Evidence evaluation report — Weight gain

DRAFT 17 May 2017

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for the Australian Government Department of Health

Contents

PROCESS OF THE REVIEW

Research questions

1 Should women have their weight routinely monitored in pregnancy (self-monitored or otherwise)?

2 What are the potential benefits and harms of routine weight monitoring during pregnancy?

3 What are the additional considerations for Aboriginal and Torres Strait Islander women?

4 What are the additional considerations for women from culturally and linguistically diverse groups?

Search strategy

Databases searched:

- MEDLINE (OVID) and PSYCHINFO (OVID) = 51
- EMBASE = 61
- COCHRANE LIBRARY = 7
- CINAHL = 21
- AUSTRALIAN INDIGENOUS HEALTHINFONET = 24

Date of searches: 19/05/2016

Dates searched: 2008 to present

Full search strategies

MEDLINE AND PSYCHINFO (OVID)

1. Exp Pregnancy/
2. Exp Prenatal Care/
3. (pregnan* or antepart* or prenatal* or antenatal* or obstetric* or maternal*).tw.
4. 1 or 2 or 3
5. ((routine* or regular* or repeat*) adj3 weigh*).tw.
6. 4 and 5
7. 2008 to current

EMBASE

1. 'pregnancy'/exp
2. 'prenatal care'/exp
3. (pregnan* OR antepart* OR prenatal* OR antenatal* OR obstetric* OR maternal*):ti,ab
4. 1 OR 2 OR 3
5. ((routine* or regular* or repeat*) NEXT/3 weigh*):ti,ab
6. 4 AND 5
7. 2008 to current

COCHRANE

1. MeSH descriptor: [Pregnancy] explode all trees
2. MeSH descriptor: [Prenatal Care] explode all trees
3. (pregnan* or antepart* or prenatal* or antenatal* or obstetric* or maternal*):ti,ab,kw
4. #1 or #2 or #3
5. ((routine* or regular* or repeat*) next/3 weigh*):ti,ab,kw
6. #4 and #5
7. 2008 to current

