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Antenatal care: An evidence-based review of the relevant measures to assess quality, quantity, and participation

CARLY MOLLOY
SHARON GOLDFELD
CHRIS HARROP
NICHOLAS PERINI

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Antenatal Care Research Summary

RESTACKING THE ODDS: PROJECT BACKGROUND

Inequities emerging in early childhood often continue into adulthood, contributing to unequal rates of low educational attainment, poor mental and physical health and low income. In some cases, this experience is part of a persistent cycle of intergenerational disadvantage. Inequities constitute a significant and ongoing social problem and – along with the substantial economic costs – have major implications for public policy.

To redress inequities, research tells us that efforts should be delivered during early childhood (pregnancy to eight years of age) to deliver the greatest benefits. Restacking the Odds focuses on five key evidence-based interventions/platforms in early childhood: antenatal care; sustained nurse home visiting; early childhood education and care; parenting programs; and the early years of school (see *Figure 1: Five Fundamental Strategies*).

These five strategies are only a subset of the possible interventions, but we have selected them carefully. They are notably *longitudinal* (across early childhood), *ecological* (targeting child and parent), *evidence-based*, and able to be *targeted* to benefit the 'bottom 25 per cent'. Our premise is that by 'stacking' these fundamental interventions (i.e., ensuring they are all applied for a given individual) there will be a cumulative effect - amplifying the impact and sustaining the benefit.

Our intent is to use a combination of data-driven, evidence-based and expert informed approaches to develop measurable best practice indicators of quality, quantity and participation for each of the five strategies:

Quality: Are the *strategies delivered effectively*, relative to evidence-based performance standards? A strategy with 'quality' is one for which there is robust evidence showing it delivers the desired outcomes. A large number of research studies have explored aspects of this question (i.e., "What works?"). Therefore, we pay particular attention to the quality dimension in this report.

Quantity: Are the strategies *available locally* in sufficient quantity for the target population? 'Quantity' helps us determine the quantum of effort and infrastructure needed to deliver the strategy adequately for a given population.

Participation: Do the *appropriately targeted* children and families *participate* at the right dosage levels? 'Participation' shows us what portion of the relevant groups are exposed to the strategy at the level required to trigger the desired benefit. (For example, attending the required number of antenatal visits during pregnancy). Participation levels can be calculated whether the strategy is universal (for everyone), or targeted (intended to benefit a certain part of the population).

These indicators will help identify gaps and priorities in Australian communities. We will test preliminary indicators in 10 communities over the next three years to determine which are pragmatic to collect, resonate with communities, and provide robust measures to stimulate community and government action.

The findings summarised in this report provide essential inputs to guide our subsequent work. There will be a similar report for each of the five strategies.

Five fundamental strategies

Antenatal	Early childhood		School years
	Birth to 2 years	2-5 years	
1 **Antenatal support** • Targeted at parents • Centre-based • *Outcomes:* healthy birth weight, good brain health, appropriate care, 'adequate parenting'	3 **Early childhood education and care** • Targeted at all children (in groups) • High quality for all children • Delivered out of home in a 'pseudo-home-learning environment' • *Outcomes:* children on optimal developmental pathway (cognitive and social-emotional), school readiness		5 **Early Years of School** • Targeted at all children • School-based • *Outcomes:* children on optimal learning pathway by Year 3
2 **Sustained nurse home visiting** • Targeted at disadvantaged parents • Health and development support • Home-based • *Outcomes:* parents develop parenting skills			4 **Parenting programs** • Targeted at parents whose children have behavioural issues (higher prevalence in disadvantaged families) • Centre-based, delivered in groups or 1:1 • *Outcomes:* remedy of specific emerging behavioural issues

Figure 1: Five fundamental strategies

OVERVIEW

This report summarises the findings from our targeted review of the relevant global evidence base of the best health care practices in antenatal care - focusing on evidence-based clinical guidelines and associated processes that lead to better outcomes for women and children.

Clinical practice guidelines are evidence based statements that include recommendations intended to optimise patient care and assist health care practitioners to make decisions about appropriate health care for specific clinical circumstances. Clinical practice guidelines should assist clinicians and patients in shared decision making[1].

