Evidence tables for review question: What are the benefits and risks of different places of birth for women at different BMI thresholds?

Brocklehurst, 2011

Bibliographic Reference	Brocklehurst P; Hardy P; Hollowell J; Linsell L; Macfarlane A; McCourt C; Marlow N; Miller A; Newburn M; Petrou S; Puddicombe D; Redshaw M; Rowe R; Sandall J; Silverton L; Stewart M; Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study.; BMJ (Clinical research ed.); 2011; vol. 343

Study details

Country/ies where study was carried out	England
Study type	Prospective cohort study
Study dates	April 2008 - April 2010
Inclusion criteria	• Women attended by an NHS midwife during labour in their planned place of birth
Exclusion criteria	• women who had elective caesarean section • women who had caesarean section before onset of labour • preterm labour (<37 weeks' gestation) • multiple pregnancy • women who were 'unbooked' (had no antenatal care) • Stillbirths occurring before the start of care in labour
Patient characteristics	<u>Age - mean (SD)</u> Obstetric unit: 28.2 (6) Home: 31.1 (5.2)

Freestanding midwifery unit: 28.8 (5.8)
Alongside midwifery unit: 28.3 (5.7)

Parity - nulliparous

Obstetric unit: 54%
Home: 27.2%
Freestanding midwifery unit: 46%
Alongside midwifery unit: 50.1%

Gestational age - mean (SD)

Obstetric unit: 39.8 (1.1)
Home: 39.8 (1.0)
Freestanding midwifery unit: 39.8 (1.0)
Alongside midwifery unit: 39.7 (1.0)

BMI - mean (SD):
Obstetric unit: 24.4 (4.0)
Home: 24.0 (3.7)
Freestanding midwifery unit: 24.1 (3.7)
Alongside midwifery unit: 24.0 (3.8)

Ethnicity:

White
Obstetric unit: 81.7%
Home: 94.8%
Freestanding midwifery unit: 91.6%
Alongside midwifery unit: 80.9%

Asian
Obstetric unit: 7.1%
Home: 0.7%

	Freestanding midwifery unit: 3.6% Alongside midwifery unit: 7.2% **Black/African/Caribbean** Obstetric unit: 4.7% Home: 1.5% Freestanding midwifery unit: 1.2% Alongside midwifery unit: 4.3% **Mixed** Obstetric unit: 1.7% Home: 1.7% Freestanding midwifery unit: 1.1% Alongside midwifery unit: 1.8% **Other** Obstetric unit: 4.8% Home: 1.4% Freestanding midwifery unit: 2.5% Alongside midwifery unit: 6.0% Confounders: Effect estimates adjusted for maternal age, ethnic group, understanding of English, marital or partner status, body mass index, deprivation score quintile, parity (previous pregnancies ≥24weeks), and weeks of gestation
Intervention(s)/control	Planned place of birth at: - Obstetric unit - Home - Freestanding midwifery unit - Alongside midwifery unit
Sources of funding	Not industry funded
Sample size	N=64538 low risk women

	Obstetrics unit: n= 19706 Home: n=16840 Freestanding midwifery units: n=11282 Alongside midwifery units: n=16710

NHS: national health service; SD: standard deviation;

Outcomes

Primary outcomes

Outcome	Obstetric Unit, , N = 19706	Home, , N = 16840	Freestanding midwifery unit, , N = 11282	Alongside midwifery unit, , N = 16710
Admission to a higher level of care No of events	n = 117	n = 58	n = 24	n = 82
Admission to a higher level of care Adjusted OR (adjusted for confounders[1])	adjusted OR 1	adjusted OR 0.77 (0.36 to 1.65)	adjusted OR 0.32 (0.13 to 0.84)	adjusted OR 1.17 (0.46 to 2.99)
Spontaneous vertex vaginal birth (number) No of events	n = 14645	n = 15590	n = 10150	n = 14413
Spontaneous vertex vaginal birth (number) Adjusted OR (adjusted for confounders[1])	adjusted OR 1	adjusted OR 3.61 (2.97 to 4.38)	adjusted OR 3.38 (2.70 to 4.25)	adjusted OR 2.22 (1.76 to 2.81)
Instrumental birth Forceps or ventouse	n = 2842	n = 714	n = 686	n = 1524

Outcome	Obstetric Unit, , N = 19706	Home, , N = 16840	Freestanding midwifery unit, , N = 11282	Alongside midwifery unit, , N = 16710
No of events				
Intrapartum caesarean section (number) No of events	n = 2158	n = 458	n = 405	n = 727
Intrapartum caesarean section (number) Adjusted OR (adjusted for confounders[1])	adjusted OR 1	adjusted OR 0.31 (0.23 to 0.41)	adjusted OR 0.32 (0.24 to 0.42)	adjusted OR 0.39 (0.29 to 0.53)
Blood transfusion No of events	n = 241	n = 101	n = 67	n = 136
Blood transfusion Adjusted OR (adjusted for confounders[1])	adjusted OR 1	adjusted OR 0.72 (0.47 to 1.12)	adjusted OR 0.48 (0.32 to 0.73)	adjusted OR 0.75 (0.55 to 1.02)
Transferred - Nulliparous (number) transfer before and after delivery No of events	N/A	n = 2057	n = 1884	n = 3360
Transferred - Multiparous (number) Transfer before and after delivery No of events	N/A	n = 1472	n = 573	n = 1041

