 1.5 | 5.6 |  |
| Beds\_4cat | 3 | vs | 1 | 4.6 | 2.3 | 9.1 |  |
| cmi\_4cat | 0 | vs | 1 | 0.9 | 0.5 | 1.7 | 0.34 |
| cmi\_4cat | 2 | vs | 1 | 1.2 | 0.7 | 1.9 | 0.01 |
| cmi\_4cat | 3 | vs | 1 | 1.0 | 0.6 | 1.6 | 0.23 |
| facCD\_4cat | 0 | vs | 2 | 4.0 | 2.0 | 8.1 | 0.07 |
| facCD\_4cat | 1 | vs | 2 | 2.4 | 1.3 | 4.5 | 0.26 |
| facCD\_4cat | 3 | vs | 2 | 1.2 | 0.6 | 2.5 |  |
| wage\_4cat | 1 | vs | 0 | 2.0 | 1.1 | 3.7 |  |
| wage\_4cat | 2 | vs | 0 | 1.3 | 0.7 | 2.3 |  |
| wage\_4cat | 3 | vs | 0 | 2.9 | 1.7 | 5.2 |  |

Notes:

* 290,499 observations used (excludes other facility types and 15 observations missing duration of labor).
* Facility-level clustering is not accounted for in this model (i.e., SSI detected during index hospitalization) due to convergence issues.
* P-value obtained from Type III Tests of Fixed Effects

**Supplementary Material 5. Table. Adjusted risk of SSI detected through post-discharge surveillance by payer among NHSN CDs linked with state inpatient discharge data: California, 2011-2013.**