Antenatal care is the universal health platform designed to optimise maternal health and fetal development during pregnancy, and minimise adverse outcomes for all women [1]. Adverse outcomes of pregnancy are sometimes unpredictable, but we know they are associated with risk factors such as, smoking, diabetes, hypertension, substance misuse, or domestic violence. The association between these antenatal risk factors and the subsequent trajectories of child learning and development is well documented. For example, obesity, stress and depression, alcohol misuse and low socioeconomic status are associated with poor fetal outcomes such as low birth weight and preterm birth [2-5], which are in turn associated with poorer physical, cognitive, and adaptive outcomes [6].

AIM

Our targeted review of the evidence base for antenatal care addressed questions in four key areas:

1. **Quality** – universal provision. What *clinical best practices* in antenatal care are significantly related to better birth outcomes and improved child developmental outcomes? What *process indicators* can we use to measure and define these best practices?

2. **Quality** – targeted provision. Should some populations of women have targeted provision? Do the best practices and indicators differ for targeted (versus universal) provision?

3. **Quantity**. Given universal provision, in what quantity should antenatal care be available for a given population?

4. **Participation**. What are the best evidence-based indicators of the required participation in antenatal care?

METHOD

For each strategy we targeted existing robust Australian data, evidence and frameworks already in place and acceptable by the field. Australia already has detailed National Clinical Practice Guidelines for antenatal care, underpinned by rigorous research and/or systematic reviews of the available evidence.

We therefore undertook the following steps:

- We developed a list of topics, actions and recommendations for antenatal *clinical practice* drawn from Australia's NHMRC Clinical Practice Guidelines for both universal care and high-risk care. We mapped these items against the guidelines for other regions and countries with generally similar health systems and demographics, identifying which were present or absent in each to produce a comprehensive list of practices identified as clinically important.

- We then identified existing *quality indicators* from each region. The UK's National Institute of Clinical Excellence (NICE) Quality Standards and Statements provided the most substantial list of indicators and the best linkage to the research literature. We mapped quality indicators from Australia and the other comparable geographies against the NICE indicators to identify where efforts already exist to capture relevant data on quality.

- We then produced a structured list of *clinical practices*, and an associated set of *quality indicators* for universal use, and for use with high-risk populations (i.e., those with mental health issues, hypertension or diabetes), drawing largely from the NICE Quality Standards and Statements.

- We conducted a separate literature search to examine the research related to thresholds for antenatal care related to *quantity* (that is, the volume of antenatal care provision required in a given community). The research in this area is limited and we have based our indicators on calculations recommended by the World Health Organisation (WHO).

- We consulted senior domain experts to pressure-test, validate and/or refine our approach.

1 Institute of Medicine. Graham R, Mancher M, Wolman DM, Greenfield S, Steinberg E, editors. Clinical practice guidelines we can trust. Washington (DC): National Academies Press, 2011; p2.

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Findings for Antenatal Care

CLINICAL PRACTICE GUIDELINES

We examined six relevant sets of guidelines for clinical practice in antenatal care:

- **Australia**. National Health and Medical Research Council (NHMRC) - *Clinical Practice Guidelines: Antenatal Care – Module 1 & 2 (2012)* [7-8]
- **United Kingdom**. National Institute of Clinical Excellence (NICE) – *Antenatal Care: routine care for the healthy pregnant woman (2008)* [9]
- **United States**. Institute for Clinical systems Improvement (ICSI) – *Routine prenatal care (2012)* [10]
- **Australia and NZ**. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists: *Standards of Maternity Care in Australia and New Zealand (2016)* [11]
- **Canada**. British Columbia Perinatal Health Program (BCPHP) *Obstetric Guideline 19: Maternity Care Pathway (2010)* [12]
- **Europe**. WHO Regional Office for Europe's Health Evidence Network (HEN) – *What is the effectiveness of antenatal care? (2005)* [1]

Due to their systematic reviews of approximately 60 aspects of clinical care, the UK's NICE Guidelines and Australia's NHMRC Antenatal Care Clinical Practice Guidelines had the highest level of scientific rigour and evidence. They provide a detailed account of the association between aspects of clinical care, other risk factors, and adverse pregnancy outcomes.

Collectively, the six sets of guidelines identified 69 different factors as being clinically relevant to child outcomes. There was a high degree of commonality across the lists, with 44 universal care factors and 4 high-risk pregnancy factors being common to almost all lists. We have divided this long list of factors into five main themes. The quality indicators are then organised into these themes:

- Provision of care
- Attendance
- Screening and assessment
- Education and awareness
- Fetal monitoring

Appendix A provides a brief summary of the evidence, organised by theme.

