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Private hospital group

25 Years of Quality Care



VON Data Analysis

Interpretation of the statistics



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Agenda



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Introduction

SMRs and shrunken SMRs

Shrunken O-E estimates

Adjusted average total LOS



The nature of statistics



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**“Statistics are like a bikini.
What they reveal is
suggestive, but what they
conceal is vital.”**

– Aaron Levenstein

VON Annual Reports



Two factors leading to differences in results **even when no true differences between NICUs exist:**

- 1) Small sample size (volatility of estimates)
- 2) Differences in casemix

To deal with these two factors, the VON report does the following:

- Report outcomes/interventions by birth weight, gestational age, birth location
- Using a multivariable risk-adjustment model to adjust for casemix differences
- Use of SMRs and shrunken SMRs
- Comparing each centre's observed rates to the expected rate for that centre

Standardised Morbidity/Mortality Ratio (SMR)



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Standardized morbidity/mortality ratio (SMR):

- Number of expected cases is calculated by using a **multivariable risk-adjustment model**
- **Ratio** of the number of observed cases (O) to the number of expected cases (E)

Shrunken SMR



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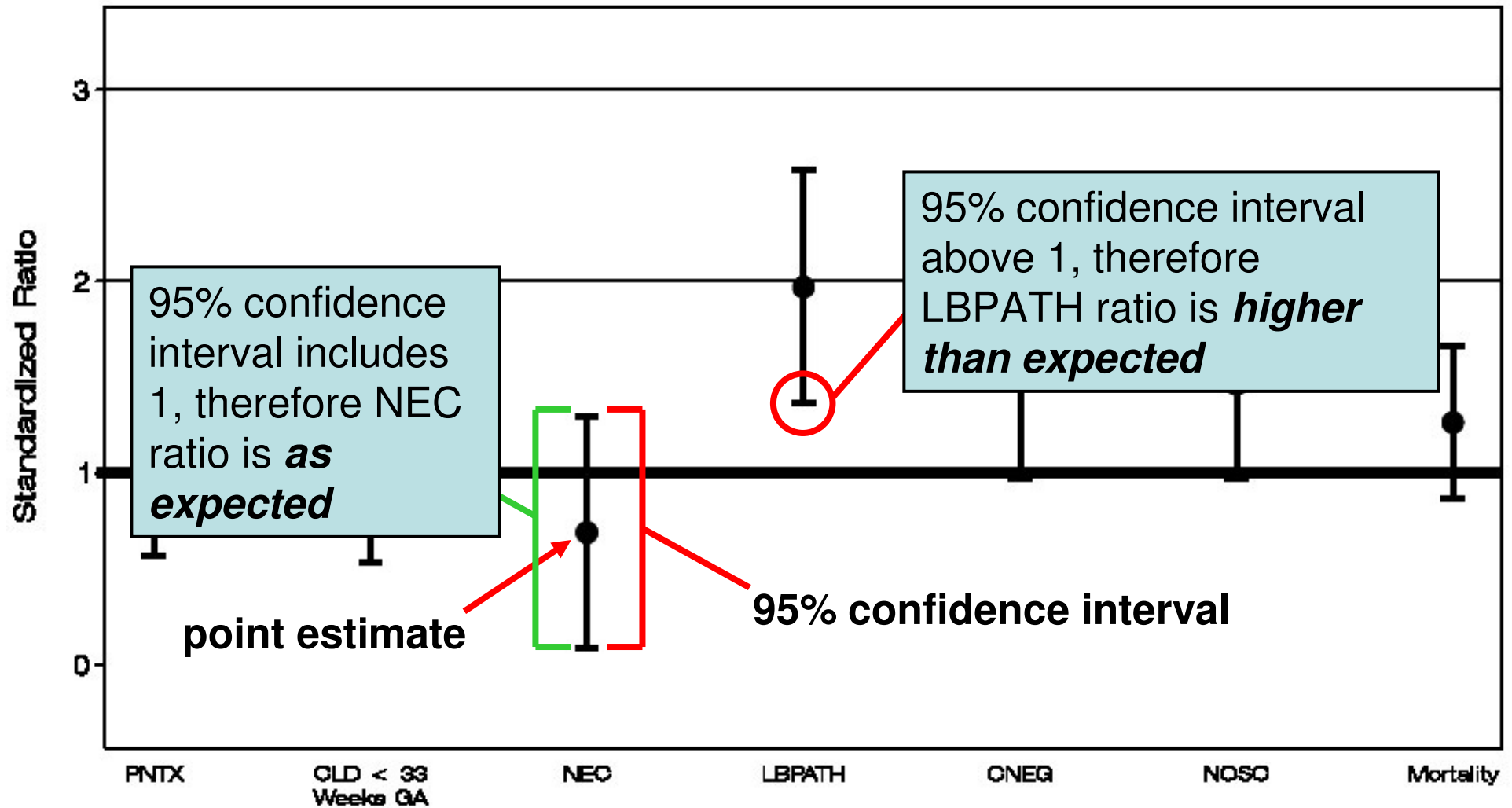
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“Shrunken” SMRs:

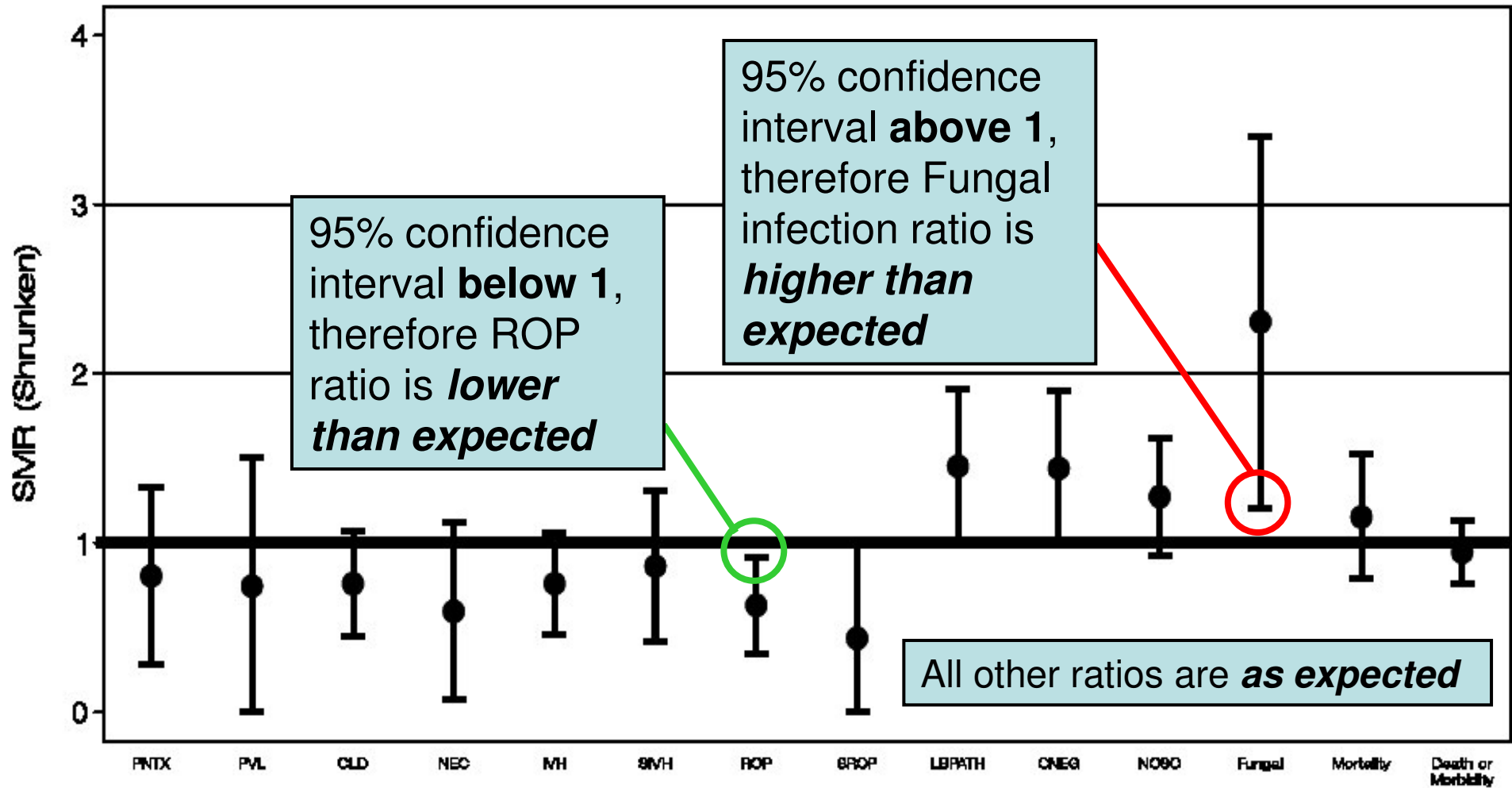
- Some observed variation between NICUs is random noise, particularly for small hospitals
 - SMR estimates are corrected (“shrunken”) to filter this random variation
- **Shrinking:** adjusting the SMR value by **moving it closer to the mean value** of all Expanded Data Centre SMRs when the estimate is imprecise (i.e. when the number of cases is small)
- **Method:** **weighted average between the calculated SMR and the mean of all hospital SMRs.** For hospitals with a small number of infants, the Network mean value will be weighted more heavily; for large hospitals, the calculated SMR will be weighted more heavily
- Shrunken SMRs are **more stable estimates**