| **Label** | **Comparison** | | | **Estimate** | **Lower** | **Upper** | **ProbF** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Medicaid | 1 | vs | 0 | 1.4 | 1.2 | 1.7 | 0.0001 |
| age\_4cat | 0 | vs | 3 | 1.1 | 0.9 | 1.3 | 0.38 |
| age\_4cat | 1 | vs | 3 | 1.1 | 0.9 | 1.3 |  |
| age\_4cat | 2 | vs | 3 | 0.9 | 0.8 | 1.1 |  |
| SID\_race\_eth\_num\_4ca | 2 | vs | 1 | 1.0 | 0.8 | 1.2 | 0.67 |
| SID\_race\_eth\_num\_4ca | 3 | vs | 1 | 0.9 | 0.8 | 1.1 |  |
| SID\_race\_eth\_num\_4ca | 4 | vs | 1 | 0.9 | 0.8 | 1.1 |  |
| BMI\_4cat | 0 | vs | 1 | 0.8 | 0.6 | 1.0 | <.0001 |
| BMI\_4cat | 2 | vs | 1 | 1.2 | 1.0 | 1.4 |  |
| BMI\_4cat | 3 | vs | 1 | 1.7 | 1.4 | 2.0 |  |
| Table1\_PrevCD | 1 | vs | 0 | 1.0 | 0.8 | 1.1 | 0.71 |
| Table1\_MultiGest | 1 | vs | 0 | 0.9 | 0.7 | 1.3 | 0.70 |
| Table1\_PrematRupt | 1 | vs | 0 | 1.0 | 0.8 | 1.3 | 0.81 |
| Table1\_chorio | 1 | vs | 0 | 1.2 | 0.9 | 1.5 | 0.25 |
| Table1\_AnteHmrrhg | 1 | vs | 0 | 0.2 | 0.1 | 0.6 | 0.01 |
| hrLabor\_4cat | 1 | vs | 0 | 1.1 | 0.9 | 1.4 | <.0001 |
| hrLabor\_4cat | 2 | vs | 0 | 1.4 | 1.2 | 1.7 |  |
| hrLabor\_4cat | 3 | vs | 0 | 1.6 | 1.3 | 1.9 |  |
| SID\_admtype\_SchedEle | 1 | vs | 0 | 1.0 | 0.9 | 1.2 | 0.97 |
| NHSN\_emergency\_num | 1 | vs | 0 | 1.1 | 1.0 | 1.3 | 0.18 |
| NHSN\_asa\_num\_1\_2\_345 | 2 | vs | 1 | 1.1 | 0.8 | 1.3 |  |
| NHSN\_asa\_num\_1\_2\_345 | 3 | vs | 1 | 1.3 | 1.0 | 1.7 | 0.09 |
| NHSN\_anesthesia\_num | 1 | vs | 0 | 1.2 | 0.9 | 1.5 | 0.26 |
| NHSN\_wound\_CODvCCC | 1 | vs | 0 | 1.0 | 0.7 | 1.4 | 0.99 |
| duration\_4cat | 1 | vs | 0 | 1.0 | 0.8 | 1.3 | <.0001 |
| duration\_4cat | 2 | vs | 0 | 1.2 | 1.0 | 1.5 |  |
| duration\_4cat | 3 | vs | 0 | 1.6 | 1.3 | 2.0 |  |