QUALITY INDICATORS

To populate the quality indicators against our themes we reviewed the available literature and distilled a list of relevant documents discussing existing indicators used to monitor improvements in quality:

- *NICE: Quality Statements* (UK)
- *National Core Maternity Indicators* (Australia) [13]
- *New Zealand Maternity Clinical Indicators* (NZ) [14]
- *WHO - Improving measurement of the quality of maternal, newborn and child care in health facilities* (Europe) [15]
- *A framework for the development of maternal quality of care indicators* (USA) [16]

Of these, the NICE Quality Statements are especially suitable for our purpose because they include a detailed list of quality measures for process, structure, and outcomes (rather than focusing only on outcomes). The measures include indicators for routine (universal) care indicators, and for high-risk pregnancies (hypertension, diabetes, and mental health).

Choosing the preliminary list of indicators

Given their relevance, we largely implemented the NICE measures into our themes, and also drew from Australia's *National Core Maternity Indicators* data (which highlighted the importance of antenatal visits, and whether the mother is smoking).

In total, we selected 20 indicators for the quality of universal care, across the five themes listed above. High-risk patients (those with mental health issues, hypertension or diabetes) require tailored metrics. We identified 21 additional (different) quality indicators relevant to these groups. Appendix B provides a full list of these indicators.

Expert opinion

We vetted the distilled set of indicators with two senior Australian ANC experts.

- *Professor Jeremy Oats MD*. Chair Victorian Consultative Council on Obstetric and Paediatric Mortality and Morbidity Professorial Fellow, Melbourne School of Population and Global Health, University of Melbourne.
- *Professor Caroline Homer PhD.* Professor of Midwifery, Centre for Midwifery, Child and Family Health Associate Dean: International and Development Associate Head, WHO Collaborating Centre for Nursing, Midwifery and Health Development, Faculty of Health, University of Technology Sydney.

The experts agreed that our approach and list of indicators were appropriate. They endorsed both the universal and high-risk indicators, with some minor alterations.

Current Australian indicators

Our research suggests that all the indicators we selected are important. They provide a way to measure whether antenatal care is being delivered in accordance with the evidence-based standards for quality.

Australian perinatal health authorities collect data on only a small subset of these indicators. Only three of the 20 universal process indicators, and none of the 21 indicators for high-risk groups, are collected routinely at a national population level (although some states and territories do routinely collect more than the national minimum dataset). The three indicators routinely collected nationally are [13]:

- Smoking during the first 20 weeks of pregnancy for all women giving birth
- Smoking after the first 20 weeks of pregnancy for all women who gave birth, and who reported smoking during pregnancy
- Antenatal care received in the first trimester for all women giving birth

Over the next three years, we will test the full list of indicators we have selected in 10 Australian communities to determine whether it is viable to collect a more comprehensive set of ANC metrics, and to understand current outcomes related to these available metrics.

QUANTITY INDICATORS

The determination of required quantity of ANC services in a given community is a function of the size of the population, the portion of the population participating, and the effort required to provide the right standard of care. This is largely a practical consideration, and it is not surprising that the evidence we reviewed (both peer reviewed and grey literature) says little about 'quantity'. The WHO report *Service Availability and Readiness Assessment [17]*, which focuses mainly on low and middle income countries, highlighted the importance of two dimensions:

- Is there sufficient *health infrastructure*? i.e., ANC facilities, maternity bed density
- Is there sufficient *health workforce*? i.e., number of GPs and midwives

This is a useful distinction, which we have used to design our preliminary indicators for ANC quantity (see Appendix C).

PARTICIPATION INDICATORS

The literature supports the importance of antenatal care for all pregnant women. More specifically, there is evidence that regular antenatal care is associated with better maternal health and positive child health outcomes – supported clinical practice from the NICE and Australian Guidelines says that all women should be seen at least once in the first trimester, and at least 10 times altogether for the first pregnancy (at least 7 times for subsequent pregnancies).

We will calculate two ANC participation measures for the total population in any given area:

- Proportion of all pregnant women accessing antenatal care who are seen at least once in the first trimester
- Proportion of all pregnant women who attend at least the recommended number of antenatal appointments (10 for first pregnancy, 7 for subsequent pregnancies).