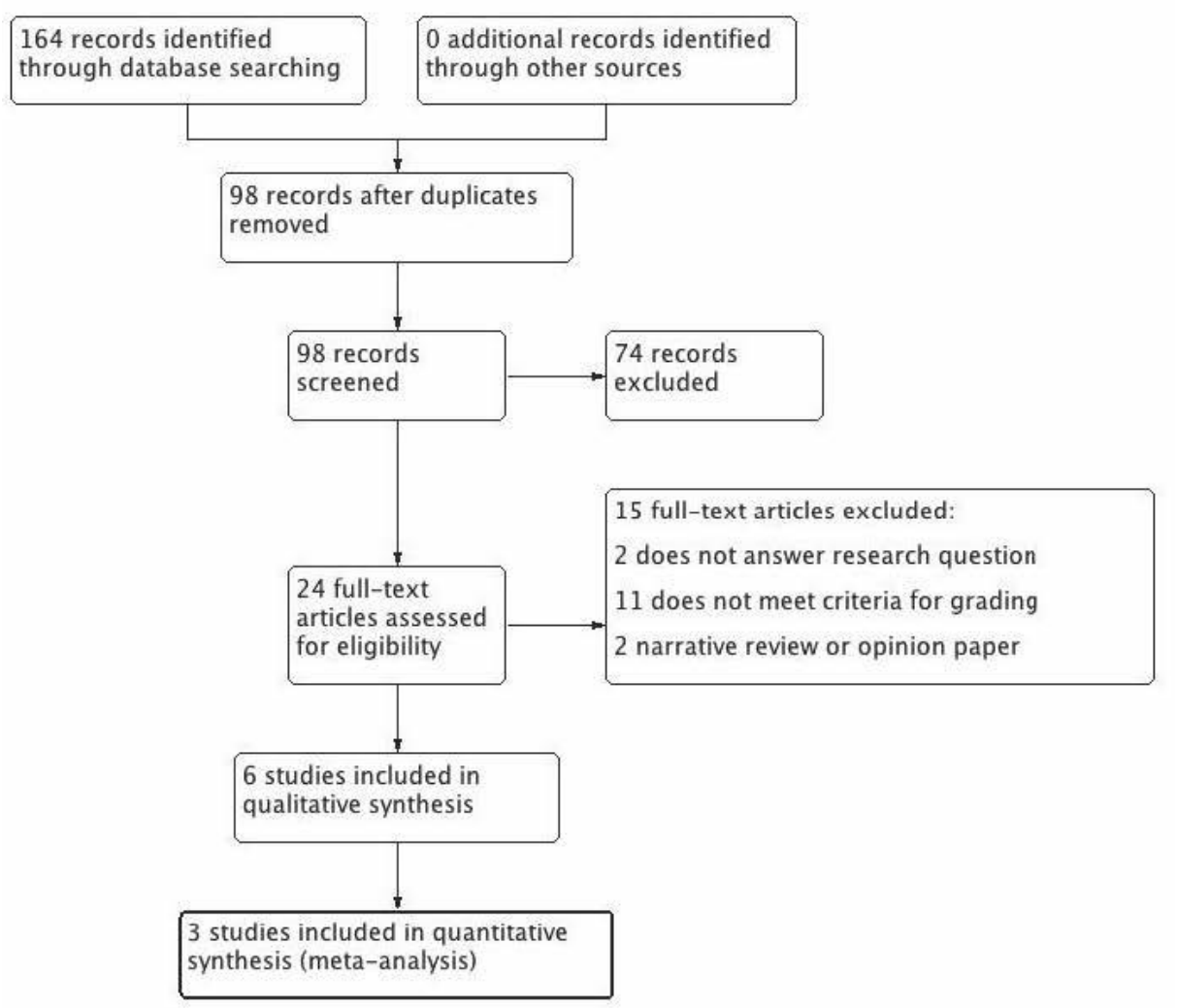
CINAHL

1. (MH "Pregnancy+")
2. (MH "Prenatal Care+")
3. (pregnan* or antepart* or prenatal* or antenatal* or obstetric* or maternal*)
4. S1 or S2 or S3
5. ((routine* or regular* or repeat*) N3 weigh*)
6. S4 and S5
7. 2008 to current

AUSTRALIAN INDIGENOUS HEALTHINFONET

Title: weigh*

2008 to current



Prisma flow diagram

Exclusion criteria

Full texts of studies within the review period and in English were reviewed. Exclusion criteria included:

- duplicate
- already included in high quality systematic reviews
- not specific to target population (eg specific to non-pregnant women or high-risk women only)
- does not answer research question
- does not meet criteria for grading (eg no outcomes reported, reporting too limited to establish risk of bias)
- narrative review or opinion paper (editorial, letter, comment).

Of nine studies included, three were analysed in the review and six were included as background information.

Assigning level of evidence

Levels of evidence were assigned using the NHMRC levels (screening intervention for research question 2) and the definitions given below. Research question 1 was considered to overlap with research question 2. No new evidence was identified for research questions 3 and 4.

Designations of levels of evidence according to type of research question

Level	Screening intervention
I	A systematic review of level II studies
II	A randomised controlled trial
III-1	Pseudo-randomised controlled trial (ie alternate allocation or some other method)
III-2	A comparative study with concurrent controls: ▪ Non-randomised, experimental trial ▪ Cohort study ▪ Case-control study
III-3	A comparative study without concurrent controls: Historical control study Two or more single arm study
IV	Case series

Source: NHMRC (2009) *NHMRC levels of evidence and grades of recommendations for developers of guidelines*.