SHRUNKEN STANDARDIZED MORBIDITY AND MORTALITY RATIOS (SMR) All Eligible Infants Born in 2007



Vertical bar represents the 95% confidence interval for the SMRs.

SHRUNKEN STANDARDIZED MORBIDITY AND MORTALITY RATIOS (SMR) Infants 501–1500 Grams Born 2005 to 2007



Vertical bars represent the 95% confidence interval for the SMRs.

Vermont Oxford Network 2007 VLBW QMR for Center [REDACTED]

TABLE 1.4, RISK-ADJUSTED OUTCOME MEASURES
 Infants 501 TO 1500 Grams Born 2005 to 2007

	2005 to 2007					
	N	SMR (Shrunken)	SMR 95% Lower	SMR 95% Upper	O-E (Shrunken)	O-E vs Control Limit
Pneumothorax	146	0.81	0.28	1.33	-1	Within
PVL	133	0.75	0.00	1.50	-1	Within
CLD	134	0.76	0.45	1.07	-8	Within
NEC	146	0.60	0.07	1.12	-4	Within
IVH	133	0.76	0.46	1.06	-7	Within
Severe IVH	133	0.86	0.42	1.31	-1	Within
ROP ←	118	0.63	0.34	0.92	-15	Below
Severe ROP	118	0.44	0.00	1.01	-4	Within
Infections						
Late Bacterial	144	1.45	1.00	1.91	7	Within
Coag Neg Staph	144	1.44	0.99	1.90	7	Within
Nosocomial	144	1.27	0.93	1.62	7	Within
Fungal ←	144	2.31	1.21	3.41	2	Above
Mortality	148	1.15	0.79	1.52	2	Within
Death or Morbidity	148	0.95	0.76	1.13	-4	Within