CONCLUSION

The preliminary indicators we have selected will help identify gaps and priorities for the delivery of antenatal care in Australian communities. We will test them in 10 communities over the next three years to determine which are pragmatic to collect, resonate with communities, and provide robust measures to stimulate community and government action. We will follow a similar path for the other four fundamental strategies that Restacking the Odds is focusing on - sustained nurse home visiting, early childhood education and care, parenting programs, and the early years of school.

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APPENDICES

Appendix A: Summary of the evidence relating to best practice antenatal care, and maternal and child outcomes

THEME 1: PROVISION OF CARE	
Continuity of care	Women who experience continuity of care are less likely to: • experience clinic waiting times greater than 15 minutes, • be admitted to hospital antenatally, • fail to attend antenatal classes, • be unable to discuss worries in pregnancy, or • not feel well-prepared for labour. Continuity of care may also be associated with: • less augmentation of labour, • less use of epidural analgesia, • fewer episiotomies, • fewer preterm births, and • reduced infant mortality. [18, 19]
THEME 2: ATTENDANCE	
Antenatal care appointments	Regular antenatal care in the first trimester (before 14 weeks gestational age) is associated with: • better maternal health during pregnancy, • fewer interventions in late pregnancy, and • positive child health outcomes. [20]
THEME 3: SCREENING & ASSESSMENT	
Blood pressure	Risks associated with high blood pressure during pregnancy include: • placental abruption, • superimposed pre-eclampsia, • fetal loss, • preterm labour, • low birth weight, • perinatal death, and • gestational diabetes. [21-23]
Proteinuria	Maternal proteinuria has been strongly associated with preterm birth. Chronic kidney disease in pregnancy has been associated with: • pre-eclampsia, • preterm labour, • small for gestational age babies, and • perinatal death. [24, 25]
Hepatitis B	• Mother-to-child transmission occurs frequently either in the uterus, through placental leakage, or through exposure to blood or blood-contaminated fluids at or around the time of birth. • Research estimates that people who are chronic carriers of HbsAg are 22 times more likely to die from hepatocellular carcinoma or cirrhosis than noncarriers. [26, 27]

THEME 3: SCREENING & ASSESSMENT (cont.)

HIV	• Globally, the vast majority of children with AIDS acquire infection through mother-to-child transmission during pregnancy, during birth, or through breastfeeding. • Mother-to-child transmission is high among children born to women diagnosed postnatally (50%) and women diagnosed antenatally who used no interventions. • Significant association between antiretroviral treatments and intrauterine growth restriction, congenital abnormalities, or preterm birth. • Short courses of certain antiretroviral medicines are effective and are not associated with any safety concerns in the short term. • Complete avoidance of breastfeeding is effective in preventing mother-to-child transmission of HIV. [28-31]
Rubella	Maternal rubella infection can result in: • spontaneous miscarriage, • fetal infection, • stillbirth, or • fetal growth restriction. [32]
Syphilis	• Maternal syphilis infection results in congenital infection in at least two-thirds of cases. • Congenital infection can occur at any stage of maternal disease, including during incubation, as early as 9–10 weeks of pregnancy, and at any subsequent time during pregnancy. • Congenital syphilis is a serious condition that, if not fatal at a young age, can cause permanent impairment, debilitation and disfigurement. • Pancreatitis and inflammation of the gastrointestinal tract are common. [7, 33-36]
Body mass index	**Underweight** — a low pre-pregnancy BMI is associated with increased risk of: • preterm birth, • small-for-gestational-age babies, and • increased risk of a low birth weight baby among Aboriginal and Torres Strait Islander women. **Overweight** — pre-pregnancy BMI >25 has been linked with: • stillbirth, • congenital abnormalities, • neural tube defects, • preterm birth, • low birth weight, • large-for-gestational-age babies, • gestational hypertension, • pre-eclampsia, • gestational diabetes, • postpartum haemorrhage, and • major depressive disorders. [7, 37-49] **Obesity** — pre-pregnancy BMI ≥30 is also linked to: • an inability to initiate breastfeeding, • postpartum weight retention, and • increased rate of caesarean birth. (Australian Health Ministers' Advisory Council, 2012; Bodnar, Siega-Riz, Simhan, Himes, & Abrams, 2010; Chu, Callaghan, et al., 2007; Chu, Kim, et al., 2007; "Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) Study: associations with maternal body mass index," 2010; "Hyperglycemia and Adverse Pregnancy Outcomes," 2008; Khashan & Kenny, 2009; McDonald, Han, Mulla, & Beyene, 2010; Oddy, De Klerk, Miller, Payne, & Bower, 2009; Panaretto et al., 2006; Siega-Riz et al., 2009; Stothard, Tennant, Bell, & Rankin, 2009; Thornton, Smarkola, Kopacz, & Ishoof, 2009; Viswanathan et al., 2008)

THEME 3: SCREENING & ASSESSMENT (cont.)