Study design definitions

- **Case series** — a single group of people exposed to the intervention (factor under study). **Post-test** – only outcomes after the intervention (factor under study) are recorded in the series of people, so no comparisons can be made. **Pre-test/post-test** – measures on an outcome are taken before and after the intervention is introduced to a series of people and are then compared (also known as a 'before- and-after study').
- **Case-control study** — people with the outcome or disease (cases) and an appropriate group of controls without the outcome or disease (controls) are selected and information obtained about their previous exposure/non-exposure to the intervention or factor under study.
- **Historical control study** – outcomes for a prospectively collected group of people exposed to the intervention (factor under study) are compared with either (1) the outcomes of people treated at the same institution prior to the introduction of the intervention (ie. control group/usual care), or (2) the outcomes of a previously published series of people undergoing the alternate or control intervention.
- **Non-randomised, experimental trial** - the unit of experimentation (eg. people, a cluster of people) is allocated to either an intervention group or a control group, using a non-random method (such as patient or clinician preference/availability) and the outcomes from each group are compared. This can include:
  - **a controlled before-and-after study**, where outcome measurements are taken before and after the intervention is introduced, and compared at the same time point to outcome measures in the (control) group.
  - **an adjusted indirect comparison**, where two randomised controlled trials compare different interventions to the same comparator ie. the placebo or control condition. The outcomes from the two interventions are then compared indirectly.
- **Prospective cohort study** — where groups of people (cohorts) are observed at a point in time to be *exposed or not exposed* to an intervention (or the factor under study) and then are followed prospectively with further outcomes recorded as they happen.
- **Pseudo-randomised controlled trial** - the unit of experimentation (eg. people, a cluster of people) is allocated to either an intervention (the factor under study) group or a control group, using a pseudo-random method (such as alternate allocation, allocation by days of the week or odd-even study numbers) and the outcomes from each group are compared.

- **Randomised controlled trial** — the unit of experimentation (eg. people, or a cluster of people4) is allocated to either an intervention (the factor under study) group or a control group, using a random mechanism (such as a coin toss, random number table, computer-generated random numbers) and the outcomes from each group are compared.
- **Retrospective cohort study** — where the cohorts (groups of people exposed and not exposed) are defined at a point of time in the past and information collected on subsequent outcomes, eg. the use of medical records to identify a group of women using oral contraceptives five years ago, and a group of women not using oral contraceptives, and then contacting these women or identifying in subsequent medical records the development of deep vein thrombosis.
- **Systematic literature review** — systematic location, appraisal and synthesis of evidence from scientific studies.
- **Two or more single arm study** – the outcomes of a single series of people receiving an intervention (case series) from two or more studies are compared.

Source: NHMRC (2009) *NHMRC levels of evidence and grades of recommendations for developers of guidelines.*

Selection of outcomes for GRADE analysis

Outcomes considered for inclusion comprised conditions known to be associated with overweight and obesity in pregnancy and factors that may be associated with routine weighing. Seven outcomes were selected on the basis of clinical impact and acceptability.

Outcome	Importance	Inclusion
Excessive weight gain in pregnancy (IOM recommendations)	7	☑
Mean weight gain (kg per week)	5	☑
Gestational diabetes	9	☑
Pre-eclampsia	7	☑
Gestational hypertension	5	☑
Macrosomia	9	☑
Birth weight	8	☒
Mode of birth (Caesarean section)	9	☒
Childhood obesity	8	☒
Shoulder dystocia	8	☒
Neonatal hypoglycaemia	8	☒
Apgar score <7 at 5 minutes	5	☒
Intrauterine growth restriction	7	☒
Induction of labour	7	☒
Postpartum haemorrhage	5	☒
Respiratory distress syndrome	5	☒
Jaundice	5	☒
Birth trauma	8	☒
Initiation of breastfeeding	8	☒
NICU admission	8	☒

Key: 1 – 3 less important; 4 – 6 important but not critical for making a decision; 7 – 9 critical for making a decision

Evidence tables

1. Should women have their weight routinely monitored in pregnancy (self-monitored or otherwise)?

Evidence summary

Please see research question 2.

2 What are the potential benefits and harms of routine weight monitoring during pregnancy?

Evidence summary

Results of previous review

Module I of the Guidelines (Australian Health Ministers' Advisory Council 2012) included a Grade B recommendation (**Give women advice about appropriate weight gain during pregnancy in relation to their BMI**) and a practice point (**Repeated weighing during pregnancy should be confined to circumstances that are likely to influence clinical management**).

Results of current review

Findings from Cochrane reviews

One Cochrane review investigated diet or exercise, or both, in reducing excessive weight gain during pregnancy but did not consider routine weighing as an intervention (Muktabhant et al 2015).

A second Cochrane review found no trials designed to reduce weight in obese pregnant women (Furber et al 2013).