| Table1\_BldTransf | 1 | vs | 0 | 1.9 | 1.4 | 2.5 | <.0001 |
| SID\_year | 2012 | vs | 2011 | 1.0 | 0.9 | 1.2 | 0.49 |
| SID\_year | 2013 | vs | 2011 | 0.9 | 0.8 | 1.1 |  |
| quarter | 2 | vs | 1 | 1.1 | 0.9 | 1.3 | 0.48 |
| quarter | 3 | vs | 1 | 1.1 | 1.0 | 1.4 |  |
| quarter | 4 | vs | 1 | 1.0 | 0.9 | 1.3 |  |
| Table1\_AlcDrugAbuse | 1 | vs | 0 | 1.1 | 0.7 | 1.6 | 0.65 |
| Table1\_AnteAnemia | 1 | vs | 0 | 1.2 | 1.0 | 1.4 | 0.12 |
| Table1\_Depression | 1 | vs | 0 | 1.2 | 0.9 | 1.7 | 0.20 |
| Table1\_Diabetes | 1 | vs | 0 | 1.1 | 0.9 | 1.3 | 0.29 |
| Table1\_Htn | 1 | vs | 0 | 1.0 | 0.8 | 1.2 | 0.99 |
| Table1\_Tobacco | 1 | vs | 0 | 1.3 | 0.9 | 1.9 | 0.19 |
| gagne\_3cat | 0 | vs | 1 | 0.8 | 0.4 | 1.7 | 0.81 |
| gagne\_3cat | 2 | vs | 1 | 1.0 | 0.8 | 1.2 |  |
| pssurv\_facowner\_num | 1 | vs | 0 | 3.0 | 1.8 | 5.0 | <.0001 |
| pssurv\_facowner\_num | 2 | vs | 0 | 0.4 | 0.2 | 0.6 |  |
| cr\_DSH\_YN\_num | 1 | vs | 0 | 0.5 | 0.3 | 0.7 | <.0001 |
| pssurv\_medAff\_num | 1 | vs | 0 | 1.0 | 0.7 | 1.3 | 0.96 |
| cr\_URBAN\_RURAL | 1 | vs | 2 | 0.9 | 0.5 | 1.6 | 0.71 |
| Beds\_4cat | 0 | vs | 1 | 1.0 | 0.7 | 1.4 | 0.14 |
| Beds\_4cat | 2 | vs | 1 | 1.2 | 0.7 | 1.9 |  |
| Beds\_4cat | 3 | vs | 1 | 0.7 | 0.4 | 1.2 |  |
| cmi\_4cat | 0 | vs | 1 | 1.2 | 0.8 | 1.6 | 0.81 |
| cmi\_4cat | 2 | vs | 1 | 1.1 | 0.8 | 1.5 |  |
| cmi\_4cat | 3 | vs | 1 | 1.1 | 0.7 | 1.6 |  |
| facCD\_4cat | 0 | vs | 2 | 1.8 | 1.1 | 2.8 | 0.02 |
| facCD\_4cat | 1 | vs | 2 | 1.1 | 0.7 | 1.6 |  |
| facCD\_4cat | 3 | vs | 2 | 1.1 | 0.7 | 1.7 |  |
| wage\_4cat | 1 | vs | 0 | 1.4 | 1.0 | 2.0 | 0.07 |
| wage\_4cat | 2 | vs | 0 | 1.1 | 0.7 | 1.6 |  |
| wage\_4cat | 3 | vs | 0 | 1.4 | 1.0 | 2.2 |  |

