CMQCC
California Maternal
Quality Care Collaborative

Pursuit of the "Holy Grail"— Measuring Outcomes for Term Babies

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This is All About Getting the Right Balance…

- Balancing Interests: Mother / Baby
- Balancing Focus: All Babies / Specific Group
- Balancing Definition: Narrow / Comprehensive
- Balancing Data Collection: Accuracy / Burden
- Balancing Coding: Over-coding /Under-coding

What is the Most Important Pregnancy Outcome for Mothers and their Families?

"A Good 'Take-Home' Baby…"

Avoiding Cesarean or Episiotomy or moderate Maternal Morbidities do not come close

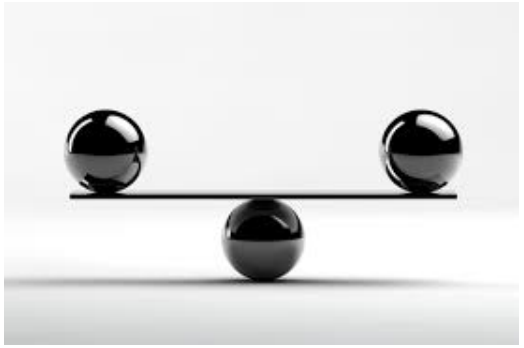
If Baby Outcomes Are So Important Why Are We Not Measuring Them?

Some of the issues…

- Which babies?
- What outcomes?
- Low rates of poor outcomes
- What poor outcomes are related to care?

Which Babies?

- All Babies versus Term Babies?
- Preterm infants have a wide range of outcomes related to gestational age, birth weight, intrauterine environment and other factors
- Not able to consider them as a homogeneous group
- Important principle: Some populations (e.g. premies) are not **expected** to go home or have perfect outcomes

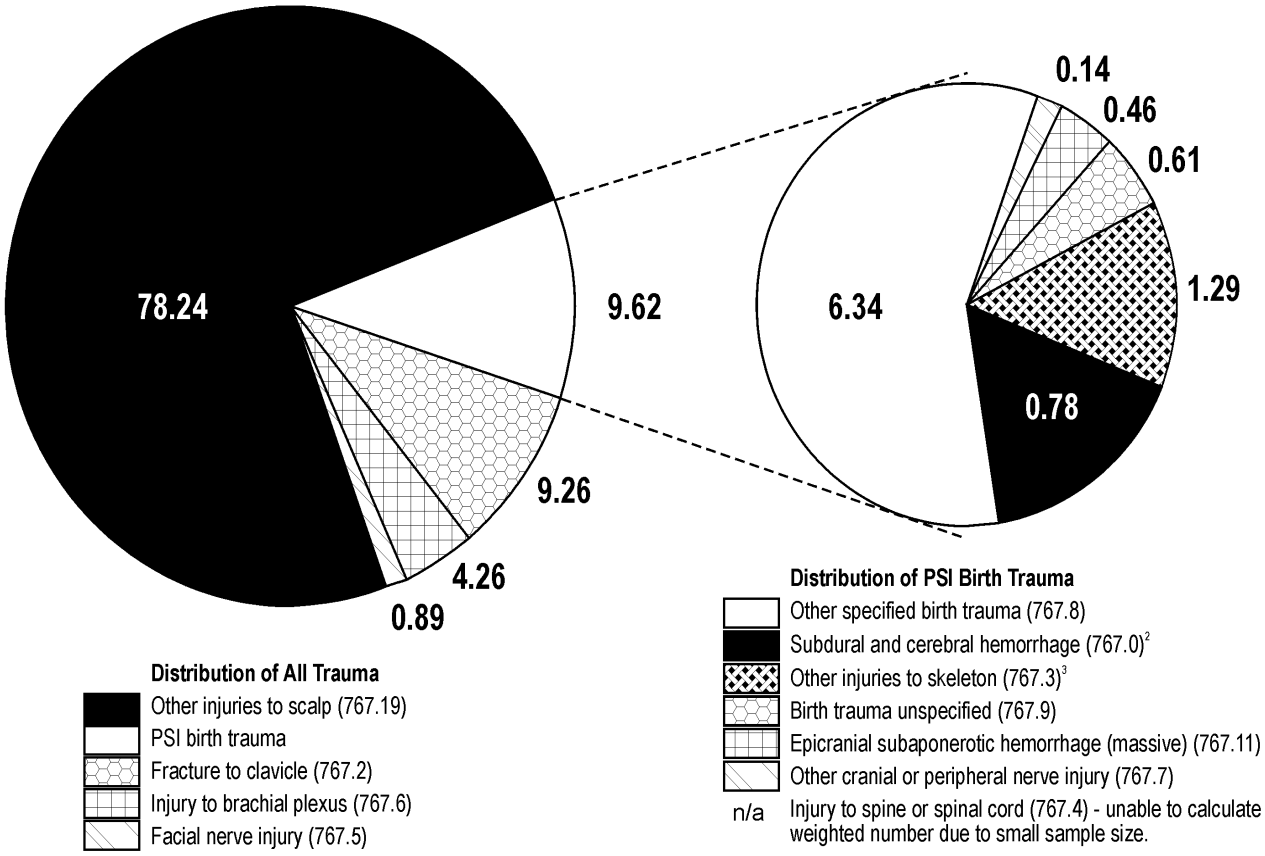


Survey of Prior Attempts to Measure Term Baby Outcomes

- Rate of Term Baby NICU admissions (or Term baby NICU LOS)
- AHRQ PSI 17: Birth Trauma Rate (injury to the infant)
- “Ideal Delivery” Rate (Gregory et al) (births without major complications)
- Neonatal Composite outcome measures (MFMU Network)

AHRQ PSI 17: Birth Trauma

Figure 1. Distribution of all neonatal birth trauma and birth trauma considered to be a Patient Safety Indicator by AHRQ, 2004-2005[1].



[1] *Denominator is total singleton live births with neonatal birth trauma in 2004-2005. However, percentages total 102.27 because some neonates had more that one type of neonatal birth trauma.*
[2] *Excluding infants weighing <2500g or EGA earlier than 37 weeks when using AHRC guidelines for PSA #17*
[3] *Excluding infants with diagnosis Osteogeneis Imperfecta when using AHRQ guidelines.*

Rates (per 1,000)

All Trauma: 25.9

PSI 17: 2.45

CS v. Vag (OR)

All Trauma: 0.55

PSI 17: 1.71

Moczygemba CK, Paramsothy P, Meikle S, et al. Route of delivery and neonatal birth trauma. Am J Obstet Gynecol 2010;202:361.e1-6.

AHRQ PSI 17: Birth Trauma

- Critique:
  - Small subset of all birth traumas
  - Very low rate: 2 per thousand births
  - Dominated by non-specific codes
  - Easy to "show improvement" by adjusting coding practices
  - Narrow view of birth outcomes…
- But it is easy to caluclate!

Gregory et al: "Ideal Delivery"

- Neonatal death, transfer
- Birth trauma (all codes)
- RDS, other respiratory problems
- Hypoxia, convulsions, ICH
- Neonatal infection

Total rate 9.8%

Many complications had short LOS…

Gregory KD, Friedman M, Shah S, et al. Global measures of quality- and patient safety-related childbirth outcomes: should we monitor adverse or ideal rates?
Am J Obstet Gynecol 2009;200:681.e1-681.e7.