Findings from RCTs

Of the three identified RCTs, only one addressed regular weighing plus advice on weight gain versus usual care (Brownfoot et al 2015; Brownfoot et al 2016). The study (n=782) was conducted in Australia and found no clear difference in weight gain, proportion of women gaining more weight than the Institute of Medicine (IOM) recommended range or secondary outcomes (Brownfoot et al 2015). Among a subset of women who provided feedback (n=586), 73% were comfortable with being weighed (Brownfoot et al 2016).

A pilot study (Daley et al 2015) (n=76), combined regular weighing and advice on weight gain with self-weighing between antenatal visits. Compared to usual care, there was no clear difference in the percentage of women gaining excessive weight during pregnancy or in mean depression and anxiety scores. Feedback in a subset of participants showed support for regular weighing among participants (9/12) and midwives (7/7).

Pooled results

When these two trials were pooled (n=711), there was no clear difference in excessive gestational weight (RR 1.05 95% CI 0.95 to 1.16) or in mean weight gain (0.01 kg per week 95% CI -0.03 to 0.05). GRADE quality of evidence was low for both outcomes.

There was no indication in the two trials that either excessive gestational weight gain or mean gestational weight gain differed in women of normal weight at the beginning of pregnancy compared with women who were overweight or obese (subgroup interaction tests were not significant).

The remaining study (from Australia) found that, compared to usual care, self-weighing plus advice on weight gain reduced weight gain among women who were overweight but not among women who were normal weight or obese before pregnancy. However, the intervention did not influence excessive weight gain (n=236) (Jeffries et al 2009).

Advice to EWG

The evidence does not change the existing recommendation on providing advice on weight gain and may support a recommendation against regular weighing as part of antenatal care.

Evidence statements

- Excessive gestational weight gain, mean weekly weight gain and rates of gestational diabetes, pregnancy induced hypertension, pre-eclampsia and macrosomia do not differ significantly between women weighed regularly during pregnancy and those receiving usual care (low quality evidence).
- Self-weighing combined with advice on weight gain may slightly reduce mean weight gain compared with usual care but does not influence excessive weight gain (moderate quality evidence).
- Self-weighing combined with advice on weight gain compared to usual care reduces excessive weight gain and mean weight gain in women with a BMI of 26 to 29 but not in women with a BMI >29 (moderate quality evidence).

Consensus-based recommendations

If women are underweight or overweight, record and discuss their weight at every visit.

Although there is insufficient evidence to recommend routine weighing based on its effects on pregnancy complications, at each antenatal visit offer women the opportunity to be weighed and to discuss their weight gain since the last antenatal visit, their diet and level of physical activity.

Summary of findings

Regular weighing compared to usual care for gestational weight gain

Patient or population: Pregnant women

Setting: Australia, UK

Intervention: Routine weighing

Comparison: Usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Quality of the evidence (GRADE)	Comments
	Risk with usual care	Risk with routine weighing				
Excessive gestational weight gain	ALL 665 per 1,000	**704 per 1,000** (638 to 771)	**RR 1.05** (0.95 to 1.16)	711 (2 RCTs)	⨁⨁◯◯ LOW [1,2,]	
Mean weight gain (kg per week)		The mean weight gain (kg per week) ALL in the intervention group was 0.01 higher (0.03 lower to 0.05 higher)	MD 0.01 (-0.03 to 0.05)	816 (2 RCTs)	⨁⨁◯◯ LOW [1,2,]	
Gestational diabetes	53 per 1,000	**55 per 1,000** (30 to 98)	**RR 1.03** (0.57 to 1.85)	782 (1 RCT)	⨁⨁◯◯ LOW [2,3]	
Pregnancy-induced hypertension/pre-eclampsia	40 per 1,000	**46 per 1,000** (24 to 90)	**RR 1.15** (0.60 to 2.23)	782 (1 RCT)	⨁⨁◯◯ LOW [2,3]	
Macrosomia	71 per 1,000	**70 per 1,000** (42 to 117)	**RR 0.99** (0.59 to 1.65)	782 (1 RCT)	⨁⨁◯◯ LOW [2,3]	

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

GRADE Working Group grades of evidence
High quality: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

1. Small sample size in one study (n=34)
2. Loss to follow-up not clear in one study
3. Wide confidence interval crossing line of no effect

