

**Online Appendix B: Results from sensitivity analyses**

**Table B1** Adjusted odds ratios for outcomes associated with admission to either tertiary or high volume neonatal care at the hospital of birth using an instrumental variable logistic regression model; infants with missing data excluded

Outcome	Tertiary neonatal unit			High volume neonatal unit <sup>a</sup>		
	(1) ≤32 <sup>+6</sup> weeks n=19,382	(2) ≤26 <sup>+6</sup> weeks n=2,452	(3) 27 <sup>+0</sup> -32 <sup>+6</sup> weeks n=16,930	(4) ≤32 <sup>+6</sup> weeks n=19,382	(5) ≤26 <sup>+6</sup> weeks n=2,452	(6) 27 <sup>+0</sup> -32 <sup>+6</sup> weeks n=16,930
Neonatal Mortality	0.88 (0.67-1.17)	1.03 (0.63-1.69)	0.82 (0.59-1.14)	0.68** (0.52-0.90)	0.51** (0.31-0.84)	0.80 (0.57-1.11)
Any in hospital mortality	0.85 (0.67-1.08)	0.95 (0.61-1.47)	0.84 (0.64-1.11)	0.67** (0.53-0.84)	0.50** (0.32-0.79)	0.79 (0.59-1.05)
BPD	1.16 (0.93-1.44)	1.01 (0.64-1.61)	1.15 (0.90-1.46)	1.03 (0.84-1.26)	1.86** (1.17-2.97)	0.94 (0.74-1.18)
Treatment for ROP	1.93* (1.16-3.21)	1.76 (0.91-3.77)	1.94 (0.93-4.06)	1.04 (0.61-1.77)	0.63 (0.32-1.27)	1.79 (0.81-3.95)
Surgery for NEC	1.04 (0.63-1.73)	0.68 (0.32-1.45)	1.24 (0.68-2.24)	1.24 (0.73-2.09)	1.02 (0.48-2.16)	1.38 (0.75-2.54)
PMA at discharge >40 <sup>+0</sup> weeks	0.94 (0.73-1.22)	0.84 (0.60-1.18)	0.97 (0.71-1.32)	0.93 (0.73-1.19)	1.06 (0.78-1.46)	0.88 (0.66-1.16)

Values are odd ratios (95% confidence interval). \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

BPD=Bronchopulmonary Dysplasia, PMA at discharge=postmenstrual age at discharge, equal to gestational age at birth plus the length of stay in weeks. Models are adjusted for gestational age, gestational age squared, birthweight z score, use of antenatal steroids, gender, infant year of birth and deprivation.

<sup>a</sup> High volume was defined as being in the top quartile of units by number of care days provided to infants born at ≤32<sup>+6</sup> weeks gestation.

**Table B2** Adjusted odds ratios for morbidities associated with admission to either tertiary or high volume neonatal care at the hospital of birth using an instrumental variable logistic regression model; infants who died excluded from morbidity outcome

Outcome	Tertiary neonatal unit			High volume neonatal unit <sup>a</sup>		
	(1) ≤32 <sup>+6</sup> weeks n=19,560	(2) ≤26 <sup>+6</sup> weeks n=1,987	(3) 27 <sup>+0</sup> -32 <sup>+6</sup> weeks n=17,573	(4) ≤32 <sup>+6</sup> weeks n=19,560	(5) ≤26 <sup>+6</sup> weeks n=1,987	(6) 27 <sup>+0</sup> -32 <sup>+6</sup> weeks n=17,573
BPD	1.15 (0.88-1.52)	1.07 (0.30-3.80)	1.16 (0.88-1.52)	0.93 (0.72-1.22)	0.88 (0.25-3.04)	0.94 (0.72-1.22)
Treatment for ROP	1.96* (1.15-3.32)	1.73 (0.87-3.45)	2.13* (1.04-4.40)	0.93 (0.53-1.65)	0.49 (0.23-1.03)	1.80 (0.81-3.99)
Surgery for NEC	1.12 (0.66-1.90)	0.80 (0.36-1.76)	1.29 (0.71-2.33)	1.11 (0.65-1.89)	0.82 (0.37-1.82)	1.29 (0.70-2.38)
PMA >40 <sup>+0</sup> weeks	0.89 (0.67-1.19)	0.78 (0.53-1.15)	0.94 (0.69-1.28)	0.83 (0.63-1.08)	0.78 (0.53-1.13)	0.85 (0.63-1.13)
Any in-hospital mortality and/or BPD	1.13 (0.88-1.45)	N/A <sup>b</sup>	1.13 (0.88-1.45)	0.92 (0.72-1.17)	0.83 (0.24-2.86)	0.92 (0.72-1.17)

Values are odd ratios (95% confidence interval). \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

BPD=Bronchopulmonary Dysplasia, PMA at discharge=postmenstrual age at discharge, equal to gestational age at birth plus the length of stay in weeks. Models are adjusted for gestational age, gestational age squared, birthweight z score, use of antenatal steroids, gender, infant year of birth and deprivation.