Tobacco smoking	High-level evidence identified in the NICE guidelines indicates a significant association between smoking in pregnancy and adverse outcomes, including: • birth defects including cleft lip and palate, • effects on the pregnancy including perinatal mortality, placental abruption, preterm premature rupture of membranes, ectopic pregnancy, placenta praevia, preterm birth, and miscarriage, • effects on the baby, in particular reduced birth weight (with babies born to smokers being a consistent 175–200g smaller than those born to similar non-smokers), fetal and infant mortality and sudden infant death syndrome, and • long-term effects of low birth weight due to antenatal exposure to tobacco smoking suggest an increased risk of coronary heart disease, type 2 diabetes, and adiposity in adulthood (conflicting results).	[50-60]
Alcohol consumption	• High-level and/or frequent intake of alcohol in pregnancy increases the risk of miscarriage, stillbirth and premature birth. • Exposure of the fetus to alcohol may result in a spectrum of adverse effects, referred to collectively as fetal alcohol spectrum disorders (FASD) – issues can include facial abnormalities, impaired growth, abnormal function/structure of the central nervous system, developmental, behavioural and cognitive problems. • People with FASD experience lifelong problems, including learning difficulties and disrupted education, increased rates of mental illness, drug and alcohol problems and trouble with the law.	[61-64]
Depression & anxiety	• Depressive episodes can be a reaction to the pregnancy itself, to associated health issues, or to other major life stressors. They can also be a continuation or relapse of a pre-pregnancy condition, especially among women who stop taking medication on confirmation of pregnancy. • Anxiety may occur in response to fears about aspects of the pregnancy (e.g. parenting role, miscarriage, congenital disorders), or as a continuation of a pre-pregnancy condition and/or with depression. Higher levels of anxiety in pregnancy increase the risk of post-natal depression.	[65-68]

THEME 3: SCREENING & ASSESSMENT (cont.)	
Intimate Partner Violence	• Violence poses serious health risks to pregnant women (including breast and genital injury, miscarriage, antepartum haemorrhage and infection, blunt or penetrating abdominal trauma and death) and babies (including fetal fractures, low birth weight, injury, suppressed immune system). • Young women exposed to violence are more likely to have a miscarriage, stillbirth, premature birth or termination of pregnancy than other young women. • Women exposed to violence during pregnancy are more likely to develop depression in the postnatal period [69-72]
THEME 4: EDUCATION AND AWARENESS	
Smoking cessation	• A high-level of evidence, based on systematic reviews and RCTs, shows that smoking cessation interventions reduce smoking rates in pregnant women. • Cessation interventions reduce smoking in late pregnancy and reduce incidences of low birth weight and preterm births, while increasing birth weight. [73]
Nutrition-related pregnancy interventions	• Some evidence that intensive antenatal dietary counselling and support is effective in increasing women's knowledge about healthy eating and can influence eating behaviours. [74-77]
THEME 5: FETAL MONITORING	
Fetal development & anatomy	Ultrasound between 18–20 weeks: • sensitivity in detecting structural anomalies increases after 18 weeks gestation, • detection of structural anomalies before 20 weeks gestation gives women the choice of terminating the pregnancy, where this is permitted under jurisdictional legislation, and • reduced number of inductions for 'prolonged pregnancy'. [78]
Fetal growth	• Intrauterine growth restriction has been associated with pregnancy related hypertension, pre-existing diabetes, autoimmune disease, maternal heart disease, toxic exposure to smoking, alcohol or drugs, malnutrition, living at high altitudes, living in developing countries, low socioeconomic status, ethnicity, family or prior history of intrauterine growth restriction, extremes of maternal age, fetal genetic disease, fetal malformations, multiple gestation, placental anomalies, fetal infection and maternal malaria. [79]
Screening for fetal chromosomal abnormalities	• The combined test identifies factors that are known to be associated with fetal chromosomal abnormalities and that are independent of each other. [80, 81]

*Research extracted from Australia's Clinical Practice Guidelines and NICE Guidelines.