Self-weighing plus advice on weight gain compared to usual care for gestational weight gain

Patient or population: gestational weight gain
Setting: Australia
Intervention: Self-weighing plus advice on weight gain
Comparison: usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Quality of the evidence (GRADE)	Comments
	Risk with usual care	Risk with Self-weighing plus advice on weight gain				
Excessive gestational weight gain ALL	234 per 1,000	**183 per 1,000** (112 to 295)	**RR 0.79** (0.48 to 1.29)	236 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Mean weight gain (kg per week) ALL		The mean weight gain (kg per week) ALL in the intervention group was 0.02 lower (0.02 lower to 0.07 higher)	MD 0.02 (-0.02 to 0.07)	236 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Pre-eclampsia	27 per 1,000	**72 per 1,000** (15 to 351)	**RR 2.68** (0.55 to 13.0)	235 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Pregnancy-induced hypertension	9 per 1,000	**32 per 1,000** (4 to 285)	**RR 3.58** (0.41 to 31.6)	235 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Gestational diabetes	9 per 1,000	**10 per 1,000** (5 to 23)	**RR 1.16** (0.53 to 2.54)	235 (1 RCT)	⨁⨁⨁◯ MODERATE [2]	
Macrosomia	99 per 1,000	**65 per 1,000** (28 to 158)	**RR 0.66** (0.28 to 1.59)	235 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

GRADE Working Group grades of evidence
High quality: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

1. Wide confidence interval crossing line of no effect
2. Wide confidence interval and few events

Subgroup analysis of self-weighing plus advice on weight gain vs usual care by BMI category

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Quality of the evidence (GRADE)	Comments
	Risk with usual care	Risk with self-weighing plus advice on weight gain				
Excessive gestational weight gain BMI 26 to 29	556 per 1,000	**350 per 1,000** (167 to 722)	**RR 0.63** (0.30 to 1.30)	38 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Excessive gestational weight gain BMI >29	238 per 1,000	**360 per 1,000** (143 to 910)	**RR 1.51** (0.60 to 3.82)	46 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	
Mean weight gain (kg per week) BMI 26 to 29	The mean weight gain (kg per week) BMI 26 to 29 was **0**	The mean weight gain (kg per week) BMI 26 to 29 in the intervention group was 0.12 lower (0.21 lower to 0.03 lower)	-	38 (1 RCT)	⨁⨁⨁◯ MODERATE	
Mean weight gain (kg per week) BMI >29	The mean weight gain (kg per week) BMI >29 was **0**	The mean weight gain (kg per week) BMI >29 in the intervention group was 0.07 higher (0.04 lower to 0.18 higher)	-	46 (1 RCT)	⨁⨁⨁◯ MODERATE [1]	

2.1 Regular weighing and advice at antenatal visits

Regular weighing and advice on weight gain vs usual care

Study ref	Design	LoE	N	Aim, setting, population, measurements	Results	Comments
(Brownfoot et al 2015)	RCT	II	782	**Aim**: To assess whether routinely weighing women at each antenatal visit leads to a difference in gestational weight gain and weight gain within the IOM recommendations. **Setting** Antenatal clinics in a tertiary obstetric hospital in Melbourne. **Population**: Healthy women were enrolled during their antenatal booking visit if they were between 18 and 45 years of age, were <21 weeks' gestation with a singleton pregnancy. **Intervention**: The intervention (n=386) was weighing at each antenatal clinic appointment followed by counselling by their treating clinician according to IOM gestational weight gain guidelines. The control group (n=396) had standard antenatal care comprising recording weight at booking and then at 36 weeks. Primary analysis was by intention-to-treat. **Outcomes**: The primary outcome was difference in mean weight gain between groups. An important secondary outcome was gestational weight gain within IOM recommendations. Secondary outcomes also included maternal or neonatal morbidity.	There was no significant difference in weight gain between the intervention group (0.54 kg/week) compared with the control group (0.53 kg/week) (P=0.63) in any BMI category. A similar proportion of women gained more weight than the IOM recommended range: 75% in the intervention group and 71% in the control group (P=0.21) across BMI categories. Risk ratios (95%CI) by BMI were: • <18.5: 1.20 (0.41 to 3.51) p=0.20 • 18.5–24.9: 1.09 (0.94 to 1.27) p=0.27 • 24.9–30: 1.01 (0.89 to 1.15) p=0.87 • >30: 1.09 (0.87 to 1.35) p=0.46 There were no significant differences in secondary outcomes (maternal: hypertensive disorders of pregnancy, gestational diabetes, macrosomia, intrauterine growth restriction (IUGR), mode of delivery, induction of labour, 3rd or 4th degree tear, shoulder dystocia, postpartum haemorrhage (PPH), wound infection, antibiotic use, thrombosis, maternal death and initiation of breastfeeding; fetus/neonate: perinatal death, low Apgar score (<7 at 5 min), SCN/NICU admission, mean birthweight, hypoglycaemia, respiratory distress syndrome, jaundice, infection, birth trauma) between the two groups.	High risk of bias; see Section 2.3.