<sup>a</sup> High volume was defined as being in the top quartile of units by number of care days provided to infants born at ≤32<sup>+6</sup> weeks gestation.

<sup>b</sup> Unable to estimate due to too few negative outcomes

**Table B3** Adjusted odds ratios for outcomes associated with admission to high volume neonatal care at the hospital of birth using an instrumental variable logistic regression model; alternative definitions of 'high volume'

Outcome	High volume defined as top 25% by number of intensive care days provided to infants $\leq 32^{+6}$ weeks			High volume defined as top 25% by number of $\leq 32^{+6}$ weeks births in hospital		
	(1) $\leq 32^{+6}$ weeks	(2) $\leq 26^{+6}$ weeks	(3) $27^{+0}-32^{+6}$ weeks	(4) $\leq 32^{+6}$ weeks	(5) $\leq 26^{+6}$ weeks	(6) $27^{+0}-32^{+6}$ weeks
Neonatal Mortality	0.73* (0.56-0.96)	0.73 (0.45-1.19)	0.71* (0.52-0.98)	0.81 (0.61-1.06)	0.78 (0.49-1.24)	0.82 (0.59-1.13)
Any in hospital mortality	0.67** (0.53-0.86)	0.65* (0.43-1.00)	0.69* (0.50-0.94)	0.75* (0.59-0.94)	0.69 (0.45-1.07)	0.79 (0.60-1.05)
BPD	0.98 (0.79-1.23)	1.28 (0.81-2.02)	0.93 (0.72-1.19)	1.09 (0.88-1.35)	1.41 (0.91-2.17)	1.02 (0.79-1.32)
Surgery for ROP	0.96 (0.56-1.57)	0.55 (0.28-1.06)	1.50 (0.66-3.43)	1.27 (0.76-2.13)	0.71 (0.36-1.42)	1.19 (0.88-4.14)
Surgery for NEC	1.16 (0.73-1.86)	1.11 (0.54-2.28)	1.22 (0.69-2.17)	1.10 (0.67-1.81)	0.95 (0.48-1.89)	1.15 (0.63-2.13)
PMA $>40^{+0}$ weeks	0.81 (0.63-1.04)	0.87 (0.65-1.17)	0.78 (0.58-1.04)	0.86 (0.67-1.10)	0.88 (0.64-1.21)	0.83 (0.62-1.10)

Values are odd ratios (95% confidence interval). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

BPD=Bronchopulmonary Dysplasia, PMA at discharge=postmenstrual age at discharge, equal to gestational age at birth plus the length of stay in weeks. Models are adjusted for gestational age, gestational age squared, birthweight z score, use of antenatal steroids, gender, infant year of birth and deprivation.

**Table B3** Adjusted odds ratios for outcomes associated with admission to high volume neonatal care at the hospital of birth using an instrumental variable logistic regression model; alternative definitions of 'high volume'

<b>High volume defined as top 25% by number of intensive care days provided to infants <math>\leq 32^{+6}</math> weeks</b>			
<b>Outcome</b>	<b>(1) <math>\leq 32^{+6}</math> weeks</b>	<b>(2) <math>\leq 26^{+6}</math> weeks</b>	<b>(3) <math>27^{+0}-32^{+6}</math> weeks</b>
Neonatal Mortality	0.40 (0.03-4.96)	N/A <sup>a</sup>	0.74 (0.01-36.67)
Any in hospital mortality	0.28 (0.04-2.28)	1.18 (0.13-10.69)	0.52 (0.03-9.44)
BPD	1.95 (0.48-7.84)	0.29 (0.04-2.35)	1.10 (0.16-7.79)
Surgery for ROP	2.23 (0.17-29.70)	1.64 (0.07-40.08)	N/A <sup>a</sup>
Surgery for NEC	4.11 (0.29-58.79)	0.23 (0.00-26.25)	N/A <sup>a</sup>
PMA $>40^{+0}$ weeks	0.54 (0.11-2.64)	0.40 (0.06-2.50)	0.45 (0.05-3.95)

Values are odd ratios (95% confidence interval). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

BPD=Bronchopulmonary Dysplasia, PMA at discharge=postmenstrual age at discharge, equal to gestational age at birth plus the length of stay in weeks. Models are adjusted for gestational age, gestational age squared, birthweight z score, use of antenatal steroids, gender, infant year of birth and deprivation.

<sup>a</sup>Too few observed outcomes in treatment group to estimate