Gregory et al: "Ideal Delivery"

- Critique:
  - Better
  - Seemingly high rate (~10%)
  - Includes a lot of cases with short LOS, suggesting they were minor issues
  - Not field tested

Research Neonatal Composites: MFMU Network

Neonatal outcome	
Death	1 (0.08)
Respiratory distress syndrome	49 (3.8)
Transient tachypnea of the newborn	69 (5.3)
Necrotizing enterocolitis	1 (0.08)
Sepsis	92 (7.1)
Mechanical ventilation	30 (2.3)
Seizure	1 (0.08)
Hypoxic–ischemic encephalopathy	0
Neonatal intensive care unit admission	212 (16.4)
5-min Apgar score 3 or less	1 (0.08)
Composite outcomes	217 (16.7)

Critique:

- Dominated by Respiratory and Sepsis diagnoses
- Equivalent to NICU admissions

(in this study of early repeat CS results were not representative)

Chiossi G etal., Timing of Delivery and Adverse Outcomes in Term Singleton Repeat Cesarean Deliveries. Obstet Gynecol 2013;121:561–9)

CMQCC Approach

- Started with: “Healthy Term Newborn” (“96%”)
- Reframed as the inverse:
  “Unexpected Newborn Complications” (“4%”)
- Wanted to set aside “pre-existing conditions”
  Settings in which the families expectations are lowered:
  - Preterm, small for dates, multiple gestations
  - Congenital malformations, big or small
  - Fetal diagnoses, Drug withdrawal

#1 Goal for all families:

The Devil is always in the Details…

- Use administrative data to minimize data burden
- NICU admission is a not a code (and grounds for admission vary greatly from unit to unit (and even shift to shift)
- Separate out Severe from Moderate complications
- Identify diagnosis categories (“buckets”) to facilitate QI projects
- Provide safeguards for over-coding and under-coding

UNC Denominator: Inclusions / Exclusions

- Include: Singleton livebirths (ICD10)
- BWt ≥2.5kg and GA≥37 weeks
- Exclusions:
  - All congenital malformations (Q codes)
  - Congenital disorders (from E and G codes)
  - Fetal-placental Conditions, Infections, IUGR, Hydrops, Rh sensitization (from A and P codes)
  - Maternal Drug Use and withdrawal symptoms (from P codes)

Complications were categorized from the viewpoint of the Family:

Frame 1 (Severe): "Would I be fearful of my baby's survival or long term outcome if my baby had…"

Frame 2 (Moderate): "Would I be upset if my baby had…."

Note that the concept of preventability is not used.

UNC Numerator: Severe Complication "Buckets"

- Severe Birth Trauma / Neurologic (e.g. intracranial hemorrhages, nerve injuries, Apgars at 5' or 10' ≤3, organ injuries, major fractures, hypoxic ischemic encephalopathy, coma, leukomalcia, EEG)
- Severe Infection (e.g. severe sepsis, sepsis with LOS>4 days)
- Severe Respiratory (e.g. Pulmonary hemorrhage, Mec aspiration with symptoms, ventilator, chest tubes, nitric oxide, ECMO)
- Severe Shock/Resuscitation (e.g. ATN, cardiogenic shock, insertion of arterial monitoring devices)
- Transfer to a Higher Level of Care (indicates a major morbidity and results in a major disruption to the family)

UNC: Coding Strategies

- After examining coding practices for hospitals around the state, "needs" appeared:
- Over-coding Protection:
  - Sepsis vs. "R/O Sepsis"—Added a requirement for a prolonged newborn LOS: LOS >4 days
- Under-coding Protection:
  - Diagnoses are not always recorded (e.g. a systematic exclusion of hypoxia codes) however procedure codes are almost always coded as they tie to billing.
  - Utilize both diagnosis and procedure codes for a "bucket" whenever appropriate (e.g nitric oxide, EEG, ventilator, ECMO)

UNC Numerator: Moderate Complication "Buckets"

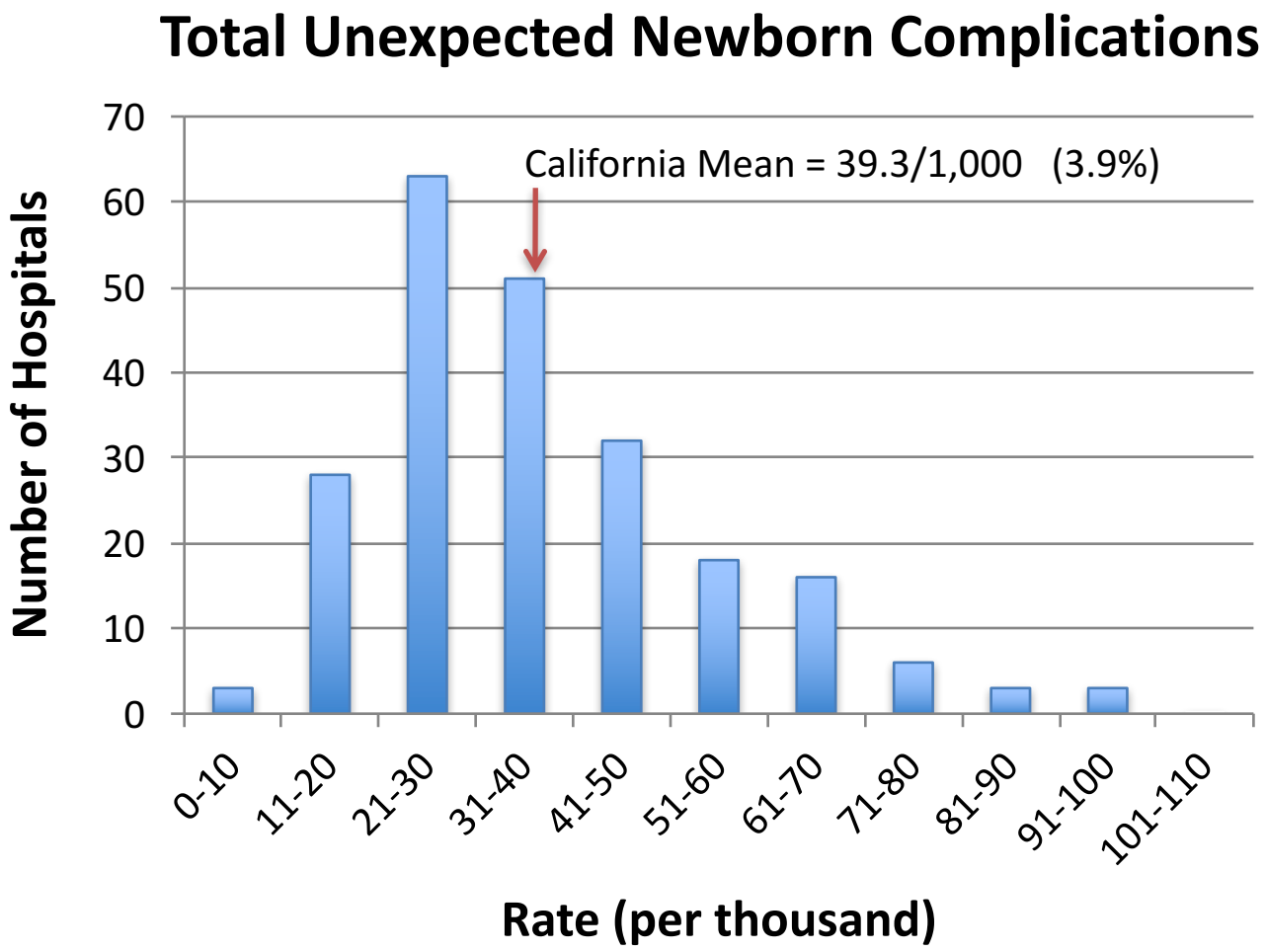
- Moderate Birth Trauma / Neurologic (e.g. facial nerve injury, clavical fracture; With LOS requirement: CT MRI, suspected to be affected by delivery, unspecified birth injury)
- Moderate Respiratory (e.g. RDS, interstitial emphysema, pneumothorax, CPAP; With LOS requirement: TTN, atelectasis, apnea, other respiratory distress)
- Severe Shock/Resuscitation (e.g. ATN, cardiogenic shock, insertion of arterial monitoring devices)