OR: odds ratio
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, body mass index, deprivation score quintile, parity (previous pregnancies ≥24weeks), and weeks of gestation

Critical appraisal – ROBINS-I

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low *(No confounding expected)*
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low *(All eligible participants were included in the study and start of follow up and start of intervention coincide.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low *(Intervention status is well defined and based on information collected at the time of the intervention (BMI on booking).)*
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate *(There may be some unbalanced co-interventions taking place across the different obstetric units, however, they would be in line with current practice in the UK and the variation would be a natural variation reflective of what is seen in practice so unlikely to have a big impact)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low *(Data was reasonably complete.)*
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low *(Methods of outcome assessment are comparable across groups, and the outcome measure was unlikely to be influenced by knowledge of the intervention received by study participants.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low *(Pre-registered protocol reports all confounders to be used in the analysis, and intended outcomes.)*
Overall bias	Risk of bias judgement	Low
Overall bias	Risk of bias variation across outcomes	No variation

Section	Question	Answer
Overall bias		Directly applicable
	Directness	

BMI: body mass index

Hollowell, 2014

Bibliographic Reference	Hollowell, J.; Pillas, D.; Rowe, R.; Linsell, L.; Knight, M.; Brocklehurst, P.; The impact of maternal obesity on intrapartum outcomes in otherwise low risk women: secondary analysis of the Birthplace national prospective cohort study; BJOG : an international journal of obstetrics and gynaecology; 2014; vol. 121 (no. 3); 343-55

Study details

Country/ies where study was carried out	See Brocklehurst 2011
Study type	Prospective cohort study
Study dates	See Brocklehurst 2011
Inclusion criteria	See Brocklehurst 2011
Exclusion criteria	See Brocklehurst 2011
Patient characteristics	<u>Mean age (SD)</u> Underweight <18.5kg/m^2: 25.4 (5.6) Normal weight 18.5 – 24.9kg/m^2 : 28 (6.0) Overweight 25-29.9kg/m^2: 28.8 (5.9) Obese 30-35kg/m^2: 28.2 (5.8) Very obese >35kg/m^2: 28.1 (5.9) <u>Nulliparous</u> Underweight: 59.6% Normal weight: 56.0% Overweight: 50.6%

Obese: 48.3%
Very obese: 42.5%

<u>Gestational age – mean (SD)</u>
Underweight: 39.5 (1.2)
Normal weight: 39.7 (1.1)
Overweight: 39.8 (1.1)
Obese: 39.9 (1.1)
Very obese: 39.9 (1.1)

<u>Ethnicity</u>

White
Underweight: 78.2%
Normal weight: 81.7%
Overweight: 81.5%
Obese: 83.4%
Very obese: 87.7%

Asian
Underweight: 11.1%
Normal weight: 7.4%
Overweight: 7.5%
Obese: 5.5%
Very obese: 3%

Black/Caribbean/African
Underweight: 2.8%
Normal weight: 3.9%
Overweight: 5.7%
Obese: 6%
Very obese: 6.3%

Mixed
Underweight: 1.7%

	Normal weight: 1.5% Overweight: 1.5% Obese: 1.5% Very obese: 1.5% **Other** Underweight: 6.1% Normal weight: 5.5% Overweight: 3.8% Obese: 3.3% Very obese: 1.3% Confounders: Maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery
Intervention(s)/control	Intervention: Women who planned birth in an obstetric unit, with BMI ranges: • < 18.5 kg/m^2 • 25-29.9 kg/m^2 • 30-35 kg/m^2 • >35-40 kg/m^2 Control: Women who planned birth in an obstetric unit, with BMI range: • 18.5 – 24.9kg/m^2 (Supplementary data provided data for women who planned birth at home, freestanding midwifery unit, or alongside midwifery unit with the same BMI comparisons)
Sources of funding	Not industry funded
Sample size	N=17230 women who planned birth in an obstetric suite without risk factors (other than BMI > 35 kg/m^2)

	Underweight n=577 Normal weight n=8936 Overweight n=4778 Obese n=1955 Very obese n=984
Other information	Data extracted for the outcome 'obstetric interventions and adverse maternal outcomes combined' was assumed to be adjusted. There seemed to be a typo in the study table 5 referring to these ratios as 'unadjusted'. Outcomes from this cohort have been reported in the secondary report by Hollowell 2015 as they include BMI information, therefore the outcomes from the primary report have not been included in the analysis for this review