Notes:

* 290,499 observations used (excludes other facility types and 15 observations missing duration of labor).
* P-value obtained from Type III Tests of Fixed Effects

**Supplementary Material 6. Table. Adjusted risk of SSI detected during hospital readmission by payer among NHSN CDs linked with state inpatient discharge data: California, 2011-2013.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Label** | **Comparison** | | | **Estimate** | **Lower** | **Upper** | **ProbF** |
| Medicaid | 1 | vs | 0 | 1.6 | 1.3 | 1.9 | <.0001 |
| age\_4cat | 0 | vs | 3 | 1.4 | 1.1 | 1.7 | 0.02 |
| age\_4cat | 1 | vs | 3 | 1.1 | 0.9 | 1.4 |  |
| age\_4cat | 2 | vs | 3 | 1.1 | 0.9 | 1.4 |  |
| SID\_race\_eth\_num\_4ca | 2 | vs | 1 | 1.0 | 0.8 | 1.3 | 0.02 |
| SID\_race\_eth\_num\_4ca | 3 | vs | 1 | 1.0 | 0.8 | 1.2 |  |
| SID\_race\_eth\_num\_4ca | 4 | vs | 1 | 0.7 | 0.5 | 0.9 |  |
| BMI\_4cat | 0 | vs | 1 | 1.3 | 1.1 | 1.6 | <.0001 |
| BMI\_4cat | 2 | vs | 1 | 1.5 | 1.2 | 1.8 |  |
| BMI\_4cat | 3 | vs | 1 | 2.1 | 1.7 | 2.6 |  |
| Table1\_PrevCD | 1 | vs | 0 | 0.7 | 0.6 | 0.8 | <.0001 |
| Table1\_MultiGest | 1 | vs | 0 | 1.1 | 0.8 | 1.5 | 0.74 |
| Table1\_PrematRupt | 1 | vs | 0 | 1.3 | 1.0 | 1.8 | 0.04 |
| Table1\_chorio | 1 | vs | 0 | 1.3 | 0.9 | 1.7 | 0.14 |
| Table1\_AnteHmrrhg | 1 | vs | 0 | 1.0 | 0.5 | 1.7 | 0.87 |
| hrLabor\_4cat | 1 | vs | 0 | 0.9 | 0.7 | 1.2 | 0.002 |
| hrLabor\_4cat | 2 | vs | 0 | 1.3 | 1.0 | 1.5 |  |
| hrLabor\_4cat | 3 | vs | 0 | 1.4 | 1.2 | 1.7 |  |
| SID\_admtype\_SchedEle | 1 | vs | 0 | 0.9 | 0.7 | 1.0 | 0.06 |
| NHSN\_emergency\_num | 1 | vs | 0 | 1.3 | 1.1 | 1.5 | 0.0004 |
| NHSN\_asa\_num\_1\_2\_345 | 2 | vs | 1 | 1.1 | 0.9 | 1.4 | 0.05 |
| NHSN\_asa\_num\_1\_2\_345 | 3 | vs | 1 | 1.3 | 1.0 | 1.8 |  |
| NHSN\_anesthesia\_num | 1 | vs | 0 | 1.3 | 1.0 | 1.7 | 0.06 |
| NHSN\_wound\_CODvCCC | 1 | vs | 0 | 1.4 | 0.9 | 2.1 | 0.18 |
| duration\_4cat | 1 | vs | 0 | 1.1 | 0.9 | 1.4 | <.0001 |
| duration\_4cat | 2 | vs | 0 | 1.2 | 1.0 | 1.5 |  |
| duration\_4cat | 3 | vs | 0 | 1.6 | 1.3 | 2.0 |  |
| Table1\_BldTransf | 1 | vs | 0 | 2.2 | 1.6 | 3.0 | <.0001 |
| SID\_year | 2012 | vs | 2011 | 1.0 | 0.8 | 1.2 | 0.19 |
| SID\_year | 2013 | vs | 2011 | 1.2 | 0.9 | 1.4 |  |
| quarter | 2 | vs | 1 | 1.0 | 0.8 | 1.3 | 0.85 |
| quarter | 3 | vs | 1 | 1.1 | 0.9 | 1.3 |  |
| quarter | 4 | vs | 1 | 1.0 | 0.8 | 1.2 |  |
| Table1\_AlcDrugAbuse | 1 | vs | 0 | 1.7 | 1.2 | 2.4 | 0.003 |
| Table1\_AnteAnemia | 1 | vs | 0 | 1.0 | 0.8 | 1.3 | 0.96 |