UNC: Coding Strategies-2

- Over-coding Protection:
  - A number of moderate complication diagnoses required a longer LOS than usual to indicate that it was consequential—Added a requirement for a prolonged newborn LOS: LOS >4 days for a Cesarean and >2 days for a vaginal birth
- Under-coding Protection:
  - Some cases had very few codes but very long LOS…suspcious for a morbidity
  - Screened these cases first for neonatal jaundice, phototherapy, and a series of codes for social problems (e.g. homelessness, child welfare custody, residential institution)
  - If none of these codes, these cases were considered moderate morbidity

Fig. 5: Frequency Distribution of UNC Measure

In California Hospitals (2011)



Significant variation noted in both large and small hospitals

Revised Specifications
NQF #716: Unexpected Newborn Complications
(aka Healthy Term Newborn)

Table 2: Sub-Measure Calculations

An additional feature is the ability to calculate several sub-measures to direct Quality Improvement efforts. These "buckets" include like-diagnoses from both severe and moderate categories. Hospital level comparisons show significant variation in these categories. This Sub-measure analysis allows hospitals to focus on specific care practices to drive QI. See Appendix 6 for details on the Sub-Category groupings.

Neonatal Complication Sub-Categories	Proportion of Total Complications (California 2011)	Rate of each Complication Category (per 1,000 births)
Respiratory	35.5%	13.5
Infection	16.7%	6.3
Transfer to Higher Level of Care	14.9%	5.6
Neurologic/Birth Injury	12.6%	4.8
Shock/Resuscitation	12.0%	4.5
Long LOS (without clear diagnosis)	8.4%	3.2

Unexpected Newborn Complications: NQF Validation Studies: Anisha Abreo, MPH

- Face Validity:
  - In a comparison trial for neonatal morbidity by gestational age UNC tracked very closely to NPIC (major East Coast perinatal data set) analysis using NICU admissions and major complications
- Formal Reliability Testing
  - NQF requirement using RAND statistical tools
  - Tests ability to discriminate among hospitals (variation and frequency)
  - Good is 0.8, excellent is 0.9
  - Mean Reliability among 220 California hospitals =0.92
- Stability within a hospital over time
  - Tested for 3 6-month periods with minimal variation noted in >90% of California hospitals

Figure 3A: Neonatal Special Care, Ventilation and Combined Respiratory Morbidities (NPIC)
Odds Ratios by Gestational Age in Completed Weeks

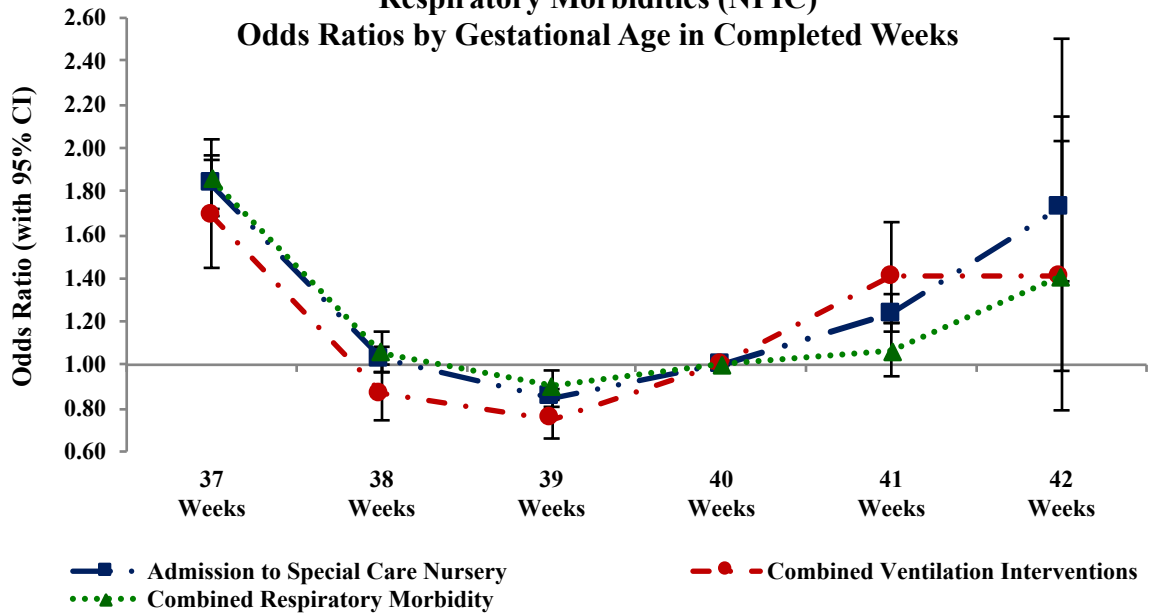
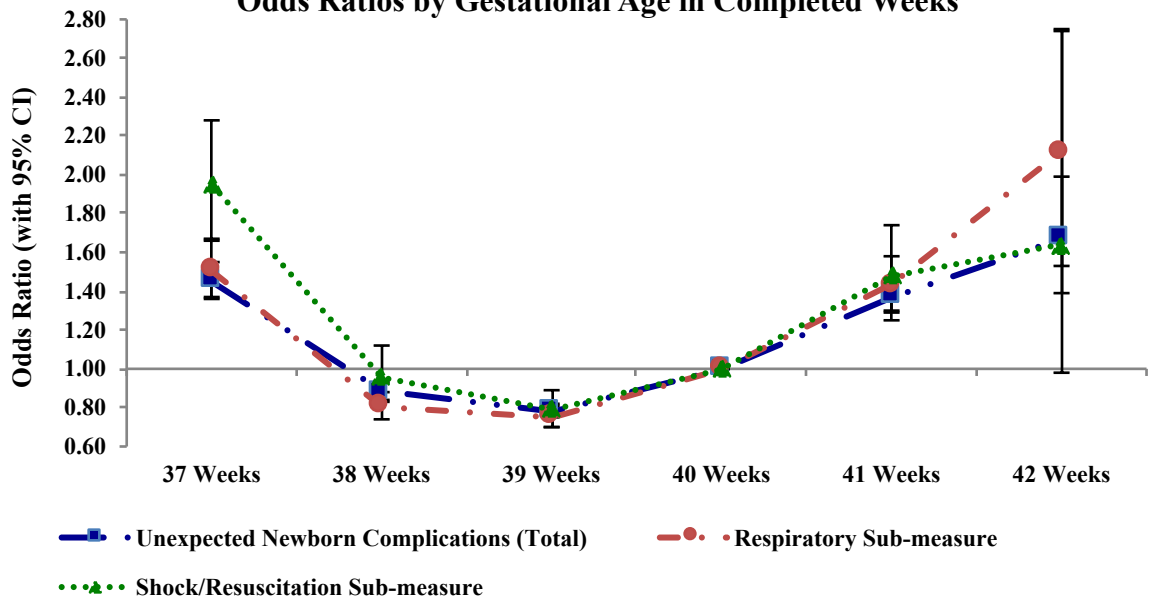
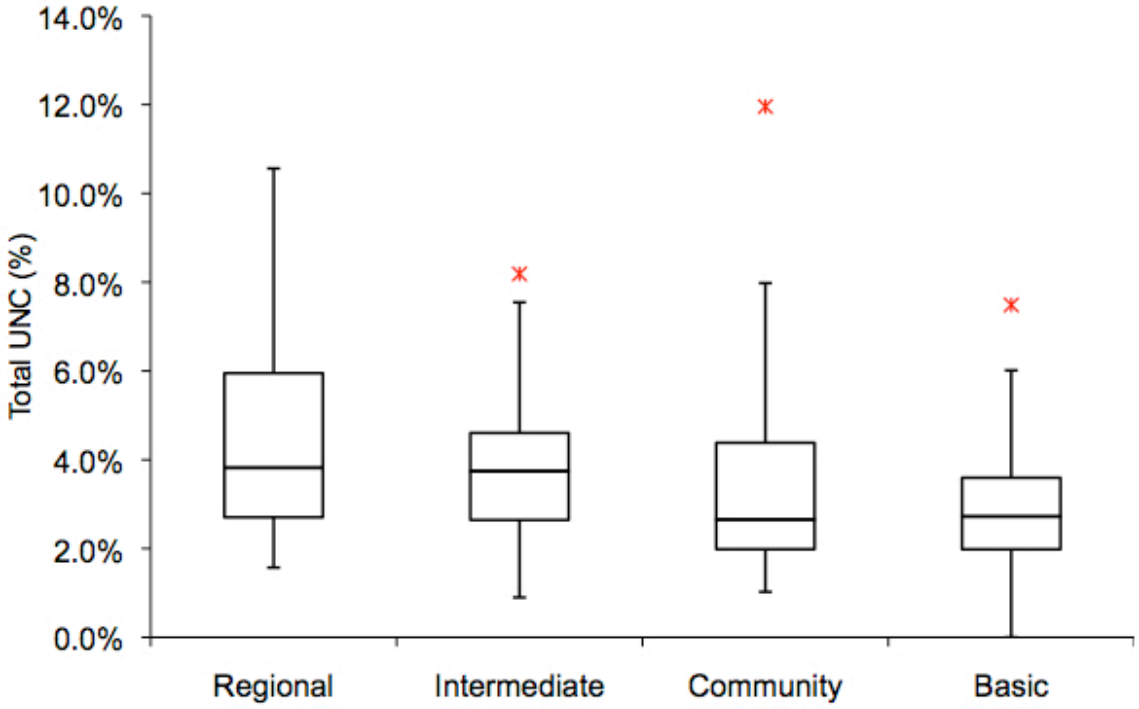


