

Title

Profile of severely growth restricted births undelivered at 40 weeks in Western Australia

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Table S1: International Classification of Disease versions 9 and 10 diagnosis code and diagnosis categories in the Hospital Morbidity Data collection used to identify maternal conditions.

Maternal conditions	ICD 9 codes	ICD 10 codes
Medical conditions		
Existing diabetes	250	E10-11, E13-14, O24.0-24.3
Essential hypertension	401, 642.0-642.2	I10, O10
Pregnancy complications		
Gestational diabetes	648.8	O24.4, O24.9
Gestational hypertension	642.3, 642.9	O13, O16
Threatened miscarriage	640.0-640.03	O20.0
Preeclampsia	642.4-642.7	O11, O14, O15
Any ante-partum haemorrhage	640.8-640.93, 641	O20.8, O20.9, O44-46

Table S2: Cross tabulation of maternal region of birth by ethnic origins^a

	Maternal Ethnic origins ^b															
	Caucasian		Aboriginal		Asian		Indian		African		Polynesian		Maori		Other	
	n	row %	n	row %	n	row %	n	row %	n	row %	n	row %	n	row %	n	row %
Maternal region of birth ^c																
Australia	46,340	88.0 ^d	3,823	7.3	592	1.1	89	0.2	13	0.0	24	0.0	117	0.2	1,627	3.1
Oceania (other than Australia)	2,516	57.9 ^d	10	0.2	23	0.5	28	0.6			89	2.0	1,318	30.3 ^e	357	8.2
North-West Europe	7,495	95.0 ^d			44	0.6	47	0.6	10	0.1					282	3.6
Southern and Eastern Europe	1,312	87.1 ^d													185	12.3
North Africa and the Middle East	391	21.6			78	4.3	36	2.0	408	22.5					896	49.5 ^d
South-East Asia	245	4.5			4,606	85.0 ^d	112	2.1			37	0.7			407	7.5
North-East Asia	93	3.2			2,697	93.6 ^d	0	0.0							91	3.2
Southern and Central Asia	229	4.7			641	13.2	3,408	70.1 ^d							574	11.8
Americas	1,170	78.3 ^d			18	1.2			10	0.7					284	19.0
Sub-Saharan Africa	1,611	42.2			42	1.1	138	3.6	1,223	32.0 ^e	10	0.3			786	20.6

Missing: Ethnicity 15 (0.0%), Country of birth 169 (0.2%)

^a Numbers only given for cells with n > 10.

^b Maternal self-reported ethnic origins as recorded in the Midwives Notification System

^c Based on Standard Australian Classification of Countries, Major region group of maternal country of birth recorded in the Birth Register.

^d Prevalent Ethnic group in region

^e Other Ethnic group with >30% of region total.

Table S3: Prevalence of RCOG minor and major risk factors for SGA^{a,b}

SGA risk factors	FGR_40 (N= 696)		FGR_37-39 (n= 1,208)		Not SGA 37+ (N=84,918)		Overall missing data
	n	%	n	%	n	%	%
At least 1 major or 3 minor risk factors	360	51.7	771	63.8	36,999	43.6	
Major risk factors							
<i>Available at booking appointment</i>							
Maternal age>40 years	<10 ^c	<1.5	28	2.3	1,957	2.3	0.0
Smoker >10 cigarettes per day	47	6.8	91	7.5	2,160	2.5	0.0
Chronic Hypertension	<10 ^c	<1.5	<10 ^c	<1.0	771	0.9	0.0
Existing Diabetes ^d	0	0.0	11	0.9	627	0.7	0.0
BMI ≥ 35	107	15.4	145	12.0	16,584	19.5	4.9
<i>Pregnancy complications/developments</i>							
Threatened miscarriage	72	10.3	248	20.5	7,411	8.7	0.0
Pre-eclampsia	17	2.4	54	4.5	2,039	2.4	0.0
Other Ante-partum haemorrhage ^e	15	2.2	34	2.8	2,327	2.7	0.0
<i>Only available for multiparous women</i>							
Previous SGA baby	92	13.2	262	21.7	4,584	5.4	8.7 ^f
Previous stillbirth	<10 ^c	<1.5	<10 ^c	<1.0	662	0.8	8.7 ^f
<i>Only available for parents with a MNS record (born in WA, ≥ 1980)</i>							
Maternal SGA	62	8.9	132	10.9	3,334	3.9	61.5
Paternal SGA	33	4.7	75	6.2	2,342	2.8	71.6
Minor risk factors							
<i>Available at booking appointment</i>							
Maternal age 35-40 years	91	13.1	212	17.5	15,804	18.6	0.0
Primiparous	462	66.4	653	54.1	35,100	41.3	0.0
BMI <20	102	14.7	235	19.5	7,702	9.1	4.9
BMI 25-34.9	36	5.2	121	10.0	22,681	26.7	4.9
Smoker 1-10 cigarettes per day	84	12.1	237	19.6	5,428	6.4	0.0