BMI: body mass index; SD: standard deviation

Outcomes

Outcomes – Obstetric unit

Outcome	Underweight BMI < 18.5 kg/m^2, N = 577	Normal weight BMI 18.5–24.9 kg/m^2, N = 8936	Overweight BMI 25–29.9 kg/m^2, N = 4778	Obese BMI 30–35 kg/m^2, N = 1955	Very obese BMI > 35 kg/m^2, N = 984
Maternal admission to higher level care No of events	n = 5	n = 57	n = 28	n = 11	n = 5
Maternal admission to higher level care Adjusted RR (adjusted for confounders[1])	aRR 1.63 (0.72 to 3.69)	aRR 1	aRR 0.78 (0.41 to 1.49)	aRR 0.88 (0.50 to 1.54	aRR 0.71 (0.25 to 2.03)
Instrumental delivery No of events	n = 79	n = 1397	n = 635	n = 249	n = 84
Instrumental delivery Adjusted RR (adjusted for confounders[1])	aRR 0.95 (0.79 to 1.13)	aRR 1	0.87 (0.80 to 0.95)	aRR 0.86 (0.74 to 1.00)	aRR 0.70 (0.57 to 0.86)

Outcome	Underweight BMI < 18.5 kg/m², N = 577	Normal weight BMI 18.5–24.9 kg/m², N = 8936	Overweight BMI 25–29.9 kg/m², N = 4778	Obese BMI 30–35 kg/m², N = 1955	Very obese BMI > 35 kg/m², N = 984
Intrapartum caesarean birth No of events	n = 39	n = 846	n = 588	n = 260	n = 135
Intrapartum caesarean birth Adjusted RR (adjusted for confounders[1])	aRR 0.83 (0.61 to 1.13)	aRR 1	aRR 1.34 (1.20 to 1.50)	aRR 1.52 (1.30 to 1.79)	aRR 1.69 (1.35 to 2.12)
Maternal blood transfusion No of events	n = 6	n = 112	n = 61	n = 25	n = 9
Maternal blood transfusion Adjusted RR (adjusted for confounders[1])	aRR 1.03 (0.48 to 2.21)	RR 1	aRR 0.96 (0.62 to 1.48)	aRR 1.00 (0.65 to 1.53)	aRR 0.77 (0.40 to 1.50)
Obstetric interventions and adverse maternal outcomes combined – nulliparous Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care No of events	n = 150	n = 2524	n = 1277	n = 535	n = 225
Obstetric interventions and adverse maternal outcomes combined – nulliparous Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care Adjusted RR (adjusted for confounders[1])	aRR 0.94 (0.82 to 1.09)	aRR 1	aRR 1.04 (0.99 to 1.08)	aRR 1.12 (1.05 to 1.18)	aRR 1.08 (0.99 to 1.18)

Outcome	Underweight BMI < 18.5 kg/m^2, N = 577	Normal weight BMI 18.5–24.9 kg/m^2, N = 8936	Overweight BMI 25–29.9 kg/m^2, N = 4778	Obese BMI 30–35 kg/m^2, N = 1955	Very obese BMI > 35 kg/m^2, N = 984
Obstetric interventions and adverse maternal outcomes combined – multiparous No of events	n = 32	n = 666	n = 465	n = 212	n = 117
Obstetric interventions and adverse maternal outcomes combined – multiparous Adjusted RR (adjusted for confounders[1])	aRR 0.87 (0.57 to 1.31)	aRR 1	aRR 1.16 (1.02 to 1.32)	aRR 1.22 (1.05 to 1.42)	aRR 1.24 (0.97 to 1.59)
Admission to a neonatal unit or intrapartum stillbirth/early neonatal death – nulliparous No of events	n = 9	n = 180	n = 76	n = 39	n = 28
Admission to a neonatal unit or intrapartum stillbirth/early neonatal death – nulliparous Adjusted RR (adjusted for confounders[1])	aRR 0.72 (0.36 to 1.46)	aRR 1	aRR 0.88 (0.62 to 1.24)	aRR 1.18 (0.80 to 1.74)	aRR 2.00 (1.31 to 3.05)
Admission to a neonatal unit or intrapartum stillbirth/early neonatal death – multiparous No of events	n = 5	n = 68	n = 46	n = 19	n = 15
Admission to a neonatal unit or intrapartum stillbirth/early neonatal death – multiparous Adjusted RR (adjusted for confounders[1])	aRR 1.13 (0.40 to 3.19)	aRR 1	aRR 1.19 (0.88 to 1.61)	aRR 1.26 (0.69 to 2.28)	aRR 1.83 (1.22 to 2.75)

a(RR): adjusted risk ratio; BMI: body mass index
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery

Outcomes – Home

Outcome	Underweight BMI < 18.5 kg/m^2, N = 318	Normal weight BMI 18.5–24.9 kg/m^2, N = 8051	Overweight BMI 25–29.9 kg/m^2, N = 3723	Obese BMI 30–35 kg/m^2, N = 1211	Very obese BMI >35 – 40 kg/m^2 , N = 265
Obstetric interventions and adverse maternal outcomes combined Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care No of events	n = 29	n = 901	n = 396	n = 109	n = 19
Obstetric interventions and adverse maternal outcomes combined Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care Adjusted RR (adjusted for confounders[1])	aRR 0.97 (0.68 to 1.41)	aRR 1	aRR 1.03 (0.93 to 1.14)	aRR 1.04 (0.89 to 1.22)	aRR 0.95 (0.59 to 1.52)
Neonatal unit admission or intrapartum stillbirth/early neonatal death No of events	n = 7	n = 135	n = 70	n = 22	n = 5
Neonatal unit admission or intrapartum stillbirth/early neonatal death Adjusted RR (adjusted for confounders[1])	aRR 1.11 (0.47 to 2.63)	1	aRR 1.09 (0.81-1.47)	aRR 1.36 (0.80 to 2.29)	aRR 1.17 (0.49 to 2.81)

a(RR): adjusted risk ratio: BMI: body mass index
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery

Outcomes – freestanding midwifery unit

Outcome	Underweight BMI < 18.5 kg/m², N = 234	Normal weight BMI 18.5–24.9 kg/m², N = 5584	Overweight BMI 25–29.9 kg/m², N = 2650	Obese BMI 30–35 kg/m², , N = 911	Very obese BMI >35 - ≤40 kg/m², N = 62
Obstetric interventions and adverse maternal outcomes Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care No of events	n = 25	n = 813	n = 369	n = 86	n = 4
Obstetric interventions and adverse maternal outcomes Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care Adjusted RR (adjusted for confounders[1])	aRR 0.98 (0.61 to 1.57)	aRR 1	aRR 1.10 (0.98 to 1.22)	aRR 0.74 (0.61 to 0.89)	aRR 0.80 (0.33 to 1.94)
Neonatal unit admission or intrapartum stillbirth/early neonatal death No of events	n = 5	n = 95	n = 50	n = 19	n = 3
Neonatal unit admission or intrapartum stillbirth/early neonatal death Adjusted RR (adjusted for confounders[1])	aRR 1.29 (0.46 to 3.61)	aRR 1	aRR 1.15 (0.78 to 1.69)	aRR 1.33 (0.79 to 2.25)	aRR 3.95 (1.07- to 14.6)

a(RR) adjusted risk ratio: BMI: body mass index
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery

Outcomes – alongside midwifery unit

Outcome	Underweight BMI < 18.5 kg/m², N = 434	Normal weight BMI 18.5–24.9 kg/m², N = 8140	Overweight BMI 25–29.9 kg/m², N = 3735	Obese BMI 30–35 kg/m², N = 1253	Very obese BMI > 35 - ≤40 kg/m², N = 136
Obstetric interventions and adverse maternal outcomes Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care No of events	n = 88	n = 1647	n = 690	n = 212	n = 14
Obstetric interventions and adverse maternal outcomes Instrumental birth, intrapartum caesarean birth, augmentation, general anaesthesia, maternal blood transfusion, third/fourth-degree tear, maternal admission to higher level care Adjusted RR (adjusted for confounders[1])	aRR 1.08 (0.83 to 1.42)	aRR 1	aRR 1.02 (0.93 to 1.13)	aRR 1.00 (0.86 to 1.16)	aRR 0.89 (0.50 to 1.57)
Neonatal unit admission or intrapartum stillbirth/early neonatal death No of events	n = 3	n = 144	n = 77	n = 30	n = 1
Neonatal unit admission or intrapartum stillbirth/early neonatal death Adjusted RR (adjusted for confounders[1])	aRR 0.33 (0.13 to 0.86)	aRR 1	aRR 1.15 (0.78 to 1.68)	aRR 1.33 (0.75 to 2.37)	aRR 0.62 (0.15 to 2.59)

a(RR) adjusted risk ratio: adjusted risk ratio; BMI: body mass index
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery

Critical appraisal – ROBINS-I

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low *(No confounding expected.)*
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low *(All eligible participants were included, and start of follow up and intervention coincide.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low *(Intervention status is well defined and definition is based solely on information collected at the time of the intervention.)*
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate *(There may be some unbalanced co-interventions taking place across the different obstetric units, however, they would be in line with current practice in the UK and the variation would be a natural variation reflective of what is seen in practice so unlikely to have a big impact.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low *(Data was reasonably complete.)*
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low *(Methods of outcomes assessment were comparable across groups. The outcome measure was unlikely to be influenced by knowledge of the intervention.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low *(Confounders, analysis and intended outcomes are as specified in the pre-registered protocol.)*
Overall bias	Risk of bias judgement	Low
Overall bias	Risk of bias variation across outcomes	No variation
Overall bias	Directness	Directly applicable

Hollowell, 2015

Bibliographic Reference	Hollowell, J.; Rowe, R.; Townend, J.; Knight, M.; Li, Y.; Linsell, L.; Redshaw, M.; Brocklehurst, P.; Macfarlane, A.; Marlow, N.; McCourt, C.; Newburn, M.; Sandall, J.; Silvert; The Birthplace in England national prospective cohort study: further analyses to enhance policy and service delivery decision-making for planned place of birth; 2015

Study details

Country/ies where study was carried out	See Brocklehurst 2011
Study type	Prospective cohort study
Study dates	See Brocklehurst 2011
Inclusion criteria	See Brocklehurst 2011
Exclusion criteria	See Brocklehurst 2011
Patient characteristics	See Brocklehurst 2011
Intervention(s)/control	For mode of birth: Intervention: Planned place of birth at: • Home • FMU • AMU Control: Planned place of birth at: • OU For transfer to obstetric unit:

	Intervention: Women who planned birth at home, FMU or AMU, with BMI ranges: • < 18.5 kg/m^2 • 25-29.9 kg/m^2 • 30-35 kg/m^2 • >35-40 kg/m^2 Control: Women who planned birth at home, FMU or AMU, with BMI range: • 18.5 – 24.9kg/m^2
Sources of funding	See Brocklehurst 2011
Sample size	N=61335 nulliparous, n=27312 multiparous, n=34023

AMU: alongside midwifery unit; BMI: body mass index; FMU: freestanding midwifery unit; OU: obstetric unit

Outcomes

Outcome	Obstetric unit , , N = 5916	Home, , N = 3237	Freestanding midwifery unit, , N = 3909	Alongside midwifery unit, , N = 5747
Mode of birth – straightforward birth – nulliparous vaginal birth without instruments, without caesarean,	n = 5916	n = 3237	n = 3909	n = 5747

Outcome	Obstetric unit , , N = 5916	Home, , N = 3237	Freestanding midwifery unit, , N = 3909	Alongside midwifery unit, , N = 5747
without 3rd or 4th degree perineal trauma or blood transfusion No of events				
Mode of birth – straightforward birth – nulliparous vaginal birth without instruments, without caesarean, without 3rd or 4th degree perineal trauma or blood transfusion Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 1.32 (1.26 to 1.39)	aRR 1.28 (1.23 to 1.34)	aRR 1.18 (1.12 to 1.23)
Mode of birth - straightforward birth - multiparous No of events	n = 7475	n = 11301	n = 5704	n = 7529
Mode of birth - straightforward birth - multiparous Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 1.10 (1.09 to 1.12)	aRR 1.10 (1.08 to 1.12)	aRR 1.07 (1.05 to 1.09)
Mode of birth - instrumental birth - nulliparous No of events	n = 2201	n = 575	n = 604	n = 1275
Mode of birth - instrumental birth - nulliparous Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 0.51 (0.44 to 0.59)	aRR 0.49 (0.41 to 0.60)	aRR 0.73 (0.62 to 0.86)
Mode of birth - instrumental birth - multiparous No of events	n = 482	n = 107	n = 69	n = 185
Mode of birth - instrumental birth - multiparous Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 0.15 (0.12 to 0.20)	aRR 0.19 (0.13 to 0.27)	aRR 0.46 (0.35 to 0.60)

Outcome	Obstetric unit , , N = 5916	Home, , N = 3237	Freestanding midwifery unit, , N = 3909	Alongside midwifery unit, , N = 5747
Mode of birth - caesarean birth - nulliparous No of events	n = 1545	n = 356	n = 342	n = 618
Mode of birth - caesarean birth - nulliparous Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 0.57 (0.47 to 0.70)	aRR 0.51 (0.42 to 0.61)	aRR 0.59 (0.48 to 0.71)
Mode of birth - caesarean birth - multiparous No of events	n = 446	n = 78	n = 44	n = 85
Mode of birth - caesarean birth - multiparous Adjusted RR (adjusted for confounders[1])	aRR 1	aRR 0.15 (0.10 to 0.21)	aRR 0.18 (0.12 to 0.26)	aRR 0.24 (0.17 to 0.36)
Transfer to obstetric unit - BMI <18.5 – nulliparous No of events Adjusted RR (adjusted for confounders[1])	*N/A*	n = 28/80 aRR 0.79 (0.58 to 1.07)	n = 36/120 aRR 1.12 (0.80 to 1.57)	n = 90/242 aRR 1.02 (0.78 to 1.34)
Transfer to obstetric unit - BMI <18.5 – multiparous No of events Adjusted RR (adjusted for confounders[1])	*N/A*	n = 28/237 aRR 1.27 (0.84 to 1.92)	n = 11/112 aRR 0.97 (0.51 to 1.87)	n = 25/194 aRR 1.21 (0.77 to 1.91)
Transfer to obstetric unit - BMI 18.5 - 24.9 - nulliparous No of events Adjusted RR (adjusted for confounders[1])	*N/A*	n = 1050/2344 aRR 1	n = 931/2723 aRR 1	n = 1764/4385 aRR 1