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APPENDICES

Appendix B: Quality Indicators

Antenatal care				
Mother				Fetus
Provision of care	Attendance	Screening & Assessments	Education & Awareness	Fetal Monitoring
Universal care: Core Indicators				
QI 1 % of pregnant women with a named midwife	**QI 2** % of pregnant women accessing antenatal care who are seen at least once in the 1st trimester	**QI 4** % of PW accessing ANC who have a complete record of the min. set of antenatal test results*	**QI 11** % of PW with a BMI 30 kg/m² or ≥ who are offered personalised advice from an appropriately trained person on healthy eating and physical activity	**QI 13** % of PW women booking before 14 weeks 2 days who are offered the combined screening test to take place between 10 weeks 0 days and 14 weeks 1 day.
	QI 3 % of PW accessing antenatal care who attend at least the recommended number of antenatal appointments – 10 for 1st pregnancy, 7 for subsequent pregnancies	**QI 5** % of PW accessing ANC whose BMI is calculated & recorded	**QI 12** % of PW who smoke who are referred to an evidence-based stop smoking service	**QI 14** % of PW booking between 14 weeks 2 days and 20 weeks 0 days who are offered the quadruple screening test for Down's syndrome to take place between 14 weeks 2 days and 20 weeks 0 days
		QI 6 % of PW accessing ANC whose smoking status is recorded		**QI 15** % of PW booking before 21 weeks who are offered ultrasound screening for fetal anomalies to take place between 18 weeks 0 days and 20 weeks 6 days
		QI 7 % of PW accessing ANC whose alcohol use is recorded		**QI 16** % of PW with a suspected breech presentation at 36 weeks or later (until labour begins) who are referred for confirmatory ultrasound assessment
		QI 8 % of PW accessing ANC whose risk for FV is recorded		**QI 17** % of pregnant women with a confirmed uncomplicated singleton breech presentation at 36 weeks or later (until labour begins) who are offered external cephalic version
		QI 9 % of PW identified as at risk of gestational diabetes at the booking appointment who are offered testing for gestational diabetes		**QI 18** % of nulliparous & primiparous PW attending a 40-week antenatal appointment who are offered a vaginal examination for membrane sweeping
		QI 10 % of PW identified as at risk of gestational diabetes who receive testing for gestational diabetes		**QI 19** % of nulliparous & primiparous PW attending a 41-week antenatal appointment who are offered a vaginal examination for membrane sweeping
				QI 20 % of PW provided with verbal and written information regarding normal fetal movements during the antenatal period.

Abbreviations: QI, Quality indicator; PW, pregnant women; ANC, antenatal care; BMI, body mass index; FV, family violence

Antenatal care

Mother

Fetus

Provision of care	Attendance	Screening & Assessments	Education & Awareness	Fetal Monitoring

Universal care: Core Indicators

Triage for High Risk Mothers

Hypertension	Mental Health	Diabetes
QI 21 % of PW who have their risk factors for pre-eclampsia identified and recorded at the booking appointment	**QI 27** % of women of childbearing potential prescribed valproate to treat a mental health problem	**QI 33** % of pregnant women with type 1 diabetes prescribed folic acid from at least 3 months before conception
QI 22 % of PW at increased risk of pre-eclampsia who are offered a prescription of 75 mg of aspirin (unless contraindicated) to take daily from 12 weeks until birth	**QI 28** % of PW with a previous severe mental health problem or any current mental health problem who are given information at their booking appointment about how their mental health problem and its treatment might affect them or their baby	**QI 34** % of pregnant women with type 2 diabetes prescribed folic acid from at least 3 months before conception.
QI 23 % of PW with severe hypertension who are admitted for a full assessment, carried out by a healthcare professional trained in managing hypertensive disorders in pregnancy	**QI 29** % of routine antenatal and postnatal contacts at which woman are asked about their emotional wellbeing by a healthcare professional	**QI 35** Proportion of women with pre-existing diabetes who are seen by members of the joint diabetes and antenatal care team within 4 week of their pregnancy being confirmed
QI 24 % of PW with a diagnosis of pre-eclampsia who are admitted to hospital	**QI 30** Proportion of women with a suspected mental health problem in pregnancy or within 12 months of giving birth who receive a comprehensive mental health assessment	**QI 36** Proportion of pregnant women with pre-existing diabetes who have their HbA1c levels measured at their booking appointment
QI 25 % of hospitalised women with pre-eclampsia who are monitored daily	**QI 31** % of women referred for psychological interventions in pregnancy or within 12 months of giving birth who are assessed for treatment within 2 weeks of referral	**QI 37** Proportion of pregnant women with pre-existing diabetes who are referred at their booking appointment for retinal assessment
QI 26 Women with pre-eclampsia have an agreed consultant obstetrician-led plan for the timing and mode of birth documented in their notes	**QI 32** % of women assessed as appropriate for psychological interventions in pregnancy or within 12 months of giving birth who start psychological interventions within 4 weeks of assessment	**QI 38** % of PW with pre-existing diabetes who have a retinal assessment in the first 3 months of pregnancy
		QI 39 % of women diagnosed with gestational diabetes who are seen by members of the joint diabetes and antenatal care team within 1 week of diagnosis
		QI 40 Proportion of pregnant women with diabetes who have an appropriate blood glucose meter
		QI 41 Proportion of pregnant women with diabetes who are prescribed enough blood glucose testing strips