Figure 3B: Neonatal Composite Morbidities (California)
Odds Ratios by Gestational Age in Completed Weeks

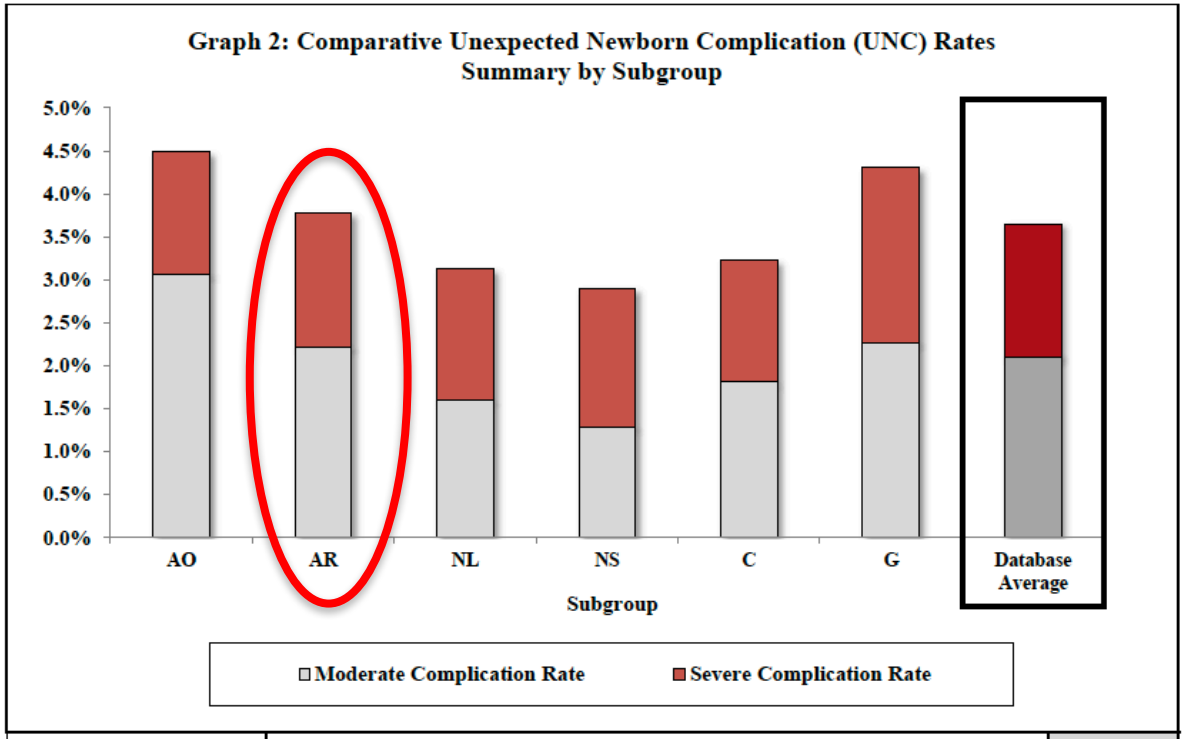


Unexpected Newborn Complications: NICU Levels



Labels	Regional	Intermediate	Community	Basic
Min	1.6%	0.9%	1.0%	0.0%
Q_1	2.7%	2.6%	2.0%	2.0%
Median	3.8%	3.7%	2.7%	2.7%
Q_3	5.9%	4.6%	4.4%	3.6%
Max	10.6%	8.2%	12.0%	7.5%
IQR	3.2%	2.0%	2.4%	1.6%
Upper Outliers	0.0%	100.0%	300.0%	200.0%
Lower Outliers	0.0%	0.0%	0.0%	0.0%

NPIC UNC Results: Hospital Sub-groups



	Subgroup						Database Average
	AO	AR	NL	NS	C	G	
Total UNC Rate	**4.5%**	**3.8%**	**3.1%**	**2.9%**	**3.2%**	**4.3%**	**3.7%**
Severe UNC Rate	1.4%	1.6%	1.5%	1.6%	1.4%	2.0%	1.6%
Moderate UNC Rate	3.1%	2.2%	1.6%	1.3%	1.8%	2.3%	2.1%