Pregnancy complications/developments

Gestational hypertension ^g	17	2.4	50	4.1	2,266	2.7	1.1
Placental abruption	<10 ^c	<1.5	<10 ^c	<1.0	292	0.3	0.0
<i>Only available for multiparous women with MNS record for previous birth(s)</i>							
Previous Pre-eclampsia	<10 ^c	<1.5	11	0.9	909	1.1	8.7 ^f
Pregnancy Interval <6 months	<10 ^c	<1.5	22	1.8	1,827	2.2	8.7 ^f
Pregnancy Interval ≥60 months	33	4.7	106	8.8	4,740	5.6	8.7 ^f

BMI: Body Mass Index; MNS: Midwives Notification System; SGA: Small-for-Gestational-Age; ROCG; Royal College of Obstetricians and Gynaecologists; FGR_40: Births undelivered at 40 weeks with FGR, Not SGA 37+: Births at 37 or later weeks' gestation not SGA, FGR_37-39: Births between 37-39 weeks' gestation with FGR.

^aRoyal College of Obstetricians and Gynaecologists. *The Investigation and Management of the Small-for-Gestational-Age Fetus. Green-top Guideline No. 31, 2nd Edition*. Royal College of Obstetricians and Gynaecologists.2013.

^bNo data for the following risk factors: Cocaine, daily vigorous exercise, renal impairment, PAPP-A <0.4 MoM, antiphospholipid syndrome, large fibroids, echogenic bowel (major) or IVF singleton pregnancy, low fruit intake prepregnancy, caffeine intake, maternal weight gain (minor).

^cExact numbers and percentages not given for cells with n= 1-10.

^dSeverity of disease not known (with or without vascular disease).

^eOther than placenta praevia or placental abruption.

^fPercentage of multiparous women with missing values. The majority of these were multiparous women at the time of the first their first record in the MNS.

^gSeverity of disease not known so classified as minor risk factor.

Table S4: Modifications to the NSW composite neonatal adverse outcome indicator^a

Diagnosis	Additional ICD-10-AM diagnosis codes
Birth trauma (intracranial haemorrhage paralysis due to brachial plexus injury, skull or long bone fracture)	P14.3 Other brachial plexus birth trauma
Sepsis/septicaemia (streptococcus, staphylococcus, E. coli, unspecified Gram-negative)	A41.0 Sepsis due to Staphylococcus aureus A41.1 Sepsis due to other specified staphylococcus A41.2 Sepsis due to unspecified staphylococcus A41.4 Sepsis due to anaerobes (includes gram-ve anaerobes)
Procedure	Additional ACHI procedure codes
Ventilatory support (mechanical ventilation and/or CPAP)	92211-00 Management of combined ventilatory support, ≥ 96 hours 92210-00 Nitric oxide therapy
Transfusion of blood or blood products	13706-05 Administration of gamma globulin
Pneumothorax requiring an intercostal catheter	38806-00 Insertion of intercostal catheter for drainage (replaced 38409-00 in 2008)
Any intravenous fluids	92192-00 Parenteral infusion of nutritional substances

ICD-10-AM: International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (Versions 7-9 were in use during the time of interest (2013-2015)).

ACHI: Australian Classification of Health Interventions (Versions 7-9 were in use during the time of interest (2013-2015)).