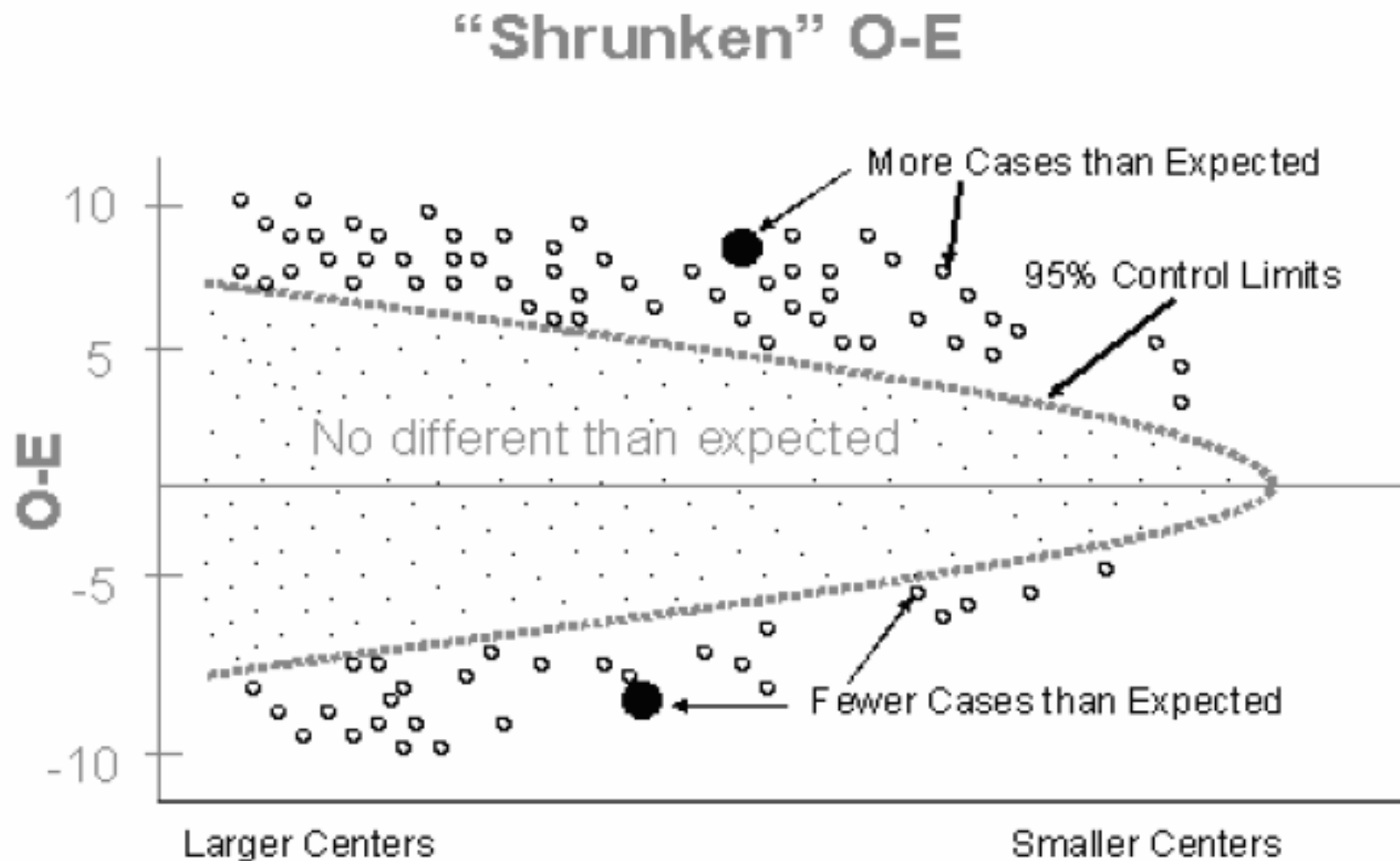
Shrunken O-E Estimates



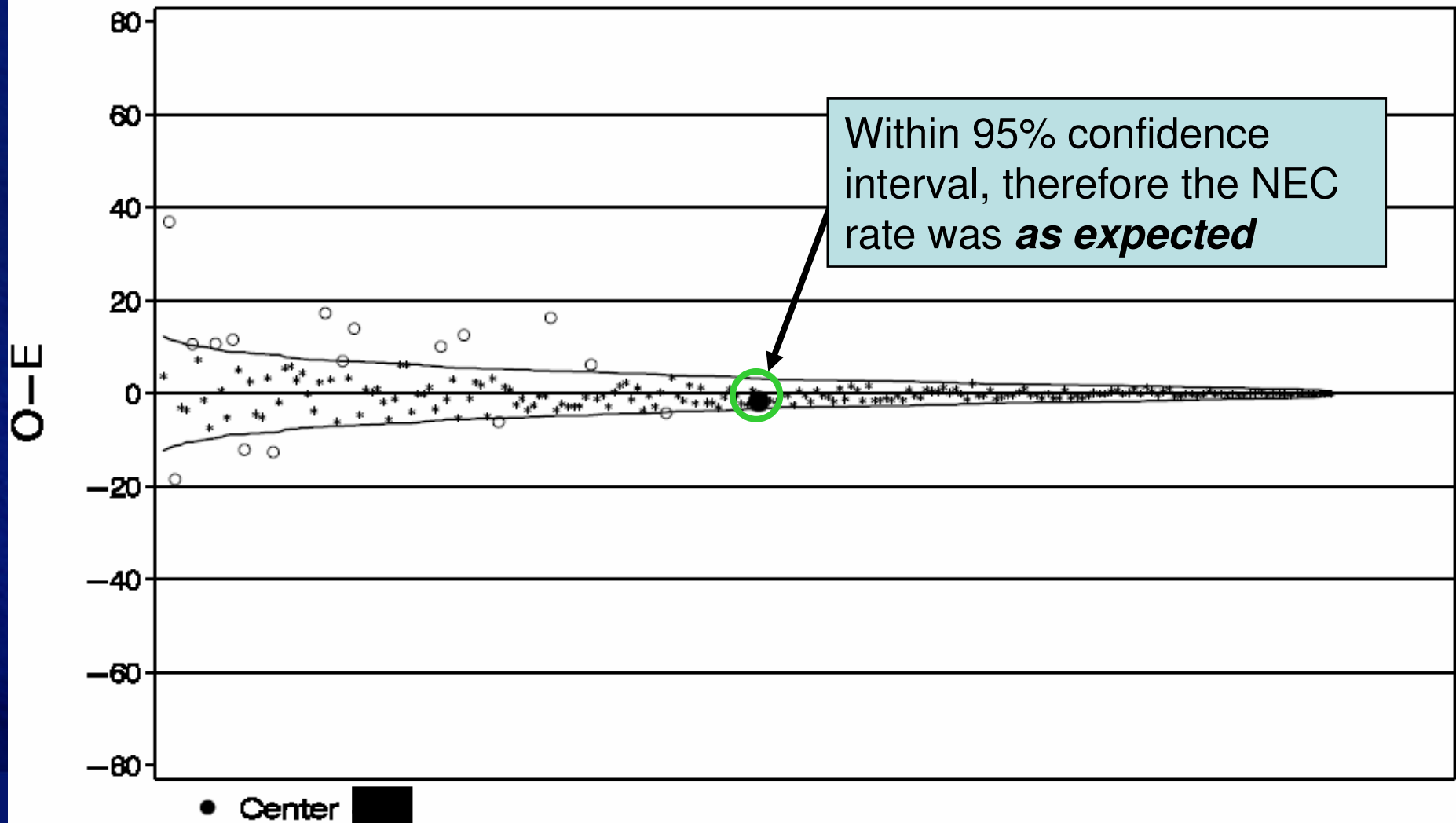
Observed – Expected (O-E) estimates:

- an indication of the number of patients lost/ill, **beyond** the number expected to be lost/ill
- expected values calculated with **same multivariable risk-adjustment model** as used for SMRs
- O-E estimates also **corrected** using **shrinkage methods**
- Interpretation of the O-E estimates:
 - < 0 : performance was *better than expected*
 - > 0 : performance was *worse than expected*
 - = 0 : performance was *as expected*
- 95% control limits also given

Shrunken O-E Estimates



OBSERVED MINUS EXPECTED VALUES
NECROTIZING ENTEROCOELITIS
All Eligible Infants, Shrunken Estimates for Birth Year 2007