| Table1\_Depression | 1 | vs | 0 | 1.2 | 0.8 | 1.8 | 0.37 |
| Table1\_Diabetes | 1 | vs | 0 | 1.0 | 0.8 | 1.2 | 0.95 |
| Table1\_Htn | 1 | vs | 0 | 1.1 | 0.9 | 1.4 | 0.20 |
| Table1\_Tobacco | 1 | vs | 0 | 2.0 | 1.4 | 2.9 | 0.0002 |
| gagne\_3cat | 0 | vs | 1 | 0.6 | 0.2 | 1.5 | 0.07 |
| gagne\_3cat | 2 | vs | 1 | 1.2 | 1.0 | 1.5 |  |
| pssurv\_facowner\_num | 1 | vs | 0 | 1.2 | 0.9 | 1.5 | 0.10 |
| pssurv\_facowner\_num | 2 | vs | 0 | 1.2 | 1.0 | 1.5 |  |
| cr\_DSH\_YN\_num | 1 | vs | 0 | 0.9 | 0.7 | 1.1 | 0.19 |
| pssurv\_medAff\_num | 1 | vs | 0 | 1.2 | 1.0 | 1.4 | 0.05 |
| cr\_URBAN\_RURAL | 1 | vs | 2 | 1.2 | 0.8 | 1.8 | 0.47 |
| Beds\_4cat | 0 | vs | 1 | 0.9 | 0.7 | 1.2 | 0.65 |
| Beds\_4cat | 2 | vs | 1 | 1.0 | 0.8 | 1.2 |  |
| Beds\_4cat | 3 | vs | 1 | 1.1 | 0.9 | 1.4 |  |
| cmi\_4cat | 0 | vs | 1 | 1.3 | 1.0 | 1.6 | 0.12 |
| cmi\_4cat | 2 | vs | 1 | 1.2 | 1.0 | 1.5 |  |
| cmi\_4cat | 3 | vs | 1 | 1.2 | 1.0 | 1.6 |  |
| facCD\_4cat | 0 | vs | 2 | 0.9 | 0.7 | 1.1 | 0.22 |
| facCD\_4cat | 1 | vs | 2 | 1.0 | 0.8 | 1.3 |  |
| facCD\_4cat | 3 | vs | 2 | 1.2 | 0.9 | 1.5 |  |
| wage\_4cat | 1 | vs | 0 | 1.0 | 0.8 | 1.3 | 0.77 |
| wage\_4cat | 2 | vs | 0 | 0.9 | 0.8 | 1.2 |  |
| wage\_4cat | 3 | vs | 0 | 1.0 | 0.8 | 1.3 |  |

Notes:

* 290,499 observations used (excludes other facility types and 15 observations missing duration of labor).
* Facility-level clustering is not accounted for in this model (i.e., SSI detected during hospital readmission) due to convergence issues.
* P-value obtained from Type III Tests of Fixed Effects

**Supplementary Material 7. Figure. Flow diagram of NHSN CDs linked with state inpatient discharge data: New York, 2008-2013.**

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Abbreviations: BMI, body mass index; CD, Cesarean delivery; NHSN, National Healthcare Safety Network; OSHPD, Office of Statewide Health Planning & Development; procs, procedures; SPARCS, Statewide Planning and Research Cooperative System.

aNumber of hospitals refers to count of distinct CMS Certification numbers.

bUnique refers to having a unique combination of hospital identifier, procedure date, and date of birth in preparation for exact deterministic data linkage.

cPatients may have been excluded for multiple reasons, therefore the summed reasons for exclusion may exceed the total number of CDs excluded.

dIn accordance with data use agreements, actual number and corresponding percent of total were not displayed or combined with adjacent cells when cell size ≤10.