Outcome	Obstetric unit , , N = 5916	Home, , N = 3237	Freestanding midwifery unit, , N = 3909	Alongside midwifery unit, , N = 5747
Transfer to obstetric unit - BMI 18.5 - 24.9 - multiparous No of events Adjusted RR (adjusted for confounders[1])	N/A	n = 579/5702 aRR 1	n = 243/2842 aRR 1	n = 460/3765 aRR 1
Transfer to obstetric unit - BMI 25 - 29.9 - nulliparous No of events Adjusted RR (adjusted for confounders[1])	N/A	n = 438/902 aRR 1.05 (0.96 to 1.15)	n = 404/1091 aRR 1.11 (1.00 to 1.25)	n = 707/1699 aRR 1.02 (0.92 to 1.12)
Transfer to obstetric unit - BMI 25 - 29.9 - multiparous No of events Adjusted RR (adjusted for confounders[1])	N/A	n = 361/2833 aRR 1.17 (1.03 to 1.32)	n = 143/1542 aRR 1.10 (0.88 to 1.39)	n = 256/2053 aRR 1.00 (0.86 to 1.16)
Transfer to obstetric unit - BMI 30 – 35 - nulliparous No of events Adjusted RR (adjusted for confounders[1])	N/A	n = 115/252 aRR 1.03 (0.88 to 1.22)	n = 105/333 aRR 0.92 (0.77 to 1.10)	n = 211/518 aRR 1.01 (0.84 to 1.20)
Transfer to obstetric unit - BMI 30 – 35 - multiparous No of events Adjusted RR (adjusted for confounders[1])	N/A	n = 138/955 aRR 1.29 (1.08 to 1.54)	n = 42/572 aRR 0.83 (0.62 to 1.12)	n = 96/745 aRR 0.89 (0.68 to 1.17)

a(RR): adjusted risk ratio; BMI: body mass index
1. Confounders adjusted for: maternal age, ethnic group, understanding of English, marital or partner status, Index of Multiple Deprivation score, parity (previous pregnancies ≥24weeks), gestation at delivery

Critical appraisal – ROBINS-I

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low *(No confounding expected)*
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low *(All eligible participants were included in the study and start of follow up and intervention coincide.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low *(Intervention status is well defined and based solely on information collected at the time of the intervention.)*
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate *(There may be some unbalanced co-interventions taking place across the different obstetric units, however, they would be in line with current practice in the UK and the variation would be a natural variation reflective of what is seen in practice so unlikely to have a big impact.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low *(Data was reasonably complete.)*
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low *(The methods of outcome assessment were comparable across intervention groups and unlikely to be included by knowledge of the intervention.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low *(Confounders and intended outcomes were specified in the pre-registered protocol.)*
Overall bias	Risk of bias judgement	Low
Overall bias	Risk of bias variation across outcomes	No variation

Section	Question	Answer
Overall bias		Directly applicable
	Directness	

Rowe, 2018

Bibliographic Reference	Rowe, Rachel; Knight, Marian; Kurinczuk, Jennifer J.; Outcomes for women with BMI>35kg/m2 admitted for labour care to alongside midwifery units in the UK: A national prospective cohort study using the UK Midwifery Study System (UKMidSS); PLoS ONE; 2018; vol. 13 (no. 12); e0208041

Study details

Country/ies where study was carried out	England, Wales, Scotland, Northern Ireland.
Study type	Prospective cohort study
Study dates	January to December 2016
Inclusion criteria	Intervention group • Women with a BMI >35kg/m^2 at booking appointment (first antenatal appointment). • Admitted to an alongside midwifery unit and gave birth in the same admission. Comparison cohort • Women with a BMI ≤35kg/m^2 at booking appointment (first antenatal appointment). • Admitted to an alongside midwifery unit and gave birth in the same admission.
Exclusion criteria	• Women admitted assessment in the alongside midwifery unit but then discharged before giving birth. • Women admitted for assessment in the alongside midwifery unit and seen for obstetric triage. • Women whose BMI data was unclear and could not be confirmed by the midwife looking after them.

Patient characteristics	N=3071 Parity Women with a BMI >35kg/m^2: Nulliparous n= 312 (28%) Multiparous n=808 (72%) Women with a BMI ≤35kg/m^2: Nulliparous n=890 (46%) Multiparous n=1056 (54%) Age Women with a BMI >35kg/m^2: <35 n= 963 (86%) ≥35 n= 159 (14%) Women with a BMI ≤35kg/m^2: <35 n=1630 (84%) ≥35 n= 319 (16%) Gestation at admission Women with a BMI >35kg/m^2: 36-37 weeks n= 48 (4%) >37 weeks n= 1074 (96%) Women with a BMI ≤35kg/m^2: 36-37 weeks n= 91 (5%) >37 weeks n= 1858 (95%)

	No pre-existing risk factors Women with a BMI >35kg/m^2 n=980 (87%) Women with a BMI ≤35kg/m^2 :n=1803 (90%) BMI at booking Women with a BMI >35kg/m^2: 35.1-40 kg/m^2 = 92.2% 40.1-45 kg/m^2 = 6.5% >45 kg/m^2 = 1.3% Women with a BMI ≤35kg/m^2: <18.5 kg/m^2 = 4.1% 18.5-24.9 kg/m^2 = 54.9% 25-29.9 kg/m^2 = 30% 30-35.0 kg/m^2 = 11% Confounders: Maternal age, ethnic group, gestational age at admission (completed weeks), Children in Low-income Families Measure quintile, parity (previous pregnancies ≥24 weeks), pre-existing risk factors (none, ≥1 clear, ≥1 possible).
Intervention(s)/control	Intervention - Severely obese group • Women with a BMI of >35 kg/m^2 admitted for labour in an alongside midwifery unit. Control - comparison group • Women with a BMI of ≤35 kg/m^2 admitted for labour in the same alongside midwifery units. • The comparison group was selected by recording data for the two women with a BMI of ≤35 kg/m^2 who had been admitted to the alongside midwifery unit immediately before the woman selected for the women with a BMI of >35 kg/m^2 group.
Sources of funding	Not industry funded