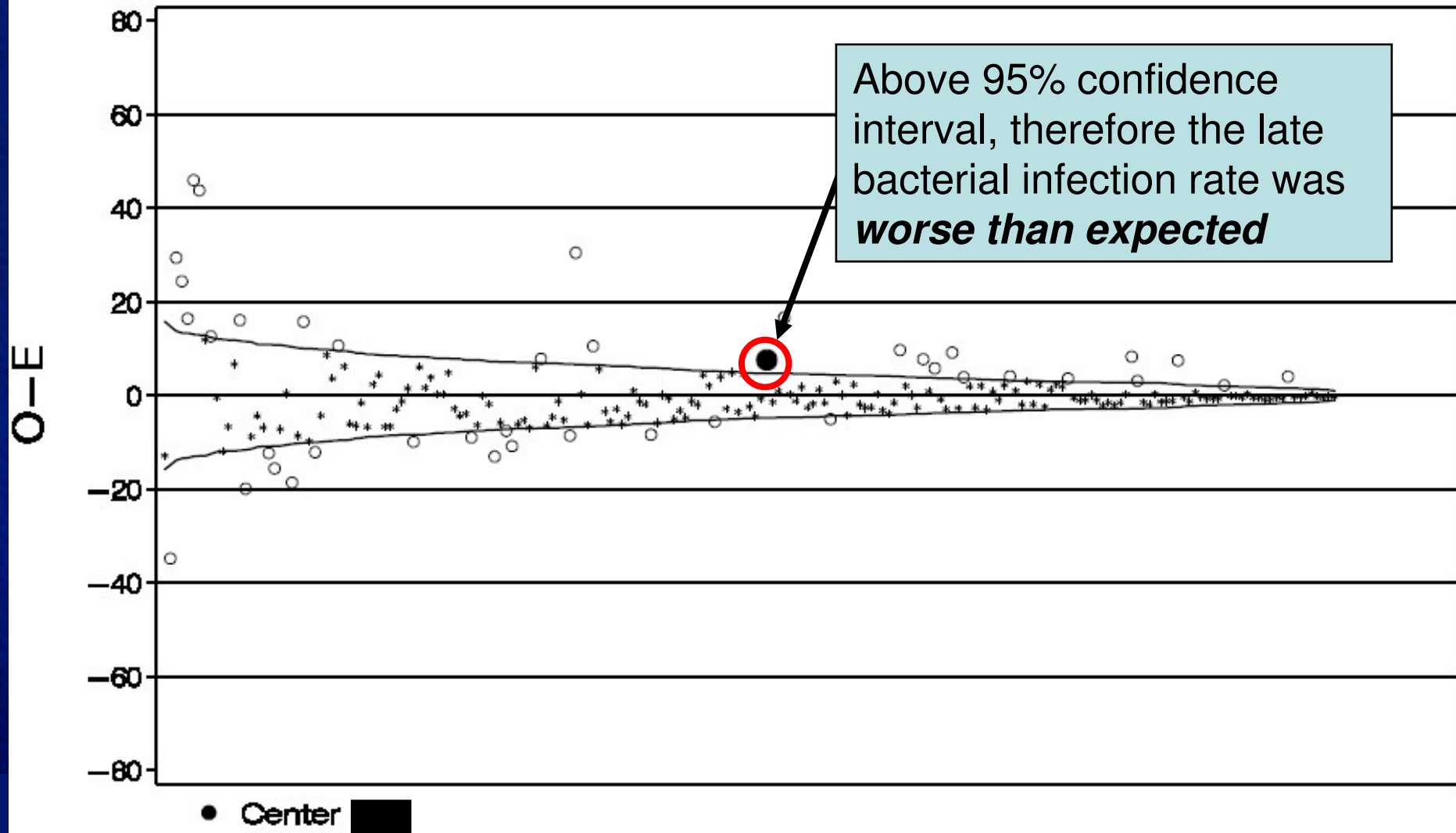


95% control limits are shown.