Study ref	Design	LoE	N	Aim, setting, population, measurements	Results	Comments
(Brownfoot et al 2016)	RCT	II	782	**Aim**: To assess the opinions of pregnant women regarding their weight gain and to assess the level of satisfaction and anxiety provoked by being weighed in clinic. **Setting**: A tertiary hospital antenatal clinic in Melbourne, Australia. **Population**: In all, 782 healthy pregnant women participated in the randomised controlled trial and 586 responded to the questionnaire. **Intervention**: Questionnaires were given to women participating in a randomised controlled trial comparing routine weighing in the antenatal clinic with standard care. A questionnaire was offered to all participants at 36 weeks of gestation gauging their satisfaction with their weight gain during pregnancy. The intervention group was asked about their level of satisfaction and anxiety provoked by being weighed in clinic. The control group was asked whether they would have liked to be weighed in clinic. Both groups were questioned about the influences on their weight gain.	Women in both groups were satisfied with their weight gain during pregnancy. Of women in the intervention group. 73% were very comfortable with being weighed in clinic. Approximately half of those in the control group would have favoured being weighed. Twenty-one percent of women said other people influenced their weight gain; mostly family members and two-thirds of them encouraged weight gain. Less than half of the women in the study used weighing scales at home. Women were satisfied with being weighed antenatally and it did not cause anxiety. Pregnant women accepted the re-introduction of weighing in the antenatal clinic.	

Regular weighing and advice on weight gain plus self-weighing vs usual care

Study ref	Design	LoE	N	Aim, setting, population, measurements	Results	Comments
(Daley et al 2015)	RCT	II	76	**Aim**: to establish the feasibility and acceptability of incorporating regular weighing, setting maximum weight gain targets and feedback by community midwives. **Setting**: Birmingham UK **Population**: Low risk pregnant women cared for by eight community midwives randomised to usual care (n=34) or usual care plus the intervention at 10–14 weeks of pregnancy (n=34). **Intervention**: Community midwives weighed and plotted weight on a weight gain chart, setting weight gain limit targets, giving brief feedback at each antenatal appointment and encouraging women to weigh themselves weekly between antenatal appointments. Women and midwives were interviewed about their views of the intervention. **Outcomes**: Feasibility and acceptability of the intervention for women. Secondary outcomes were weight gain, physical activity, depression and anxiety.	No clear difference between groups in the percentage of women gaining excessive gestational weight (23.5 % vs 29.4 %). The usual care group consistently reported higher mean (SD) depression (12 wk: 2.8 [2.4] vs 3.1 [2.5]; 28 wk: 4.8 [3.3] vs 3.4 [2.6]; 38 wk: 5.4 [3.4] vs 3.8 [2.7]; postnatal: 5.4 [3.4] vs 3.8 [2.7]) and anxiety (12 wk: 5.4 [3.4] vs 4.8 [2.8]; 28 wk: 6.4 [3.5] vs 4.7 [2.7]; 38 wk: 5.7 [3.0] vs 4.4 [2.7]; postnatal: 5.7 [3.0] vs 4.4 [2.7] scores compared with the intervention group, though none of the differences reached significance. Most women in a subset (9/12) commented the intervention was useful in encouraging them to think about their weight and believed it should be part of routine antenatal care. A subset of community midwives (7/7) felt the intervention could be implemented within routine care without adding substantially to consultation length, thus not perceived as adding substantially to their workload.	High risk of bias; see Section 2.3.

