



Estimates of maternal overweight and obesity based on the NSW Perinatal Data Collection

BACKGROUND

Maternal obesity is associated with an increased risk of adverse health outcomes for both mothers and babies, including gestational diabetes, high blood pressure, pre-eclampsia, pre-term birth, stillbirth and fetal macrosomia.¹ In order to monitor trends in maternal overweight and obesity in NSW, two new data items describing maternal height and weight were added to the NSW Perinatal Data Collection (PDC) in 2016.

The aims of this paper are to: examine the completeness of reporting of maternal height and weight in the PDC; describe the methods used to calculate maternal overweight and obesity using the PDC; and compare the distribution of Body Mass Index (BMI) in mothers giving birth in NSW as recorded in the PDC with that recorded in other data collections.

METHODS

Data sources

The PDC is a statutory data collection under the NSW Public Health Act 2010. Medical practitioners are required to notify the NSW Ministry of Health of all live births and all stillbirths of at least 20 weeks gestation or 400g birthweight. Information collected includes details about the mother, the pregnancy and birth, and information about the baby. Maternal weight was supplied to the collection as follows:

The weight recorded in the first trimester, in kilograms, preferably as a measured weight. However, the woman's self-reported weight around the time of conception is acceptable if a measured weight is not available.²

The PDC specifies height should be provided in whole centimetres and weight provided in kilograms, and does not capture information on whether the weight or height information was measured or self-reported. For this analysis, data for 2016 to 2018 were used.

The NSW Population Health Survey (PHS) commenced in 1997 and uses computer assisted telephone interviewing to collect information on risk factors and health behaviours that impact on the people of NSW. Questions on self-reported height and weight have been included in the

survey since its inception. Respondent data on women aged 15–49 years who completed the Survey in 2016, 2017 or 2018 were used to compare to the PDC.

The Australia's Mothers and Babies report series is one of the longest running report series on the health of Australians. The Australian Institute of Health and Welfare (AIHW) collates data from states and territories to create the National Perinatal Data Collection (NPDC). From 2016, every state and territory was able to supply information on maternal height and weight to the NPDC. Depending on the state or territory, maternal height and weight were based on measured values at first antenatal visit, and/or self-reported pre-pregnancy values. Information on height and weight is supplied in centimetres and kilograms respectively. In the Australia's Mothers and Babies reports, the AIHW includes all mothers with a valid height and weight to calculate and classify BMI. Published NPDC statistics from the 2017 Australia's Mothers and Babies report³ were used for comparison with NSW.

Data analysis

We initially reviewed the quality of the PDC data, including missing and biologically implausible values. Extreme values of height or weight could be due to measurement or recording errors, or may be very low or very high 'true' values. To improve the quality of reporting of BMI, biologically implausible values were excluded from further analyses. Values of height, weight and BMI were excluded if they were outside the 1st and 99th percentile of the United States Centers for Disease Control Growth Charts for girls,⁴ with the percentile values for women aged 20 used for all women aged 20 or over.

For the PDC and PHS, BMI was calculated using the formula $\text{weight(kg)}/\text{height(m)}^2$.⁵ For mothers aged over 18 years, the BMI score is classified using World Health Organization (WHO) criteria (Table 1). Where the mother's age is less than 18 years, modified BMI thresholds were used, as described by Cole et al.^{6,7} As age is recorded in completed years on the PDC, BMI calculations for mothers younger than 18 years are based on half-year cut-off points, as these are considered to provide an essentially unbiased estimate of prevalence.⁸ For the PDC, BMI was calculated by gestational age at first antenatal visit to assess the impact of pregnancy weight gain on estimates of overweight and obesity.

Table 1. Body Mass Index classification for adults 18 years and older

Body Mass Index category	Range (kg/m ²)
Underweight	Less than 18.5
Healthy weight	18.5 to 24.9
Overweight	25.0 to 29.9
Obese	30 or higher

Source: World Health Organization⁵

RESULTS

Between 2016 and 2018, the proportion of PDC records with missing values for height, weight and BMI almost halved, from 4.9% in 2016 to 2.7% in 2018. Rates of biologically implausible values were similar for all years of data. Over the three years 2016 to 2018, private hospital records had missing height or weight for 14.4% of all women, compared to 0.3% of public hospital records. Public hospitals had a slightly higher proportion of implausible values of height, weight and BMI (Table 2).