Figure 1.12

OBSERVED MINUS EXPECTED VALUES LATE BACTERIAL INFECTION

All Eligible Infants, Shrunken Estimates for Birth Year 2007

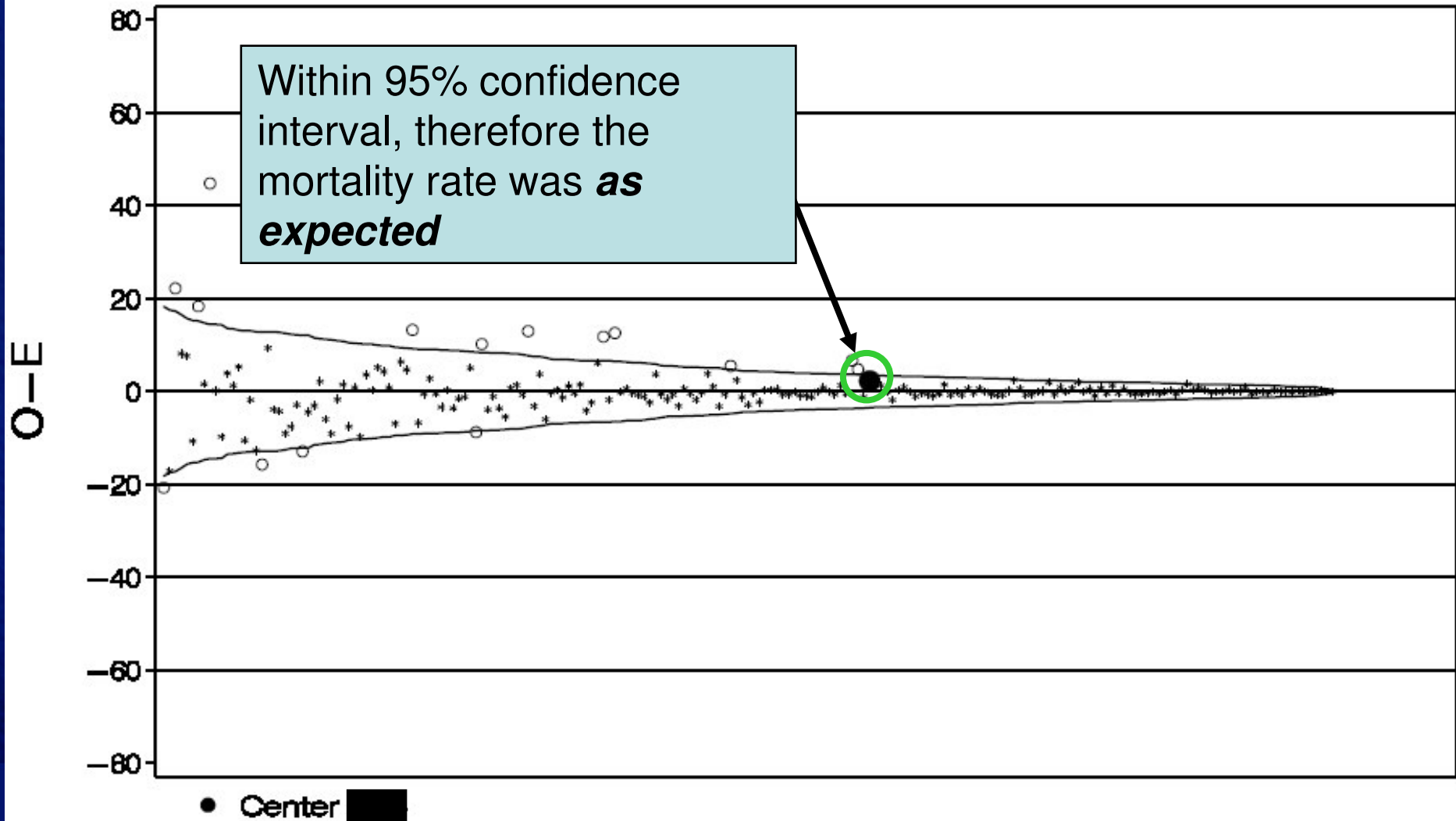


95% control limits are shown.

Figure 1.13

OBSERVED MINUS EXPECTED VALUES MORTALITY

All Eligible Infants, Shrunken Estimates for Birth Year 2007



95% control limits are shown.