^aLain SJ, Algert CS, Nassar N, Bowen JR, Roberts CL. Incidence of severe adverse neonatal outcomes: use of a composite indicator in a population cohort. *Matern Child Health J.* 2012;16(3):600-608.

Table S5. Maternal and other factors associated with having a severely growth restricted singleton birth of 37 or more weeks' gestation in WA (2013-15): full list of factors investigated.

	not SGA 37+ ^a		FGR_40		FGR_37-39				
	n=84,918		n = 696		n=1,208				
	n	%	n	%	Unadjusted OR (95% CI)	n	%	Unadjusted OR (95% CI)	P ^b value
Sex									
Boy	43,346	51	370	53.2	1.00 (Reference)	608	50.3	1.00 (Reference)	
Girl	41,572	49	326	46.8	0.92 (0.79, 1.07)	600	49.7	1.03 (0.92,1.15)	0.23
Maternal age (years)									
<25	13,759	16.2	159	22.8	1.41 (1.18, 1.70)	278	23.0	1.56 (1.36, 1.80)	0.37
25-34	53,399	62.9	437	62.8	1.00 (Reference)	690	57.1	1.00 (Reference)	
>34	17,760	20.9	100	14.4	0.69 (0.55, 0.86)	240	19.9	1.05 (0.90, 1.21)	0.01
Booking appointment BMI									
<18.5	2,339	2.8	40	5.7	1.90 (1.37, 2.64)	120	9.9	3.40 (2.79, 4.16)	<0.01
18.5 <25	39,179	46.1	353	50.7	1.00 (Reference)	591	48.9	1.00 (Reference)	
25<30	22,681	26.7	142	20.4	0.70 (0.57, 0.85)	269	22.3	0.79 (0.68, 0.91)	0.99
≥30	16,584	19.5	107	15.4	0.72 (0.58, 0.89)	145	12	0.57 (0.48, 0.70)	<0.01
Missing values ^c	4,135	4.9	54	7.8		83	6.9		
Maternal height (cm)									
<162	24,846	29.3	345	49.6	1.84 (1.55, 2.18)	641	53.1	2.13 (1.87, 2.43)	0.19
162-167	29,107	34.3	220	31.6	1.00 (Reference)	352	29.1	1.00 (Reference)	

>167	30,396	35.8	125	18	0.54 (0.44, 0.68)	209	17.3	0.57 (0.48, 0.68)	0.81
Primiparous	35,100	41.3	462	66.4	2.83 (2.41, 3.31)	653	54.1	1.67 (1.49, 1.87)	<0.01
Ante-natal booking appointment >10 weeks GA	35,337	41.6	303	43.5	1.09 (0.94, 1.28)	563	46.6	1.22 (1.08, 1.09)	0.28
Missing values ^c	4,674	5.5	41	5.9		57	4.7		
Smoking during pregnancy									
Nil	77,311	91	563	80.9	1.00 (Reference)	880	72.8	1.00 (Reference)	
Any	7,588	8.9	131	18.8	2.37 (1.96, 2.87)	328	27.2	3.80 (3.34, 4.32)	<0.01
≤10 CPD	5,428	6.4	84	12.1	2.13 (1.69, 2.68)	237	19.6	3.84 (3.32, 4.44)	0.59
>10 CPD	2,087	2.5	46	6.6	3.03 (2.23, 4.10)	87	7.2	3.66 (2.93, 4.59)	0.44
CPD unknown					1.88(0.26, 13.56)			4.83 (1.77, 13.23)	0.54
					Trend <i>P</i> value=<0.01			Trend <i>P</i> value=<0.01	
Maternal medical conditions									
Pre-existing diabetes	667	0.8	0	0	Not estimated	11	0.9	1.16 (0.64, 2.11)	NA
Essential hypertension	919	1.1	<10	<1.4	0.40 (0.13, 1.23)	<10	<0.8	0.69 (0.36,1.33)	0.41
Pregnancy complications									
Threatened miscarriage	7458	8.8	73	10.5	1.22 (0.96, 1.56)	248	20.5	2.68 (2.33, 3.09)	<0.01
Gestational diabetes	11,573	13.6	64	9.2	0.64 (0.50, 0.83)	239	19.8	1.56 (1.36, 1.80)	<0.01
Gestational hypertension	3,167	3.7	21	3.0	0.81 (0.52, 1.25)	76	6.3	1.72 (1.36, 2.17)	<0.01
Pre-eclampsia	2,051	2.4	18	2.6	1.08 (0.67, 1.72)	54	4.5	1.89 (1.43, 2.49)	0.04
Ante-partum haemorrhage	3,192	3.8	23	3.3	0.88 (0.58, 1.33)	45	3.7	0.99 (0.73, 1.34)	0.64
Major congenital anomaly	3,156	3.7	26	3.7	1.01 (0.68, 1.49)	101	8.4	2.36 (1.92, 2.91)	<0.01
SES area birth residence tertiles									
Lowest	26,830	31.6	262	37.6	1.52 (1.25, 1.85)	538	44.5	2.04 (1.75, 2.37)	<0.01
Middle	27,234	32.1	220	31.6	1.25 (1.02, 1.54)	316	27.2	1.18 (1.00, 1.39)	0.05