There are currently six subgroup categories:

AO Academic OB Level II and III

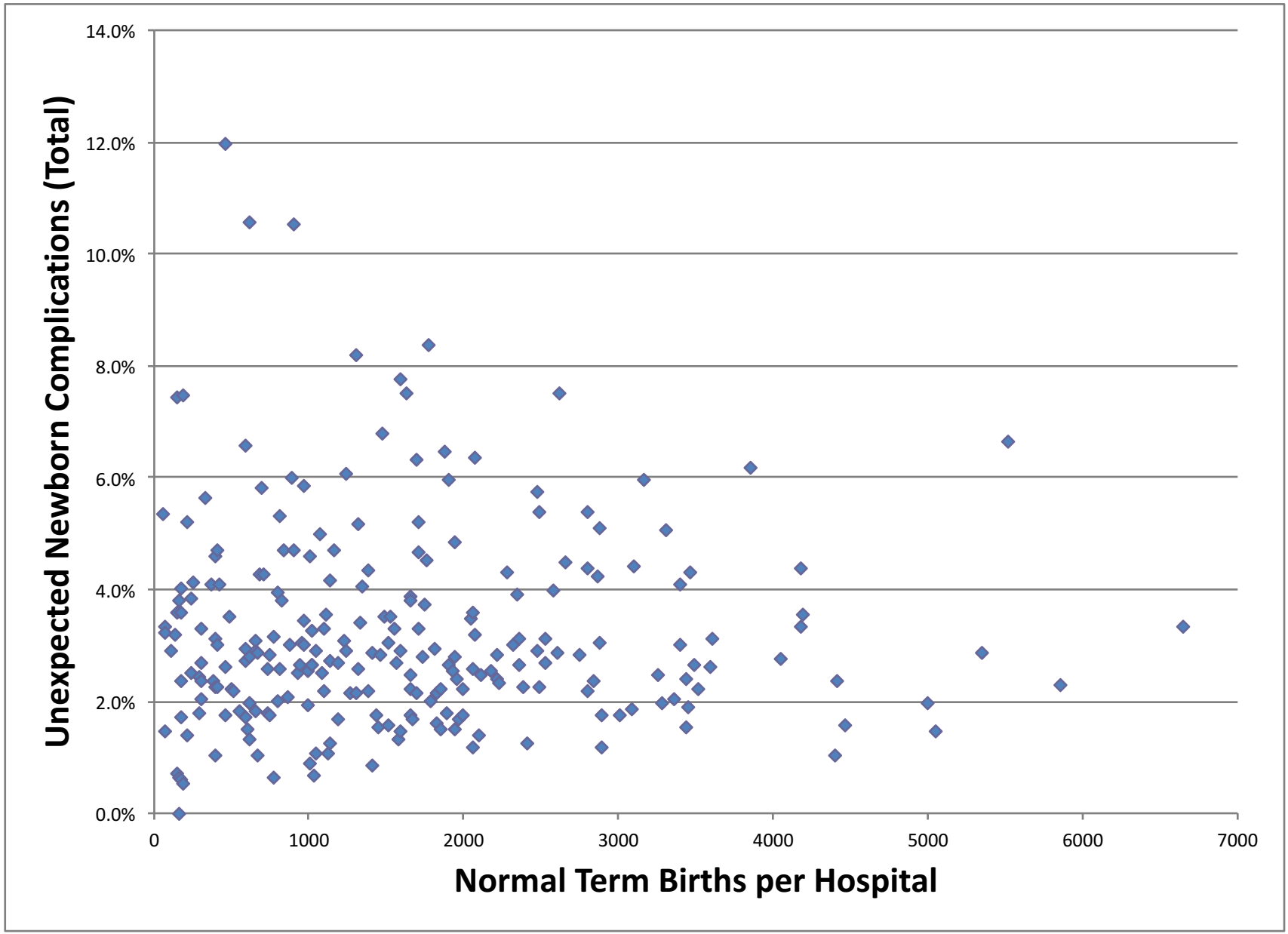
AR Academic Regional Perinatal Centers

NL Non-Academic Large (≥ 1,100 annual livebirths)

NS Non-Academic Small (<1,100 annual livebirths)

C Council of Women's and Infants' Specialty Hospitals *(CWISH)*

G Georgia Regional Perinatal Centers


Unexpected Newborn Complications (Total)
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
0
1000
2000
3000
4000
5000
6000
7000
Normal Term Births per Hospital

Does UNC Need Risk Adjustment?

- Differences between NICU levels could indicate a need
  - Case mix? More maternal disorders HTN, DM?
  - More aggressive treatments?
- Under active investigation
- At his point, we are recommending that comparisons be made between hospitals at the same level rather than compared to all