**Supplementary Material 8. Table. Patient characteristics of NHSN CDs linked with state inpatient discharge data: New York, 2008-2013.**

| **Characteristic** | **New York, 2008-2013** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Medicaid**  n=2,796 | | | **Private**  n=4,787 | | |
| Surgical site infection (SSI), n (%) | 80 | 2.86% |  | 72 | 1.50% |  |
| SSI type,[[4]](#endnote-5) n (%) |  |  |  |  |  |  |
| Superficial | 60 | 75% |  | 38 | 53% |  |
| Deep incisional or organ/space | 20 | 25% |  | 34 | 47% |  |
| Time to SSI, days,a median (Q1-Q3) | 11 | (9-14) |  | 10 | (5-15) |  |
| When detected,a n (%) |  |  |  |  |  |  |
| Hospitalization[[5]](#endnote-6) | ≤10 | ≤13% |  | 16 | 22% |  |
| Post-discharge surveillance | 63 | 79% |  | 41 | 57% |  |
| Readmissionb | ≤10 | ≤13% |  | 15 | 21% |  |
| Patient |  |  |  |  |  |  |
| Age, years, median (Q1-Q3) | 27 | (23-32) |  | 31 | (27-35) |  |
| 11-24 years, n (%) | 997 | 36% |  | 734 | 15% |  |
| 25-29 | 786 | 28% |  | 1,207 | 25% |  |
| 30-34 | 595 | 21% |  | 1,548 | 32% |  |
| 35-48 | 418 | 15% |  | 1,298 | 27% |  |
| Race/ethnicity, n (%) |  |  |  |  |  |  |
| White | 753 | 27% |  | 2,283 | 47% |  |
| Black | 662 | 24% |  | 738 | 15% |  |
| Hispanic | 894 | 32% |  | 882 | 18% |  |
| Other[[6]](#endnote-7) | 463 | 17% |  | 911 | 19% |  |
| Body mass index, kg/m2, median (Q1-Q3) | 31 | (27-36) |  | 31 | (27-36) |  |
| 12-28 kg/m2, n (%) | 826 | 30% |  | 1,451 | 30% |  |
| >28-32 | 703 | 25% |  | 1,233 | 26% |  |
| >32-36 | 538 | 19% |  | 964 | 20% |  |
| >36-81 | 729 | 26% |  | 1,139 | 24% |  |
| Pregnancy |  |  |  |  |  |  |
| Prior CD,[[7]](#endnote-8) n (%) | 1,253 | 45% |  | 2,030 | 42% |  |
| Multiple gestation | 119 | 4% |  | 215 | 4% |  |
| Premature rupture of membranes | 110 | 4% |  | 183 | 4% |  |
| Infection of amniotic cavity | 128 | 5% |  | 155 | 3% |  |
| Antepartum hemorrhage | 43 | 2% |  | 105 | 2% |  |
| Labor duration, hours |  |  |  |  |  |  |
| None | 1,385 | 50% |  | 2,558 | 53% |  |
| 1-5 hours | 416 | 15% |  | 698 | 15% |  |
| 6-12 | 468 | 17% |  | 752 | 16% |  |
| ≥13 | 527 | 19% |  | 779 | 16% |  |
| Cesarean delivery, n (%) |  |  |  |  |  |  |
| Scheduled/elective admission | 1,240 | 45% |  | 2,615 | 54% |  |
| Emergency CD | 849 | 31% |  | 1,697 | 35% |  |
| ASA physical status classification |  |  |  |  |  |  |
| I | 89 | 3% |  | 341 | 7% |  |
| II | 2,371 | 86% |  | 3,983 | 83% |  |
| III,IV,V | 336 | 12% |  | 463 | 10% |  |
| General anesthesia | 200 | 7% |  | 246 | 5% |  |
| Wound class |  |  |  |  |  |  |
| Clean or clean-contaminated | 2,784 | 100% |  | 4,739 | 98% |  |
| Contaminated or dirty | 12 | 0% |  | 48 | 1% |  |
| CD duration, minutes, median (Q1-Q3) | 57 | (45-70) |  | 52 | (40-65) |  |
| 5-41 minutes, n (%) | 492 | 18% |  | 1,347 | 28% |  |
| 42-53 | 677 | 24% |  | 1,229 | 26% |  |
| 54-67 | 825 | 30% |  | 1,137 | 24% |  |
| 68-170 | 802 | 29% |  | 1,074 | 22% |  |
| Perioperative blood transfusion | 128 | 5% |  | 138 | 3% |  |
| Year of CD, n (%) |  |  |  |  |  |  |
| 2008 | 521 | 19% |  | 939 | 20% |  |
| 2009 | 712 | 25% |  | 899 | 19% |  |
| 2010 | 507 | 18% |  | 976 | 20% |  |
| 2011 | 431 | 15% |  | 1,043 | 22% |  |
| 2012 | 252 | 9% |  | 411 | 9% |  |
| 2013 | 373 | 13% |  | 519 | 11% |  |
| Quarter of CD, n (%) |  |  |  |  |  |  |
| 1 (January-March) | 667 | 24% |  | 836 | 17% |  |
| 2 (April-June) | 670 | 24% |  | 1,159 | 24% |  |
| 3 (July-September) | 771 | 28% |  | 1,926 | 40% |  |
| 4 (October-December) | 688 | 25% |  | 866 | 18% |  |
| Comorbidities |  |  |  |  |  |  |
| Alcohol and/or drug abuse, n (%) | 106 | 4% |  | 26 | 1% |  |
| Antepartum anemia | 342 | 12% |  | 383 | 8% |  |
| Depression | 75 | 3% |  | 83 | 2% |  |
| Diabetes or abnormal glucose | 277 | 10% |  | 551 | 12% |  |
| Gestational hypertension | 425 | 15% |  | 704 | 15% |  |
| Tobacco use | 212 | 8% |  | 138 | 3% |  |
| Gagne comorbidity score |  |  |  |  |  |  |
| -1 | 19 | 1% |  | 40 | 1% |  |
| 0 | 2,242 | 80% |  | 3,960 | 83% |  |
| 1+ | 535 | 19% |  | 787 | 16% |  |
| Hospitalization |  |  |  |  |  |  |
| MS-DRG,[[8]](#endnote-9) n (%) |  |  |  |  |  |  |
| 766 | 1,592 | 57% |  | 2,994 | 63% |  |
| 765 | 1,204 | 43% |  | 1,793 | 37% |  |
| Otherb |  |  |
| LOS, days, median (Q1-Q3) | 3 | (3-4) |  | 3 | (3-4) |  |
| MS-DRG 766e | 3 | (3-4) |  | 3 | (3-4) |  |
| MS-DRG 765e | 4 | (3-5) |  | 4 | (3-5) |  |