Highest	24,993	29.4	161	23.1	1.00 (Reference)	246	20.4	1.00 (Reference)	
Missing values ^c	5,861	6.9	53	7.6		108	8.9		
Remote or very remote birth residence	5,380	6.3	61	8.8	1.42 (1.09, 1.85)	111	9.2	1.52 (1.25, 1.85)	0.68
Missing values ^c	3,890	4.6	30	4.3		69	5.7		
Maternal Ethnic origins									
Caucasian	60,462	71.2	366	52.6	1.00 (Reference)	610	50.5	1.00 (Reference)	
Aboriginal	3,751	4.4	62	8.9	2.73(2.08,3.58)	146	12.1	3.86 (3.21, 4.64)	0.03
Asian	8,477	10	107	15.4	2.09 (1.68,2.59)	166	13.7	1.94 (1.63, 2.31)	0.39
Indian	3,644	4.3	72	10.3	3.26 (2.53,4.21)	151	12.5	4.11 (3.43, 4.92)	0.15
African	1,628	1.9	22	3.2	2.23 (1.45,3.44)	27	2.2	1.64 (1.12, 2.42)	0.17
Other	6,943	8.2	65	9.3	1.55 (1.19,2.02)	108	8.9	1.54 (1.26, 1.90)	0.81
Maternal region of birth and ethnic origins									
Australian-born									
Caucasian	45,584	53.7	280	40.2	1.00 (Reference)	476	39.4	1.00 (Reference)	
Aboriginal	3,629	4.3	59	8.5	2.65 (2.00, 3.51)	135	11.2	3.56 (2.93, 4.33)	0.02
Other	2,408	2.8	21	3	1.42 (0.91, 2.22)	33	2.7	1.31 (0.92, 1.87)	0.95
Born outside Australia	33,135	39	334	48	1.64 (1.40, 1.93)	552	45.7	1.60 (1.41, 1.81)	0.44
Oceania (not Australia)									
Caucasian	2,477	2.9	16	2.3	1.05 (0.63, 1.74)	23	1.9	0.89 (0.58, 1.35)	0.82
non-Caucasian									
North-West Europe	1,788	2.1	13	1.9	1.18 (0.68, 2.07)	27	2.2	1.45 (0.98, 2.14)	0.36
Southern & Eastern	7,786	9.2	35	5	0.73 (0.52, 1.04)	65	5.4	0.80 (0.62, 1.04)	0.37
Europe	1,471	1.7	<12	<1.7	1.22 (0.67, 2.23)	24	2	1.56 (1.03, 2.36)	0.32
North Africa & Middle East	1,754	2.1	22	3.2	2.04 (1.32, 3.16)	34	2.8	1.86 (1.31, 2.64)	0.99
South-East Asia	5,263	6.2	56	8	1.73 (1.30, 2.31)	101	8.4	1.84 (1.48, 2.28)	0.36
North-East Asia	2,811	3.3	31	4.5	1.80 (1.24, 2.61)	40	3.3	1.36 (0.99, 1.89)	0.44