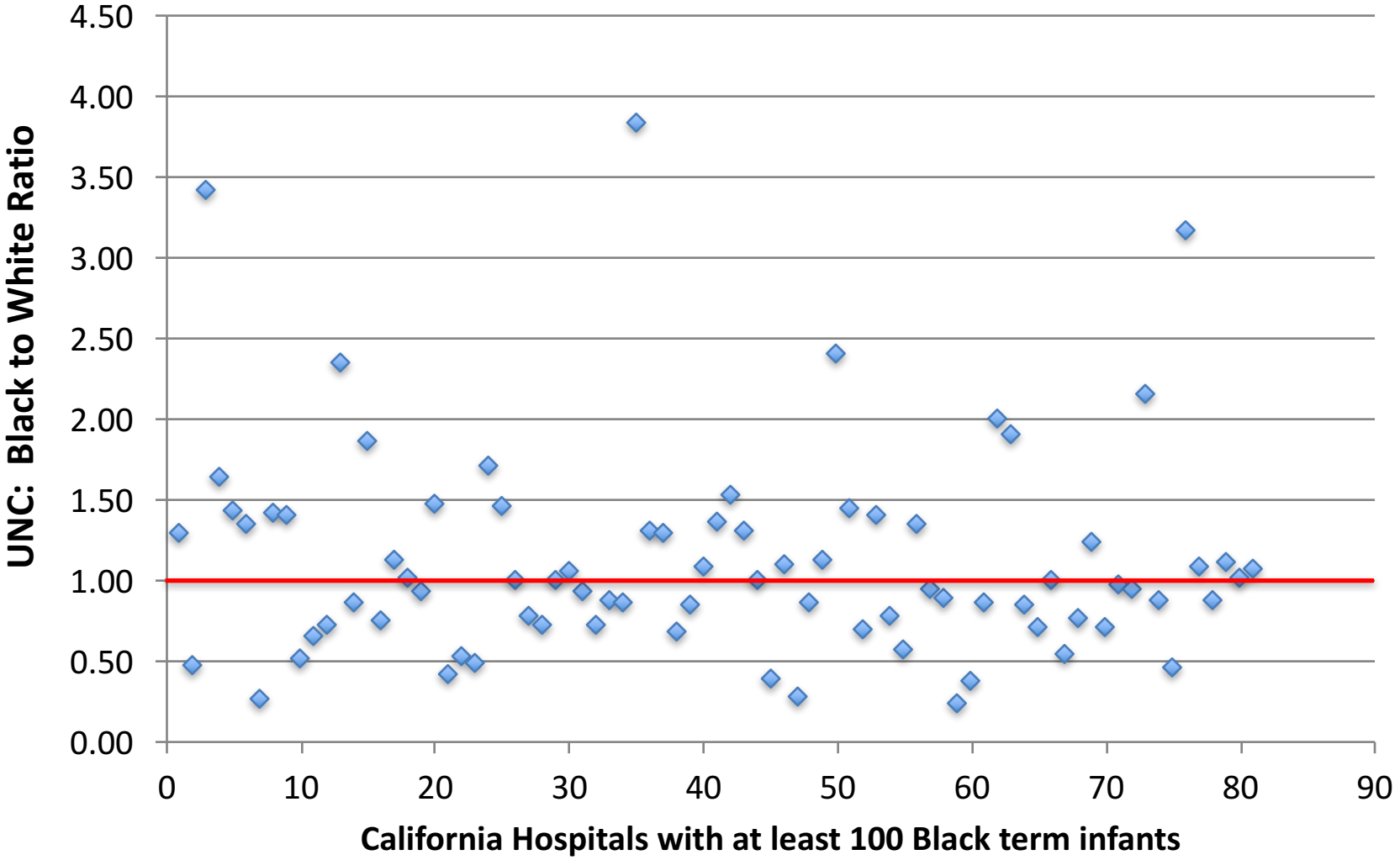
UNC: Effects of Race / Ethnicity

	Rate	Numerator	Denominator	Total Population
Hispanic, Native Born	3.90%	3,865	99,210	116,855
Hispanic, Foreign Born	3.61%	3,534	98,003	114,771
Non-Hispanic White	4.19%	4,770	113,972	134,320
Non-Hispanic Black	4.49%	916	20,381	26,307
Asian / Pacific Islander	3.39%	2,210	65,161	76,701
Others	4.91%	516	10,500	26,825
OVERALL	3.88%	15,811	407,227	495,779

Race and ethnicity have only modest effects.
Perhaps because of elimination of preexisting conditions?

All California Births: 2014 (CMQCC Maternal Data Center)

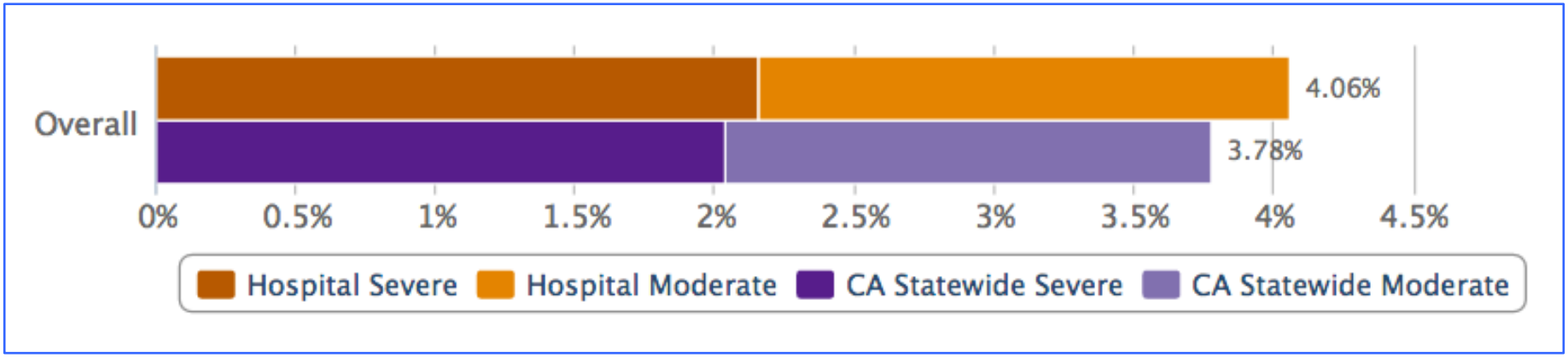
Individual Hospital Ratios of Black to White UNC Rates



Black Race may be a factor among individual hospitals…..

All California Births: 2014 (CMQCC Maternal Data Center)

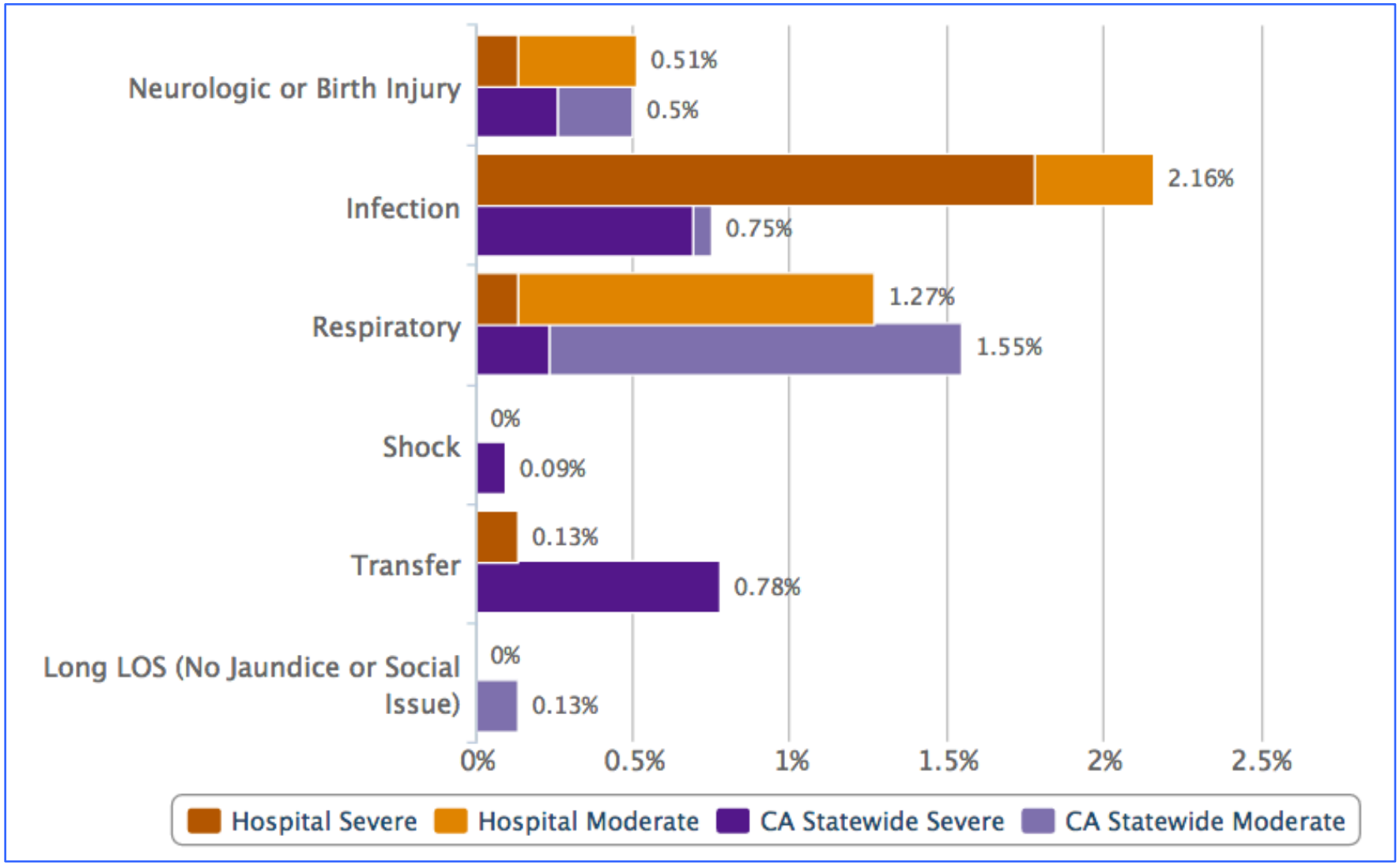
UNC By Morbidity Level



Generally, 50-60% of UNC morbidities fall into the Severe category.