Figure 1.16

Adjusted Average Total LOS



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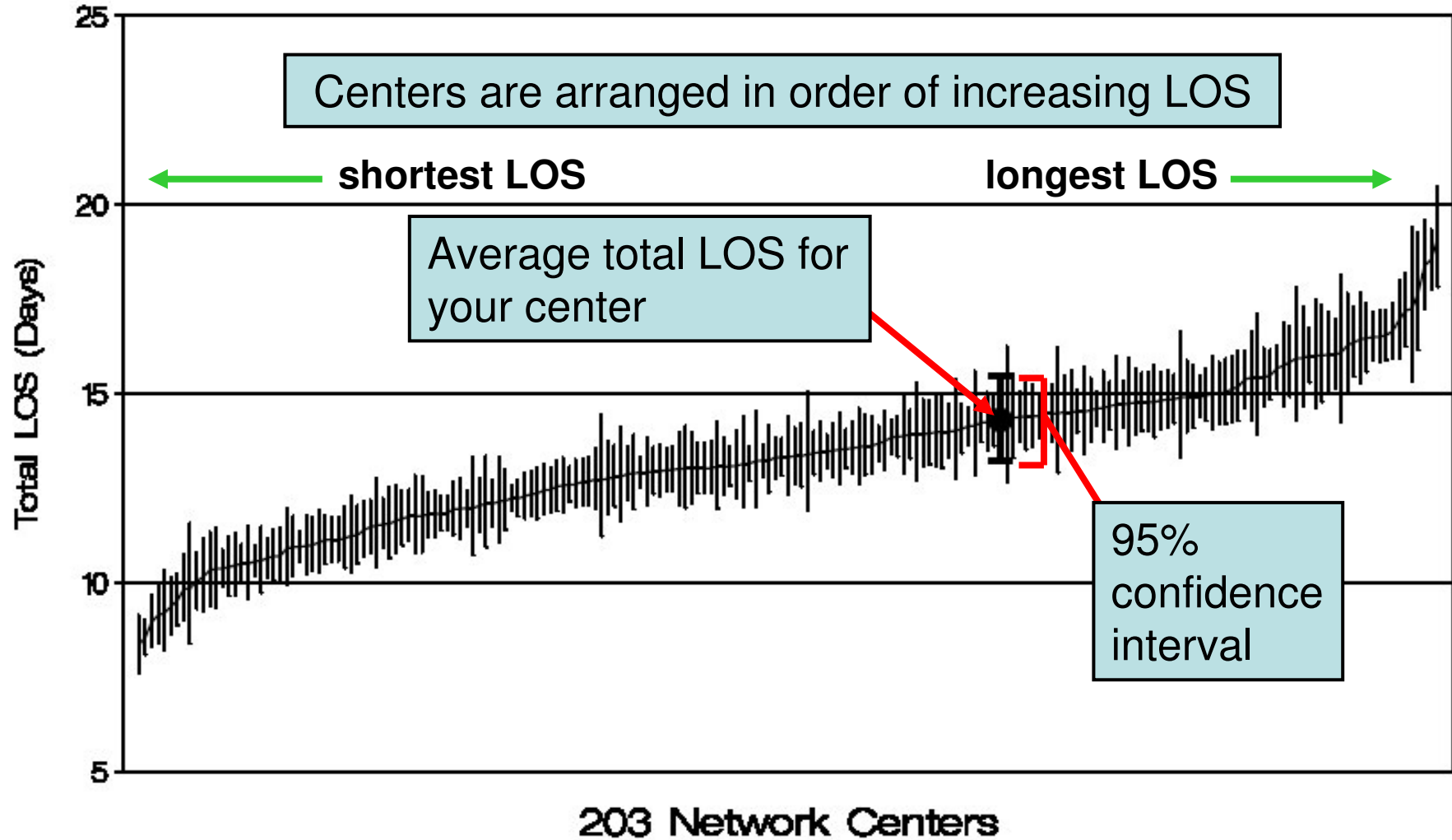
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Adjusted Average Total Hospital Stay graph:

- centers are arranged **in order of increasing LOS**
- **black dot** → Average LOS at your center
- **vertical bars** → 95% confidence intervals for the average LOS

ADJUSTED AVERAGE TOTAL HOSPITAL STAY (LOS)
All Surviving Eligible Infants Born in 2007



• Center [redacted] Adjusted LOS: 14; 95% C.I.: 13, 15

Vertical bar represents 95% confidence interval for the geometric mean.



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Questions?