Abbreviations: QI, Quality indicator; PW, pregnant women; ANC, antenatal care

APPENDICES

Appendix C: Quantity and Participation Indicators

<table>
<tr><th colspan="2">Quantity</th><th>Participation</th></tr>
<tr><td>Health Infrastructure</td><td>Health Workforce</td><td>Attendance</td></tr>
<tr><td>Indicator 1
Facility Density
Number of ANC facilities per 10 000 women of child-bearing age</td><td>Indicator 3
General Practitioner Density
Number per 10 000 women of child-bearing age</td><td>Indicator 6
Proportion of pregnant women accessing antenatal care who are seen at least once in the 1st trimester</td></tr>
<tr><td>Indicator 2
Maternity Bed Density
Number per 1000 pregnant women*</td><td>Indicator 4
Midwife Density
Number per 10 000 women of child-bearing age</td><td>Indicator 7
Proportion of pregnant accessing antenatal care who attend at least the recommended number of antenatal appointments – 10 for 1st pregnancy, 7 for subsequent pregnancies</td></tr>
<tr><td></td><td>Indicator 5
Obstetrics and gynaecology Density
Number per 10 000 women of child-bearing age</td><td>Indicator 8
Proportion of pregnant women in a disadvantaged area accessing antenatal care who are seen at least once in the 1st trimester</td></tr>
<tr><td></td><td></td><td>Indicator 9
Proportion of pregnant women in a disadvantaged area accessing antenatal care who attend at least the recommended number of antenatal appointments – 10 for 1st pregnancy, 7 for subsequent pregnancies</td></tr>
</table>

Appendix D: Calculating Maternity Bed Density

Maternity bed density: based upon the assumption that (a) there should be sufficient beds for all pregnant women, (b) an occupancy rate of 80% (to account for the uneven spread of demand over time), and (c) a mean duration of stay of 3 days: the target should be (1000/0.80) x (3/365) = 10 per 1,000 pregnant women. The indicator is scored as n/10 x 100% (maximum 100), where n is the number of maternity beds per 1,000 pregnant women.

An estimation for the number of pregnant women in the population can be derived from the CBR (crude birth rate) for the country/region of interest and the following equations:

A = estimated number of live births = (CBR per 1000 × total population)
B = estimated live births expected per month = (A / 12)
C = estimated number of pregnancies ending in stillbirths or miscarriages = (A × 0.15)
D = estimated pregnancies expected in the year = (A + C)
E = estimated number of women pregnant in a given month = (0.70 × D)
F = estimated % of total population who are pregnant at a given period = (E / total population × 100).

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THE TEAM

Restacking the Odds is a collaboration between three organisations, each with relevant and distinctive skills and resources:

Murdoch Children's Research Institute (MCRI) is an independent medical research institute. MCRI's research covers the breadth of health and medical research from basic science through to clinical sciences and population health. MCRI is committed to giving all children the opportunity to have a happy and fulfilled life.

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Dr Carly Molloy – Research Officer and Project Manager, Murdoch Children's Research Institute

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Suggested citation: Molloy C., Goldfeld S., Harrop C., Perini N. Restacking the Odds: Antenatal care: An evidence-based review of the relevant measures to assess quality, quantity, and participation. Melbourne, Australia, 2018.