Southern & Central Asia	4,592	5.4	90	13	3.19 (2.51, 4.05)	178	14.7	3.71 (3.12, 4.42)	0.08
Americas	1,470	1.7	13	1.9	1.44 (0.82, 2.52)	<12	<1	0.72 (0.39, 1.31)	0.12
Sub-Saharan Africa									
Caucasian	1,592	1.9	<12	<1.7	1.02 (0.54, 1.93)	<12	<1	0.54 (0.28, 1.05)	0.21
Sub-Saharan Africa non-Caucasian	2,129	2.5	37	5.3	2.83 (2.00, 4.00)	40	3.3	1.80 (1.30, 2.49)	0.11
Time between arrival in Australia and birth (years)									
Australian-born	51,626	60.8	360	51.7	1.00 (Reference)	644	53.3	1.00 (Reference)	
>10	10,515	12.4	80	11.5	1.09 (0.86, 1.39))	137	11.3	1.04 (0.87, 1.26)	0.38
5-9	9,909	11.7	93	13.4	1.35 (1.07, 1.39)	146	12.1	1.18 (0.99, 1.42)	0.40
<5	10,909	12.8	139	20	1.83 (1.50, 22.23)	222	18.4	1.63 (1.40, 1.90)	0.87
Unknown	1,800	2.1	22	3.2	1.75 (1.14, 2.70)	4.7	3.9	2.09 (1.55, 2.83)	0.35
					Trend <i>P</i> value <0.01				
						Trend <i>P</i> value <0.01			

Multiparous women with details of all previous pregnancies	n= 42,389		n= 187			n= 455			
Interpregnancy interval (months)									
<18	16,029	37.8	50	26.7	1.13 (0.66, 1.92)	133	29.2	1.02 (0.75, 1.40)	0.89
18-23	6,892	16.3	19	10.2	1.00 (Reference)	56	12.3	1.00 (Reference)	
≥24	19,470	45.9	118	63.1	2.20 (1.35, 3.57)	266	58.5	1.68 (1.26, 2.25)	0.26
Any history of									
Previous FGR birth	1,277	3	40	21.4	8.75 (6.14, 12.47)	137	30.1	13.85 (11.25, 17.05)	0.03
Stillbirth	662	1.6	<10	<5.3	0.68 (0.17, 2.75)	<10	<2.2	0.70 (0.29, 1.70)	0.97
Gestational diabetes	2,994	7.1	10	5.3	0.74 (0.39, 1.41)	31	6.8	0.96 (0.67, 1.39)	0.49
Gestational hypertension	2,807	6.6	17	9.1	1.41 (0.86, 2.33)	41	9.0	1.40 (1.01, 1.92)	0.97
Ante-partum haemorrhage	2,649	6.3	12	6.4	1.03 (0.57, 1.85)	36	7.9	1.29 (0.92, 1.82)	0.51
Pre-eclampsia	2,461	5.8	13	7	1.21 (0.69, 2.13)	27	5.9	1.02 (0.69, 1.51)	0.63

Threatened miscarriage	10,687	25.2	59	31.6	1.41 (1.03, 1.92)	161	35.4	1.67 (1.38, 2.03)	0.35
Previous infant with a neonatal adverse outcome ^d	4,823	11.5	21	11.4	0.98 (0.62, 1.55)	86	19.3	1.84 (1.45, 2.33)	0.02

BMI: Body Mass Index, CI: Confidence Interval, CPD: cigarettes per day, OR: Odds Ratio, SES: Socio-economic status, FGR: Severely growth restricted (birth weight <3rd centile for sex and gestational age), FGR_40 Births undelivered at 40 weeks with FGR, Not SGA 37+: Births at 37 or later weeks' gestation not SGA, FGR_37-39: Births between 37-39 weeks' gestation with FGR.

^a The reference group for the multinomial analyses was the Not SGA 37+ group.

^b Wald Chi square *P* value testing whether the ORs for FGR_40 compared to Not SGA 37+ and FGR_37-39 compared to Not SGA 37+ are different.

^c Missing values only shown for factors with >5% of missing values in any group.

^d See Supplementary Table 4 for components of the NSW composite neonatal adverse outcome indicator used as indicator for neonatal morbidity.