Sample size	N=3071 Women with a BMI >35kg/m^2: n=1122 Women with a BMI ≤35kg/m^2 : n=1949

BMI: body mass index

Outcomes

Outcome	Women with a BMI >35kg/m^2, , N = 1122	Women with a BMI ≤35kg/m^2, , N = 1949
Maternal admission for higher level care - nulliparous No of events	n = 10	n = 20
Maternal admission for higher level care - nulliparous aRR (adjusted for confounders[1])	aRR 1.34, 95% CI (0.44 to 4.11)	aRR 1
Maternal admission for higher level care – multiparous No of events	n = 9	n = 17
Maternal admission for higher level care – multiparous aRR (adjusted for confounders[1])	aRR 0.71, 95% CI (0.27 to 1.86)	aRR 1
Intrapartum caesarean birth – nulliparous No of events	n = 43	n = 73
Intrapartum caesarean birth – nulliparous aRR (adjusted for confounders[1])	aRR 1.62, 95% CI (0.98 to 2.67)	aRR 1
Intrapartum caesarean birth – multiparous No of events	n = 10	n = 7
Intrapartum caesarean birth – multiparous	aRR 1.88, 95% CI (0.56 to 6.21)	aRR 1

Outcome	Women with a BMI >35kg/m^2, , N = 1122	Women with a BMI ≤35kg/m^2, , N = 1949
aRR (adjusted for confounders[1])		
Category 1 or 2 Caesarean birth – nulliparous No of events	n = 38	n = 58
Category 1 or 2 Caesarean birth – nulliparous aRR (adjusted for confounders[1])	aRR 1.80, 95% CI (1.05 to 3.08)	aRR 1
Category 1 or 2 Caesarean birth – multiparous No of events	n = 8	n = 5
Category 1 or 2 Caesarean birth – multiparous aRR (adjusted for confounders[1])	aRR 2.10, 95% CI (0.48 to 9.11)	aRR 1
Instrumental birth - nulliparous No of events	n = 43	n = 155
Instrumental birth - nulliparous aRR (adjusted for confounders[1])	aRR 0.83, 95% CI (0.53 to 1.30)	aRR 1
Instrumental birth - multiparous No of events	n = 12	n = 26
Instrumental birth - multiparous aRR (adjusted for confounders[1])	aRR 0.6, 95% CI (0.22 to 1.61)	aRR 1
Straightforward vaginal birth - nulliparous No of events	n = 212	n = 621

Outcome	Women with a BMI >35kg/m^2, , N = 1122	Women with a BMI ≤35kg/m^2, , N = 1949
Straightforward vaginal birth - nulliparous aRR (adjusted for confounders[1])	aRR 0.96, 95% CI (0.86 to 1.06)	aRR 1
Straightforward vaginal birth - multiparous No of events	n = 776	n = 986
Straightforward vaginal birth - multiparous aRR (adjusted for confounders[1])	aRR 1.03, 95% CI (0.99 to 1.07)	aRR 1
Postpartum haemorrhage - nulliparous (≥1500ml) No of events	n = 16	n = 15
Postpartum haemorrhage - nulliparous (≥1500ml) aRR (adjusted for confounders[1])	aRR 3.01, 95% CI (1.24 to 7.31)	aRR 1
Postpartum haemorrhage - multiparous (≥1500ml) No of events	n = 15	n = 21
Postpartum haemorrhage - multiparous (≥1500ml) aRR (adjusted for confounders[1])	aRR 0.89, 95% CI (0.41 to 1.94)	aRR 1
Shoulder dystocia - nulliparous No of events	n = 3	n = 11
Shoulder dystocia - nulliparous aRR (adjusted for confounders[1])	aRR 0.79, 95% CI (0.14 to 4.51)	aRR 1
Shoulder dystocia - multiparous	n = 12	n = 17

Outcome	Women with a BMI >35kg/m^2, , N = 1122	Women with a BMI ≤35kg/m^2, , N = 1949
No of events		
Shoulder dystocia - multiparous aRR (adjusted for confounders[1])	aRR 0.84, 95% CI (0.31 to 2.23)	aRR 1
Neonatal unit admission - nulliparous No of events	n = 12	n = 29
Neonatal unit admission - nulliparous aRR (adjusted for confounders[1])	aRR 0.92, 95% CI (0.38 to 2.23)	aRR 1
Neonatal unit admission - multiparous No of events	n = 19	n = 20
Neonatal unit admission - multiparous aRR (adjusted for confounders[1])	aRR 1.10, 95% CI (0.46 to 2.68)	aRR 1
Initiation of breastfeeding - nulliparous No of events	n = 229	n = 693
Initiation of breastfeeding - nulliparous aRR (adjusted for confounders[1])	aRR 0.97, 95% CI (0.87 to 1.07)	aRR 1
Initiation of breastfeeding - multiparous No of events	n = 502	n = 747
Initiation of breastfeeding - multiparous aRR (adjusted for confounders[1])	aRR 0.92, 95% CI (0.85 to 1.00)	aRR 1

