

**Supplementary materials for Randall, Morris, Kelly and Glastras. Are newly introduced criteria for the diagnosis of gestational diabetes mellitus associated with improved pregnancy outcomes and/or increased interventions in New South Wales, Australia? A population-based data linkage study.**

Supplementary Table 1. Maternity service levels for public hospitals in NSW.

Level	Type	Description
6	Tertiary, specialist obstetric services	Normal, moderate and high-risk births, with Level 3 neonatal intensive care.
5	Regional referral, metropolitan services	Care for mothers and infants known to be at high risk. Able to cope with complications arising from these risk factors. Has Level 2a neonatal care.
4	Regional-referral, metropolitan district services	Birth and care for mothers and/or babies with moderate risk factors. Obstetricians and paediatrician available 24 hours a day, 7 days a week. Rostered resident medical staff, specialist anaesthetist on call. Has Level 2b neonatal care.
3	Country district and smaller metropolitan services	Care for mothers and infants at normal risk and selected moderate risk pregnancies and births. Full resuscitation and theatre facilities available. Rostered obstetricians, resident medical staff and midwives. Accredited general practitioners, specialist anaesthetist on call. Has Level 2b neonatal care.
2	Small maternity services	Normal-risk pregnancy and births only. Staffed by general practitioners and midwives.
1	Local maternity service (no births)	Postnatal only for women with normal outcomes.

**Supplementary Table 2. Detailed definitions and ICD-10-AM codes for exposure, outcomes, covariates and exclusion criteria.**

Variable	Data	Description	Codes
<b>Exposure</b>			
Gestational diabetes mellitus	APDC, PDC	Diagnosis of gestational diabetes in the antenatal admissions or birth record (APDC) or in the births data (PDC)	O24.4 OR Gestational diabetes (odiab) = 1
<b>Outcomes</b>			
Total planned births	PDC	Planned caesarean sections or inductions	Labour onset = 'Induction' or 'No labour'
Early planned births	PDC	Planned caesarean sections or inductions <39 weeks	Labour onset = 'Induction' or 'No labour' and gestage < 39
Caesarean sections	PDC	All Caesarean sections	Type of delivery = 'Caesarean'
Maternal morbidity	Composite indicator of maternal morbidity initially developed by Roberts et al, 2008(1) with the following components:		
	APDC	Blood transfusion	Z51.3, 13706-01, 13706-02, 13706-03, 92061-00, 92062-00, 92206-00
	APDC	Acute abdomen	K35, K37, K65.0, K65.9, N73.3, N73.5
	APDC	Acute renal failure	O90.4, N17, N19, N99.0
	APDC	Acute psychosis	F53.1, F23
	APDC	Cardiac arrest, failure, or infarction	I21, I42, I43, I46, I50, J81, O74.2, O89.1, O90.3, O29.1
	APDC	Cerebral oedema or coma	G93.6
	APDC	Disseminated intravascular coagulopathy	D65
	APDC	Cerebral-vascular accident	I61, I62, I63, I64
	APDC	Major complications of anaesthesia	O74.0, O74.2, O74.3, O89.0, O89.2, O29.0, O29.2
	APDC	Obstetric embolism	O88
	APDC	Shock	R57, O75.1, T80.5, T88.6
	APDC	Sickle cell anaemia with crisis	D57.0
	APDC	Status asthmaticus	J46
	APDC	Status epilepticus	G41
	APDC	Uterine rupture	O71.0, O71.1
	APDC	Apheresis	Z51.81
	APDC	Ventilation	13857-00, 13879-00, 13882-00, 13882-01, 13882-02, 92038-00, 92039-00, 92040-00, 92041-00, 92209-00, 92209-01, 92209-02, 92211-00
	APDC	Tracheostomy	41880-00, 41883-00, 41883-01, 41881-00, 41881-01, 90179-06, 92046-00, 92047-00
	APDC	Endotracheal intubation	22007-00, 22007-01, 22008-00, 22008-01
	APDC	Mechanical ventilation >8	8< hours_on_mech_ventilation <999
	APDC	Nasopharyngeal intubation	90179-02, 90179-05
	APDC, PDC	Curettage, in combination with a general anaesthetic	16564-00, 16564-01 AND 92514, 92502-00, 92502-01, 92502-02, 92502-03 OR General anaesthetic = '1' (PDC)
	APDC	Dialysis	13100, 13112-00, 90351-00, 13109-00, 13109-01, 13110-00
	APDC	Evacuation of haematoma	90484-00, 90484-01, 90484-02, 30394-00
	APDC	Hysterectomy	35653-00, 35653-01, 35653-02, 35653-03
	APDC	Procedures to reduce blood flow to the uterus	34103-12, 33833-03, 33845-00, 30385-00, 35759-00