Table 2. PDC records with missing or biologically implausible values of maternal height, weight or BMI by hospital sector, NSW 2016 to 2018

Missing or biologically implausible values	Hospital sector					
	Public (n=222,229)		Private (n=63,355)		Total (n=285,925) ¹	
	No.	%	No.	%	No.	%
Missing maternal height or weight	699	0.3	9,151	14.4	9,934	3.5
Biologically implausible height for age, weight for age, or BMI for age ²	18,400	8.3	3,167	5.0	21,579	7.5
Total ineligible records ³	19,122	8.6	12,342	19.5	31,561	11.0

Notes:

1. Total includes births at home assisted by independent midwives.
2. Excludes records with missing height or weight.
3. Includes 48 records that were ineligible due to missing values for maternal age.

When the three data sources were compared, 39.5% of mothers giving birth were reported to be overweight or obese at their first antenatal visit according to the PDC, compared to 45.6% in the NPDC and 37.3% of NSW women aged 15–49 years who responded to the PHS (Table 3). In the PDC, calculated overweight and obesity increased with gestational age at first antenatal visit (Table 4).

Table 3. Comparison of the distribution of BMI as recorded in the PDC, NPDC and PHS

Body Mass Index	PDC 2016 to 2018 (n=254,364)		NPDC 2017 (n=292,886)		PHS 2016 to 2018 (n=4,972)		
	No.	%	No.	%	No.	%	95% CI
Underweight	9,716	3.8	11,466	3.9	212	3.9	3.3 – 4.6
Healthy weight	144,212	56.7	147,741	50.4	2,784	58.8	57.0 – 60.5
Overweight	63,495	25.0	75,016	25.6	1,199	23.3	21.8 – 24.9
Obese	36,941	14.5	58,663	20.0	777	13.9	12.7 – 15.2
Overweight or obese	100,436	39.5	133,679	45.6	1,976	37.3	35.6 – 39.0

Table 4. Maternal overweight and obesity by duration of pregnancy at first antenatal visit, NSW 2016 to 2018

Duration of pregnancy (weeks)	Overweight or obese		Not overweight or obese		Total	
	No.	%	No.	%	No.	%
<14	71,670	38.9	112,797	61.1	184,467	100.0
14–27	25,158	40.8	36,534	59.2	61,692	100.0
28+	2,758	43.8	3,540	56.2	6,298	100.0
Not stated	850	44.6	1,057	55.4	1,907	100.0
Total	100,436	39.5	153,928	60.5	254,364	100.0

DISCUSSION

The distribution of maternal BMI calculated from height and weight reported to the PDC shows a similar pattern to that reported among women of reproductive age in the PHS. While the proportion of underweight and overweight women were similar between the PDC and the NPDC, the NPDC reported lower rates of healthy weight and higher rates of overweight and obesity compared to the PDC, suggesting higher rates of overweight and obesity in mothers giving birth in other Australian jurisdictions compared to NSW.

Using PDC data, we found that rates of overweight and obesity increased with gestational age at first antenatal visit from 38.9% for less than 14 weeks gestation to 43.8% at 28-plus weeks gestation. The rate of overweight and obesity for women with a first antenatal visit at less than 14 weeks gestation was very similar to that found using the PHS for women aged 15–49 years (38.9% versus 37.3%).

An increase in the proportion of women reported in the higher BMI categories with increasing gestational age at first antenatal visit is not surprising given that weight gain is expected in pregnancy. We were unable to assess the impact of women's self-reported weight around the time of conception as the PDC does not collect information on whether height and weight were measured or self-reported. However, it is noteworthy that the rate of overweight and obesity in women overall was 39.5% based on the PDC, only 0.6% higher than for women with a first antenatal visit at less than 14 weeks gestation.

The PDC collects information on over 90,000 women giving birth each year in NSW, while the PHS collects information on about 1,700 women aged 15–49 years annually. Due to its substantially larger sample size and universal coverage, the PDC has potential to detect small changes in overweight and obesity over time for pregnant women at a state level, and to monitor rates of overweight and obesity of the pregnant population at sub-state geographic areas, which are currently not possible using the PHS.

CONCLUSION

BMI calculated from maternal height and weight recorded in the PDC is similar to population health survey data for women of reproductive age. The PDC is suitable for monitoring patterns and trends in overweight and obesity in the pregnant population over time. With over 90,000 women giving birth each year in NSW, there is potential for the PDC to be used to detect small changes in overweight and obesity over time for pregnant women at a state level, and to monitor rates of overweight and obesity of the pregnant population at sub-state geographic areas.

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