**Supplementary Material 9. Table. Hospital characteristics of NHSN CDs linked with state inpatient discharge data: New York, 2008-2013.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Characteristic** | **New York, 2008-2013**  13 facilities | | | | |
| **Medicaid**  n=2,796 | |  | **Private**  n=4,787 | |
| Number of facilities, n (%) | 13 | 100% |  | 13 | 100% |
| Hospital ownership |  |  |  |  |  |
| Not for profit | 2,470 | 88% |  | 3,337 | 70% |
| Government | 251 | 9% |  | 1,135 | 24% |
| For profit | 75 | 3% |  | 315 | 7% |
| Disproportionate share hospital | 2,727 | 98% |  | 4,288 | 90% |
| Medical school affiliation | 2,570 | 92% |  | 3,718 | 78% |
| Rural hospital location | 14 | 1% |  | 182 | 4% |
| Hospital bed count, median (Q1-Q3) | 243 | (62-450) |  | 315 | (89-616) |
| 3-62 beds, n (%) | 717 | 26% |  | 997 | 21% |
| 89-315 | 801 | 29% |  | 1,402 | 29% |
| 385-450 | 1,105 | 40% |  | 746 | 16% |
| 459-800 | 173 | 6% |  | 1,642 | 34% |
| Hospital case mix index[[9]](#endnote-10) | 1.0 | (1.0-1.2) |  | 1.1 | (1.0-1.2) |
| 0.79-1.11 | 1,804 | 65% |  | 2,084 | 44% |
| >1.11-1.18 | 322 | 12% |  | 1,720 | 36% |
| 1.24-1.30 | 595 | 21% |  | 668 | 14% |
| 1.56-1.57 | 75 | 3% |  | 315 | 7% |
| Hospital annual CD volume | 321 | (315-634) |  | 634 | (443-788) |
| 100-320 CD | 1,172 | 42% |  | 784 | 16% |
| 321-455 | 752 | 27% |  | 981 | 20% |
| 476-706 | 692 | 25% |  | 1,237 | 26% |
| 731-1150 | 180 | 6% |  | 1,785 | 37% |
| Average area hourly wage, USD | 33 | (31-34) |  | 34 | (28-36) |
| $21.42-$28.74 | 544 | 19% |  | 1,494 | 31% |
| $30.74-$33.79 | 1,163 | 42% |  | 458 | 10% |
| $33.89-$35.94 | 629 | 22% |  | 1,311 | 27% |
| $36.05-$42.51 | 460 | 16% |  | 1,524 | 32% |

**Supplementary Material 10. Table. Risk of SSI by payer among NHSN CDs linked with state inpatient discharge data adjusting for patient and procedure characteristics and hospital-level clustering: NY cohort, 2008-2013.**

| **Effect** | **Comparison** | | | **Adjusted OR** | **95% confidence limits** | | ***P*-value[[10]](#endnote-11)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Lower** | **Upper** |
| Payer | Medicaid | vs | Private | 1.5 | 1.0 | 2.4 | 0.06 |
| Race/ethnicity | Black | vs | White | 1.2 | 0.6 | 2.3 | 0.16 |
|  | Hispanic | vs | White | 1.4 | 0.7 | 2.6 |  |
|  | Other[[11]](#endnote-12) | vs | White | 0.7 | 0.3 | 1.5 |  |
| Scheduled/elective admission | 1 | vs | 0 | 1.7 | 1.0 | 2.7 | 0.04 |
| ASA physical status classification | II | vs | I | 0.8 | 0.4 | 1.8 | 0.15 |
|  | III,IV,V | vs | I | 1.3 | 0.6 | 3.2 |  |
| General anesthesia | 1 | vs | 0 | 1.0 | 0.5 | 1.8 | 0.91 |
| Alcohol and/or drug abuse | 1 | vs | 0 | 1.2 | 0.4 | 3.4 | 0.77 |
| Antepartum anemia | 1 | vs | 0 | 0.7 | 0.4 | 1.4 | 0.33 |
| Perioperative blood transfusion | 1 | vs | 0 | 1.5 | 0.7 | 3.1 | 0.25 |
| Depression | 1 | vs | 0 | 1.9 | 0.8 | 4.3 | 0.14 |
| Diabetes or abnormal glucose | 1 | vs | 0 | 1.6 | 1.0 | 2.5 | 0.04 |
| Gestational hypertension | 1 | vs | 0 | 1.4 | 0.9 | 2.1 | 0.13 |
| Multiple gestation | 1 | vs | 0 | 0.6 | 0.2 | 1.5 | 0.26 |
| Premature rupture of membranes | 1 | vs | 0 | 1.3 | 0.6 | 2.7 | 0.46 |
| Prior CD,[[12]](#endnote-13) | 1 | vs | 0 | 0.9 | 0.6 | 1.4 | 0.64 |
| Tobacco | 1 | vs | 0 | 0.5 | 0.2 | 1.5 | 0.24 |
| Infection of amniotic cavity | 1 | vs | 0 | 1.6 | 0.8 | 3.2 | 0.14 |
| CD duration, minutes | 42-53 | vs | 5-41 | 1.4 | 0.8 | 2.5 | 0.41 |
|  | 54-67 | vs | 5-41 | 1.6 | 0.9 | 2.8 |  |
|  | 68-170 | vs | 5-41 | 1.5 | 0.9 | 2.8 |  |
| Age, years | 11-24 | vs | 35-48 | 1.3 | 0.7 | 2.2 | 0.70 |
|  | 25-29 | vs | 35-48 | 1.4 | 0.8 | 2.3 |  |
|  | 30-34 | vs | 35-48 | 1.3 | 0.7 | 2.2 |  |
| Labor duration, hours | 1-5 | vs | 0 | 1.2 | 0.7 | 2.2 | 0.0002 |
|  | 6-12 | vs | 0 | 2.2 | 1.3 | 3.5 |  |
|  | ≥13 | vs | 0 | 2.6 | 1.7 | 4.2 |  |
| Gagne comorbidity score | -1 | vs | 0 | 1.6 | 0.4 | 7.3 | 0.19 |
|  | 1+ | vs | 0 | 1.5 | 1.0 | 2.2 |  |
| BMI, kg/m2 | 12-28 | vs | >28-32 | 0.5 | 0.3 | 1.0 | 0.04 |
|  | >32-36 | vs | >28-32 | 0.9 | 0.6 | 1.5 |  |
|  | >36-81 | vs | >28-32 | 1.2 | 0.8 | 1.9 |  |