Variable	Data	Description	Codes
	APDC	Reclosure of disrupted CS wound	30403-03
	APDC, PDC	Repair of bladder following a caesarean	90480-00, 37004-03, 37004-02 AND 16520-00, 16520-01, 16520-02, 16520-03 OR Delivery = 'Caesarean' (PDC)
	APDC	Cystostomy	37011-00, 37008-01
	APDC	Repair of intestine	30566-00, 30375-19, 30565-00, 30375-24, 32003-00, 32000-00, 32003-01, 32000-01, 32005-01, 32004-01, 32006-00, 32006-01, 32005-00, 32004-00, 32012-00, 32009-00, 30375-25, 43816-02
	APDC	Repair ruptured or inverted uterus	90478-00, 16570-01
	APDC	Therapeutic plasmapheresis, leukopheresis, erythropheresis, plateletpheresis	13750-00, 13750-01, 13750-02, 13750-03
Perinatal deaths	PDC	Stillbirth	Perinatal death type = 'Stillborn' or (Apgar score 1min = 0 AND Apgar score 5min = 0) or Main indication for induction = 'Fetal death'
	RBDM	Neonatal death	0 <= (RBDM date of death - PDC date of birth) < 29 days
	APDC	Neonatal death	Mode of separation = 'Died (autopsy)' OR 'Died (no autopsy)' AND 0 <= (Episode end date - PDC date of birth) < 29
Neonatal morbidity		Composite indicator of neonatal morbidity initially developed by Lain et al(2) and updated by Todd et al(3) removing IV nutritional feeding and non-invasive ventilation, due to coding and practice changes over time. Includes the following components:	
	PDC	Gestational age < 32 weeks	gestage < 32 and birthweight < 2500
	PDC	Birthweight < 1500g	birthweight < 1500
	PDC, APDC, RBDM	Death within 28 days of birth	See neonatal death above
	APDC	Birth trauma	P10.0, P10.1, P10.2, P10.3, P13.0, P13.2, P13.3, P14.0, P14.1
	APDC	Cerebral conditions	P52.1, P52.2, P91.2, P91.5, P91.81, P91.6, P90, R56, I63
	APDC	Respiratory conditions	P23, J12, J13, J14, J15, J16, J17, J18, P22.0, P27.1, P28.0, P28.5
	APDC	Sepsis/septicaemia	P36, A40, A41.5, A41.9, B95.1, 96.2
	APDC	Necrotising enterocolitis	P77
	PDC	Resuscitation or intubation	Resuscitation of baby = 'IPPR: with intubation' OR 'External cardiac massage and ventilation'
	APDC	Transferred to a higher-level facility within 24 hrs	
	APDC	Hours of mechanical ventilation >=2	2 <= hours_on_mech_ventilation < 999
	APDC	Invasive ventilation procedure	92211-00, 13882-00, 13882-01, 13882-02, 13857-00, 13879-00, 22007, 22008, 90179
	APDC	Resuscitation procedure	92052, 92053, 92042-00, 90225
	APDC	Arterial/central catheter procedure	38206, 38200-00, 38203-00, 13303-00, 34524-00, 34530-01, 13300-02, 13319-00, 13815
	APDC	Transfusion of blood or blood products	13306-00, 13706-01, 13706-02, 13706-03, 13706-04, 92206-00
	APDC	Intravenous fluid procedure but no nutritional feeding	96199-00, 96199-01, 96199-03, 96199-04, 96199-05, 96199-06, 96199-10, 92181-00, 92182-00, 92183-00, 92185-00, 92188-00,