2.2 *Self weighing*

Self-weighing and advice on weight gain vs usual care

Study ref	Design	LoE	N	Aim, setting, population, measurements	Results	Comments
(Jeffries et al 2009)	RCT	II	236	**Aim**: To determine if regular weight measurement throughout pregnancy can reduce excessive gestational weight gain. **Setting**: A tertiary obstetric hospital in Melbourne **Population**: Women at ≤14 weeks' gestation. **Intervention**: Women allocated to the intervention group (n=125) were given a personalized weight measurement card, advised of their optimal gestational weight gain (based on their body mass index at the time of recruitment and the United States Institute of Medicine guidelines) and instructed to record their weight at 16, 20, 24, 28, 30, 32 and 34 weeks' gestation. The control group (n=111) were weighed at recruitment, but were not given advice about optimal weight gain or instructions about regular weight measurement. **Outcomes**: Primary outcome was weight gain from recruitment to follow-up at 36 weeks' gestation. Secondary outcomes included birthweight, mode of delivery, pregnancy complications and neonatal complications.	Women in the intervention group experienced a mean (SD) per-week weight gain of 0.44 (0.173) kg compared with those in the control group, who gained 0.46 (0.156) kg/week (mean difference, 0.02 kg/week; 95% CI, −0.02 to 0.07 kg/week). The intervention significantly reduced weekly weight gain in the group of women who were overweight but not obese at recruitment. Mean difference (95%CI) in weight gain (kg/wk) between intervention and control groups by BMI was: • ≤19.8: 0.14 (–0.00 to 0.29) p=0.06 • >19.8–26: 0.01 (–0.04 to 0.07) p=0.58 • 26–29: 0.12 (0.03 to 0.22) p=0.01 • >29: –0.06 (–0.18 to 0.05) p=0.27 The risk ratios (95%CI) for gaining more weight than the IOM guidelines were: • >19.8–26: 0.57 (0.23 to 1.38) p=0.21 • 26–29: 0.63 (0.30 to 1.30) p=0.21 • >29:1.51 (0.60 to 3.82) p=0.38	Unclear risk of bias; see Section 2.3

2.3 Evaluation of limitations of randomised controlled trials for research question 2

Study limitation	Judgement	Support for judgement
(Brownfoot et al 2015; Brownfoot et al 2016)		
Random sequence generation	Low risk	'The randomisation sequence was generated by an independent organisation.'
Allocation concealment	Unclear risk	'Sealed opaque envelopes.' Ideally should be sequentially numbered sealed opaque envelopes (which they probably were)
Blinding	High risk	'Limitations of our study included an inability to blind participants and their treating team due to the nature of the intervention. All the women recruited and clinicians knew the intervention was weighing and the control group was aware of the IOM guideline on weight gain in pregnancy, which is readily available.'
Incomplete outcome data	High risk	'Our loss to follow up rate was low at 5% and occurred primarily due to transfer of obstetric care to another provider. Importantly, there were no differences in BMI category, age or parity in those lost to follow up.' Loss to follow-up is not clear and likely to be closer to 18%.
Selective reporting	Low risk	Prespecified outcomes reported.
Other limitations	Low risk	There were no significant differences in baseline characteristics between intervention and control groups.
(Daley et al 2015)		
Random sequence generation	Low risk	'The randomisation list was generated by the trial statistician, independent from researchers involved in recruiting and randomising participants. Participants were randomised on a 1:1 basis to intervention or usual care using random permuted blocks of mixed size (2, 4 or 6) within strata (midwife).'
Allocation concealment	Low risk	'The researcher allocated women by opening sequentially numbered opaque sealed envelopes. The researcher opened the envelope after eligibility assessment.'
Blinding	High risk	'Because of the nature of the intervention, participants, researchers and those delivering the intervention could not be blinded to group.'
Incomplete outcome data	Low risk	'Our loss to follow up rate was low at 5% and occurred primarily due to transfer of obstetric care to another provider. Importantly, there were no differences in BMI category, age or parity in those lost to follow up.'
Selective reporting	Low risk	Prespecified outcomes reported.
Other limitations	High risk	Baseline characteristics were balanced between intervention and control groups with the exception of ethnicity and null parity where there was an imbalance.