(CMQCC Maternal Data Center Screen Shot)

UNC By Subcategory ("Bucket")



(CMQCC Maternal Data Center Screen Shot)

But can we do anything about it?

- 4 Case studies showing ability to improve care and reduce rates

UNC High Rate: Case Study 1

- High rate of Moderate Respiratory Comps
- Drill Down to individual cases
- High rate of CPAP use
- **Chart review:** staff were billing for CPAP when called to the delivery room and providing a few minutes of bag and mask resuscitation

UNC High Rate: Case Study 2

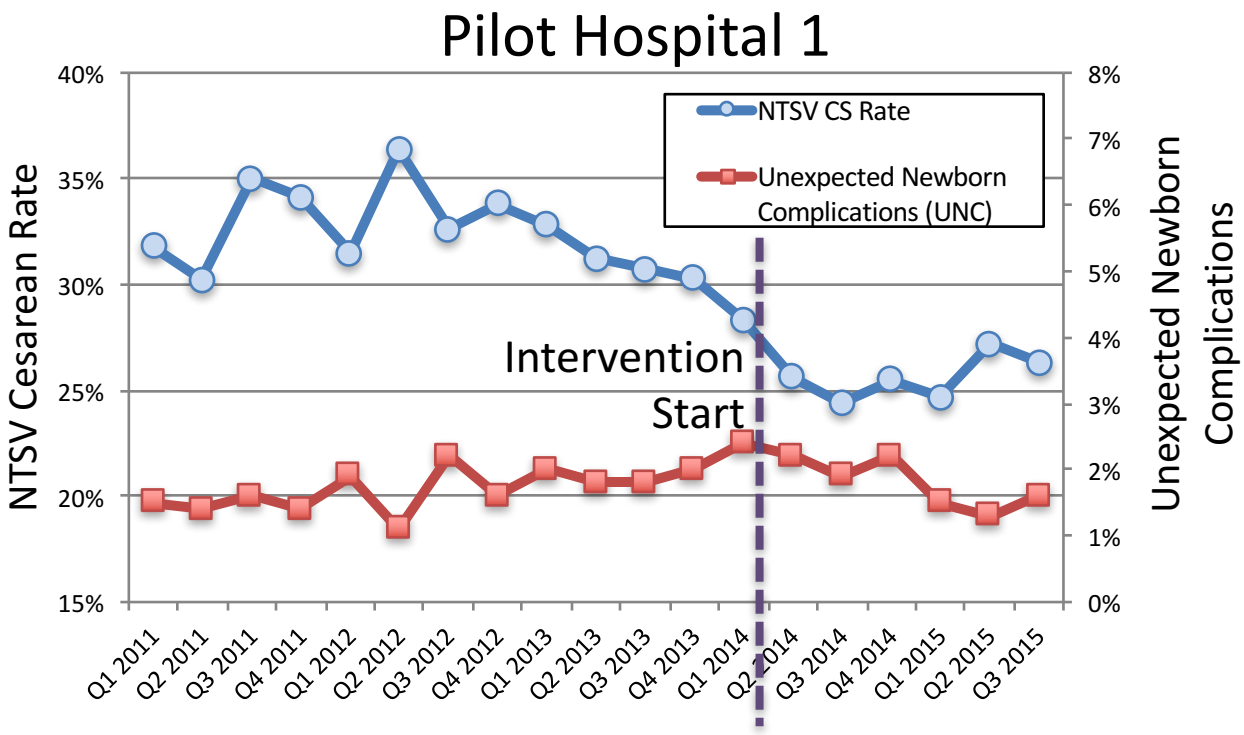
- High rate of Moderate Birth Injury Comps
- Drill Down to individual cases
- High rate of Fracture of Clavicle (1%)
- **Chart review:** Excess cases were localized to 2 obstetricians who had high rates of elective low- vacuum deliveries

UNC High Rate: Case Study 3

- High rate of Severe Infection Comps
- Drill Down to individual cases
- High rate of Septicemia
- **Chart review:** GBS infections in 37week births without knowledge of GBS status or chemoprophylaxis; no antibiotic treatment of maternal temps of 38.3C to 38.5C for several hours in labor

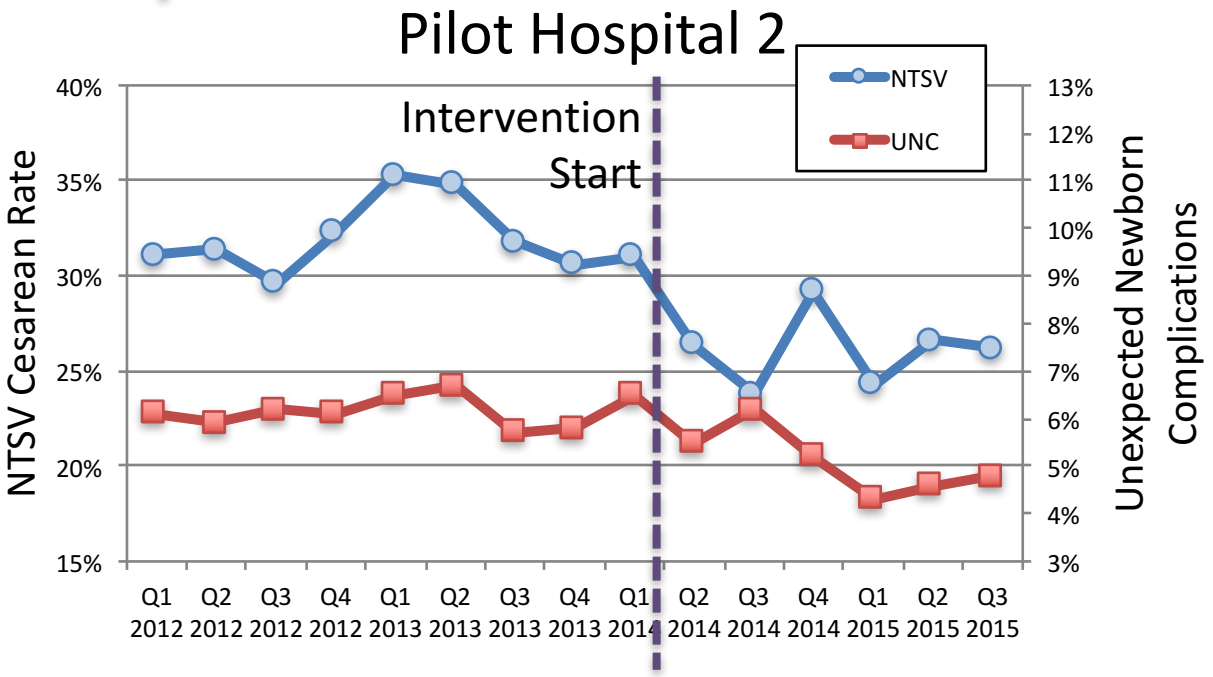
UNC High Rate: Case Study 4

- High rate of Severe Infection Comps
- Drill Down to individual cases
- High rate of Sepsis with treatment for 5 days
- **Chart review:** Sepsis was diagnosed by c-reactive protein (cultures were negative). Their sepsis protocol was leading to probable overtreatment compared to other nurseries. Changed protocol and case rate fell significantly.