Outcome	Women with a BMI >35kg/m^2, , N = 1122	Women with a BMI ≤35kg/m^2, , N = 1949
Transfer - nulliparous during labour or after birth No of events	n = 151	n = 375
Transfer - nulliparous during labour or after birth aRR (adjusted for confounders[1])	aRR 1.18, 95% CI (0.98 to 1.43)	aRR 1
Transfer - multiparous during labour or after birth No of events	n = 118	n = 134
Transfer - multiparous during labour or after birth aRR (adjusted for confounders[1])	aRR 1.12, 95% CI (0.84 to 1.49)	aRR 1

a(RR): adjusted risk ratio; CI: confidence interval
1. Confounders adjusted for: maternal age, ethnic group, gestational age at admission (completed weeks), Children in Low-income Families Measure quintile, parity (previous pregnancies ≥24 weeks), pre-existing risk factors (none, ≥1 clear, ≥1 possible).

Critical appraisal – ROBINS-I

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low *(No confounding expected.)*
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low *(All eligible women were included, and start up and follow up time coincide.)*

Section	Question	Answer
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low *(Intervention status is well defined and definition is based solely on information collected at the time of intervention.)*
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate *(There may be some unbalanced co-interventions taking place across the different alongside midwifery units, however, they would be in line with current practice in the UK and the variation would be a natural reflection of what is seen in practice so unlikely to have a big impact.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low *(Data was sufficiently complete)*
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low *(The methods of outcome assessment were comparable across intervention groups and unlikely to be influenced by knowledge of the intervention.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low *(The adjusted effect estimates have been analysed according to the confounders specified in the protocol, and all intended outcomes.)*
Overall bias	Risk of bias judgement	Low
Overall bias	Risk of bias variation across outcomes	No variation
Overall bias	Directness	Directly applicable

Stephenson-Famy, 2018

Bibliographic Reference	Stephenson-Famy, Alyssa; Masarie, Kaitlin S.; Lewis, Ali; Schiff, Melissa A.; What are the risk factors associated with hospital birth among women planning to give birth in a birth center in Washington State?; Birth (Berkeley, Calif.); 2018; vol. 45 (no. 2); 130-136

Study details

Country/ies where study was carried out	United States
Study type	Retrospective cohort study
Study dates	January 1st 2004 and December 31st 2011
Inclusion criteria	• Women planning birth in a birth centre • Who delivered a singleton, vertex delivery and at 37 or more weeks gestation
Exclusion criteria	• Women who had a preterm birth • Women with a previous caesarean birth • Nonvertex presentation • Multiple gestations • Fetal death
Patient characteristics	<u>Age <35</u> 85.4% <u>Ethnicity</u> White: 93.7% African American/American Indian/Alaska Native: 2.6% Asian: 3.7% <u>Non-Hispanic/Hispanic</u> 96% non-Hispanic 4% Hispanic <u>Parity</u> Nulliparous: 45.3%

	Confounders Maternal age, non-Hispanic/Hispanic, marital status, maternal education, BMI, insurance status
Intervention(s)/control	Planned place of birth in a free-standing birth centre (midwife)
Sample size	N=7118 women planning birth in a birth centre

BMI: body mass index

Outcomes

Outcome	BMI <18.5, N =	BMI 18.5 - 24.9, N =	BMI 25.0 - 29.9, N =	BMI ≥ 30 , N =
Transfer to hospital - nulliparous adjusted OR (adjusted for confounders[1])	aOR 0.6 (0.3 to 1.5)	OR 1	aOR 1.9 (1.4 to 2.5)	aOR 2.3 (1.6 to 3.2)

a(OR): adjusted odds ratio; BMI: body mass index
1. Confounders adjusted for: maternal age, non-Hispanic/Hispanic, marital status, maternal education, BMI, insurance status.

Critical appraisal

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low *(The authors adjusted for the confounders that were statistically significant. These confounders were all the important confounders.)*
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low *(All eligible women were included. Start of follow up and start of intervention coincide.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Moderate *(Intervention definition is based solely on information collected at the time of intervention and taken from information recorded on birth certificates. However, the study reports that recording of planned place of birth on certificates has not been assessed for accuracy so*

Section	Question	Answer
		there may be inaccuracies when reporting planned place of birth, which might have an effect of the transfer to hospital rates)
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate *(There may be unbalanced co-interventions among the different birth centres that would lead to a different rate of transfer for different women.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Moderate *(There is not enough information regarding missing information but the authors describe a regression model that only included non-missing data.)*
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low *(The methods of outcome assessment were comparable across intervention groups, and unlikely to be influenced by knowledge of the intervention.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Moderate *(There are concerns regarding the possibility of selecting results based on multiple analysis, as there is no protocol available to determine whether all the confounders which were classified as important were used. There were also no adjusted estimates reported for the multiparous group, only for all women and nulliparous.)*
Overall bias	Risk of bias judgement	Moderate
Overall bias	Risk of bias variation across outcomes	No variation
Overall bias	Directness	Directly applicable