Variable	Data	Description	Codes
	APDC	Surgical procedures	31462-00, 30378-00, 30564-00, 30565-00, 30566-00, 30571-00, 30615-00, 30617-00, 32123-00, 43801-00, 43807-00, 43816-02, 43870-00, 43930-00, 43945-00, 43963-00, 30373, 30375, 30562, 30601, 43837, 43843, 43864, 43867, 43873, 43876, 43978, 38600-00, 90224-00, 96219-00, 96220-00, 387###, 39640-00, 90032-00, 40100-00, 40103-00, 39015, 40003, 38403-00, 38803-00, 38409-00, 38806-00, 43852-00, 43900-00, 43915-00, 41881, 41883, 90180, 36624-01, 36516, 36537, 36564, 36579
Macrosomia	PDC	Birthweight > 4kg	bweight>4000
Large for gestational age	PDC	Birthweight >90 <sup>th</sup> percentile weight for gestational age	bweight and gestage compared with birthweight percentiles from Dobbins et al (4)
Neonatal hypoglycaemia	APDC	Neonatal hypoglycaemia	P70.0, P70.1, P70.4
<b>Covariates</b>			
Maternal age	PDC		Age<20, 20<=age<35, Age>=35
Country of birth	PDC, APDC (if missing PDC)	Standard Australian Classification of Countries (SACC)	Australia and New Zealand: 1000 - 1299 Rest of Oceania and Antarctica: 1300 – 1699 Europe: 2100 – 2499, 3100 – 3399, 0911, 0912, 0913, 0914, 0923 North Africa and the Middle East: 4000 – 4299 South-East Asia: 5000 – 5299 North-East Asia: 6100 – 6299, 0917 Southern Asia: 7100 - 7199 Central Asia: 7200 - 7299 North America: 8000 - 8199 Latin America and the Caribbean: 8200 – 8499 Sub-Saharan Africa: 9000 - 9299, 0918
Previous Caesarean	PDC	Any previous Caesarean section	Total no. of previous caesarean section > 0
Assisted reproductive technology	APDC	Any code up to 1 year before birth	Z31.1, Z31.2, Z31.3
Smoked in current pregnancy	PDC	Any smoking during current pregnancy	Smoking during pregnancy = 1 OR Smoking during first half of pregnancy = 1 OR Smoking during the second half of pregnancy = 1
Any hypertension in current pregnancy	APDC	Any hospital code in antenatal period and at birth	I10, O10, O11, O13-O16
	PDC	Hypertension coded at birth admission	Chronic hypertension = 1 OR Pregnancy-induced hypertension = 1 OR Pregnancy-induced hypertension – proteinuric = 1 OR Pregnancy-induced hypertension – non-proteinuric = 1
Prelabour rupture of membranes (PROM)	APDC	PROM coded in antenatal period or at birth	O42
	PDC	PROM coded at birth	Main indication for induction = PROM
Placental issues	APDC	Placenta praevia, placenta accrete, placental abruption coded in antenatal period or at birth	O44.0, O44.1, O43.2, O45, O45.0, O45.8, O45.9

Variable	Data	Description	Codes
<b>Exclusions</b>			
Existing diabetes	APDC PDC	Existing diabetes	O24.0, E10, O24.1, E11, O24.2, O24.3, E13, E14 or mdiab=1 in current pregnancy or 5 years before current date of birth
Gestation	PDC	>33 weeks and >41 weeks gestation and missing	33<=gestage<=41 OR gestage=.
Antenatal care	PDC	No antenatal care before 32 weeks	Duration of pregnancy (weeks) at first antenatal visit >=32
Not NSW resident	PDC	SLA of residence not NSW or unknown	SLA 2011 Code not in NSW or unknown
Congenital anomalies	APDC	Major congenital anomalies	Q00-Q07, Q20, Q21.2-Q21.9, Q22-Q24, Q25.2-Q25.9, Q26, Q39, Q60-Q61, Q62.0-Q62.6, Q62.8, Q63-Q64, Q77-Q78, Q79.0-Q79.4, Q79.50-Q79.51, Q90-Q99 Repair procedures 43837, 30601, 43915, 30527-01, 30527-03, 43801-00, 30601-00, 43843, 43852-00, 43903-00, 43900-00, 43855-00, 38453-04, 43864, 43867, 43873, 43870-00, 30375-19, 40103-00, 40100-00, 40003, 90224-00
Linkage error	PDC	Probable linkage errors	Births for one mother that are too close (e.g. two births within the gestation period for one birth)

### Table references

1. Roberts CL, Cameron CA, Bell JC, Algert CS, Morris JM. Measuring maternal morbidity in routinely collected health data: development and validation of a maternal morbidity outcome indicator. *Med Care*. 2008;46(8):786-94.
2. Lain SJ, Algert CS, Nassar N, Bowen JR, Roberts CL. Incidence of severe adverse neonatal outcomes: use of a composite indicator in a population cohort. *Maternal Child Health J*. 2012;16(3):600-8.
3. Todd S, Bowen J, Ibiebele I, Patterson J, Torvaldsen S, Ford F, et al. A composite neonatal adverse outcome indicator using population-based data: an update. *Int J Population Data Science*. 2020;5(1):1337.
4. Dobbins TA, Sullivan EA, Roberts CL, Simpson JM. Australian national birthweight percentiles by sex and gestational age, 1998-2007. *Medical Journal of Australia*. 2012;197(5):291-4.

**Supplementary Figure 1. Study population and exclusions.**