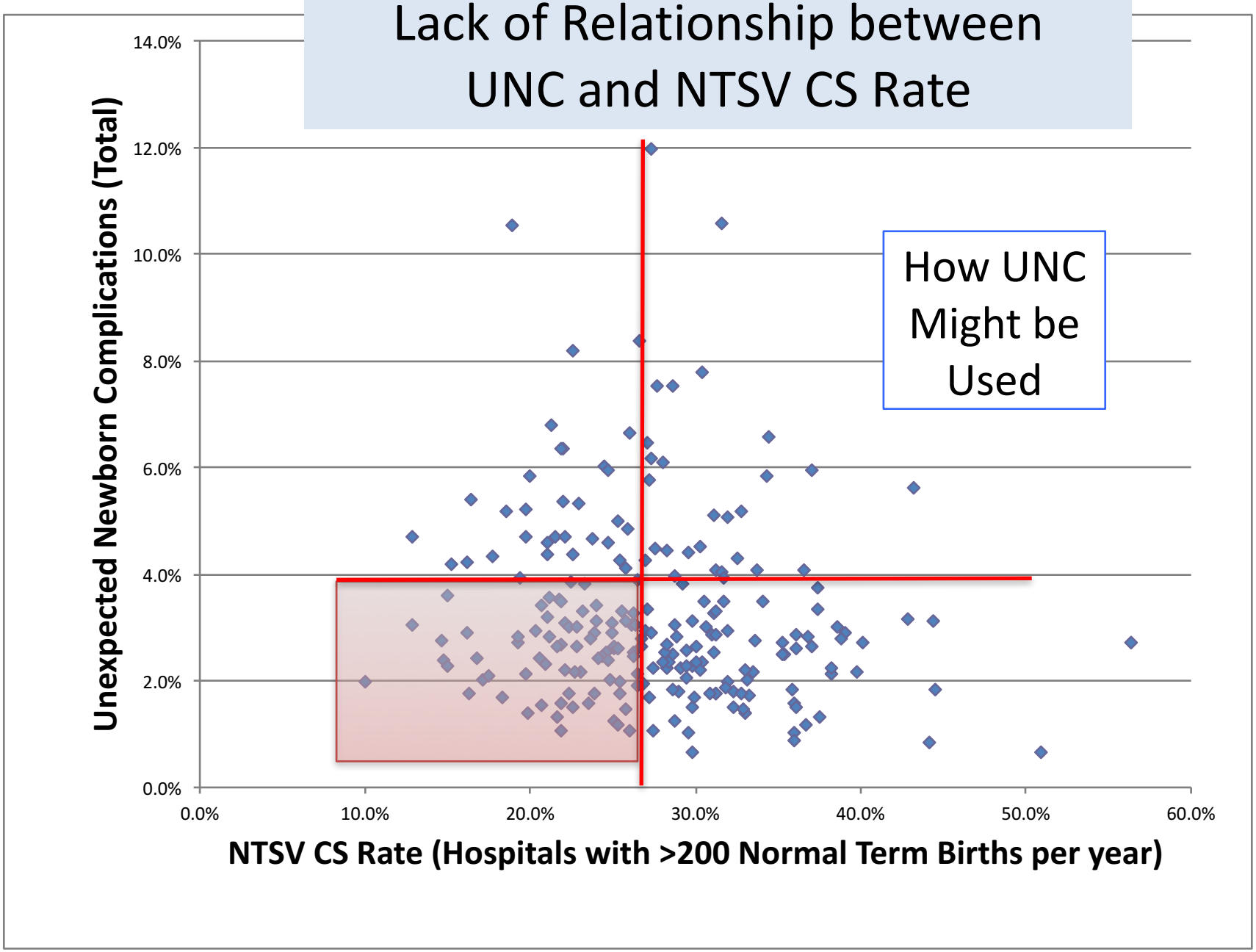


Unexpected Newborn Complications as a balancing measure for Cesarean reduction projects

In each pilot hospital, after successful intervention to reduce NTSV Cesarean births (down 15-22%), Unexpected Newborn Complications measure was either unchanged or reduced, reassuring the medical staff.



Lack of Relationship between UNC and NTSV CS Rate



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- Balancing Coding: Over-coding /Under-coding

UNC Conclusions

- Reflects a patient/family viewpoint but also resonates with physicians
- More variation than expected
- More improvement opportunities than expected
- Sensitive to both obstetric practice and neonatal care

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UNC Summary

- Validated term baby outcome measure
- Able to drill-down and examine reasons for higher levels / improvement opportunities
- May need to adjust for NICU level, but note large variation within levels
- Suitable to be used as a balancing measure for primary or NTSV Cesarean rate

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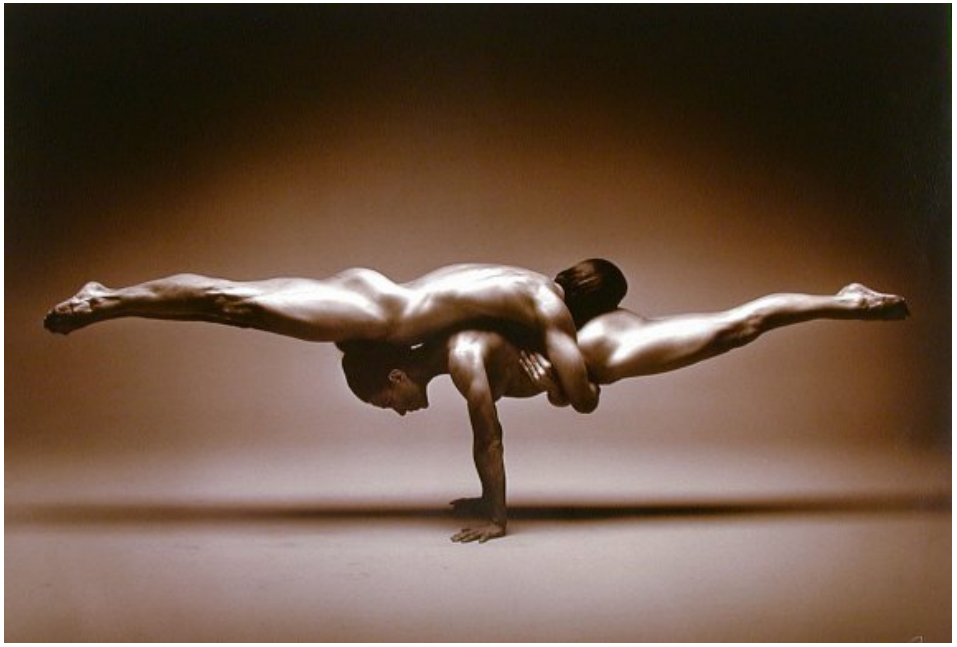
Thank You

may you be in balance…



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