1. IPRO Pellucid public database. http://admin.pellucid.ipro.org; accessed September 27, 2017. [↑](#endnote-ref-2)
2. Office of Statewide Health Planning and Development. Patient Discharge Data 2010-2014 Data Dictionary, Nonpublic Files. Revision date 2015-07-06. https://www.oshpd.ca.gov/documents/HID/Data\_Request\_Center/DataDictionary\_Nonpublic\_PDD.pdf. [↑](#endnote-ref-3)
3. Statewide Planning and Research Cooperative System. Inpatient Output Data Element Dictionary, Version 1.0 (April 2014). https://www.health.ny.gov/statistics/sparcs/sysdoc/inpatientoutputdd.pdf. [↑](#endnote-ref-4)
4. Denominator is limited to CDs with SSI for the following characteristics: SSI type, time to SSI, and when detected. [↑](#endnote-ref-5)
5. In accordance with data use agreements, actual number and corresponding percent of total were not displayed or combined with adjacent cells when cell size ≤10. [↑](#endnote-ref-6)
6. Other includes: Asian + Pacific Islander (NY: n=451), Native American (NY: n=21),

   other (NY: n=814), unknown/blank (NY: n=70). [↑](#endnote-ref-7)
7. Previous CD defined as presence of ICD-9-CM diagnosis code 654.2 on inpatient discharge record. [↑](#endnote-ref-8)
8. MS-DRG 766: Cesarean section without CC/MCC; MS-DRG 765: Cesarean section with CC/MCC. [↑](#endnote-ref-9)
9. Case mix index for each hospital is based on mean DRG for each facility-year calculated from respective state inpatient discharge data. State identifier was used as the facility identifier. [↑](#endnote-ref-10)
10. Type III Tests of Fixed Effects. [↑](#endnote-ref-11)
11. Other includes: Asian + Pacific Islander (NY: n=451), Native American (NY: n=21), other (NY: n=814), unknown/blank (NY: n=70). [↑](#endnote-ref-12)
12. Previous CD defined as presence of ICD-9-CM diagnosis code 654.2 on inpatient discharge record. [↑](#endnote-ref-13)