Study limitation	Judgement	Support for judgement
(Jeffries et al 2009)		
Random sequence generation	Low risk	'The randomisation sequence was obtained using a computer random number generator.
Allocation concealment	Low risk	'Numbered cards allocating women to either the intervention or control group were placed in opaque, sequentially numbered envelopes. The person generating the allocation sequence was also responsible for participant recruitment; however, allocation concealment was maintained.'
Blinding	Unclear risk	Participants were blinded to the purpose of the study. Of necessity, the researcher conducting the study was not blinded to treatment group after allocation.
Incomplete outcome data	Low risk	Those women who were lost to follow-up (15.5% in the intervention group; 19.6% in the control group) were not weighed at 36 weeks' gestation and excluded from the analysis. Participants excluded from the analysis were similar in weight, BMI, age, parity and socioeconomic status to those who completed the study
Selective reporting	Low risk	Prespecified outcomes reported.
Other limitations	Low risk	There were no clinically meaningful differences between the women in the control and intervention groups in terms of demographic characteristics — age, smoking status, parity, marital status or educational attainment. The ranges of gestational age at recruitment and follow-up were 7.1–14.8 weeks and 36.3–38.3 weeks, respectively

2.4 Background information for research question 2

(Allen-Walker et al 2016)	The current challenges facing health professionals in antenatal are with respect to providing clinical support to women who are obese or gain excess weight during pregnancy, together with the need for culturally specific epidemiological data on safe GWG ranges, provide an argument for re-introducing routine weighing of all women throughout pregnancy. Although this appears to be a straightforward suggestion, there are likely to be many barriers for patients and health professionals that need to be explored before a change in practice could be realised.

(Furber et al 2013)	There are no trials designed to reduce weight in obese pregnant women. Until the safety of weight loss in obese pregnant women can be established, there can be no practice recommendations for these women to intentionally lose weight during the pregnancy period. Further study is required to explore the potential benefits, or harm, of weight loss in pregnancy when obese before weight loss interventions in pregnancy can be designed. Qualitative research is also required to explore dietary habits of obese pregnant women, especially those who are morbidly obese.
(Herring et al 2010)	Few obstetric providers were fully compliant with clinical practice recommendations, defined obesity correctly, or recommended weight gains concordant with IOM guidelines. Provider personal factors were the strongest correlates of self-reported management practices. Our findings suggest a need for more education around BMI definitions and weight gain guidelines, along with strategies to address provider personal factors, such as confidence and body satisfaction, that may be important predictors of adherence to recommendations for managing obese pregnant women.
(Muktabhant et al 2015)	High-quality evidence indicates that diet or exercise, or both, during pregnancy can reduce the risk of excessive gestational weight gain. Other benefits may include a lower risk of caesarean delivery, macrosomia, and neonatal respiratory morbidity, particularly for high-risk women receiving combined diet and exercise interventions. Maternal hypertension may also be reduced. Exercise appears to be an important part of controlling weight gain in pregnancy and more research is needed to establish safe guidelines. Most included studies were carried out in developed countries and it is not clear whether these results are widely applicable to lower income settings.
(van der Pligt et al 2011)	GPs were aware of the importance of healthy GWG yet routine weighing was not standard practice for diverse reasons. Management of GWG and perspectives of the issue varied widely. Time efficient and cost effective interventions may assist GPs in ensuring women are supported in achieving healthy GWG to provide optimal maternal and infant health outcomes.

2.5 Excluded studies for research question 2

Study	Reason for exclusion
Brownfoot, F. C., M. Davey, et al. (2015). "Weighing in pregnancy study (WIP): A randomised controlled trial of the effect of routine weighing to reduce excessive antenatal weight gain." BJOG 122 SUPPL. 2: 260.	Does not meet criteria for grading (Abstract of study included in this review (Brownfoot et al 2015))
Daley, A. J., K. Jolly, et al. (2015). "Effectiveness of regular weighing, weight target setting and feedback by community midwives within routine antenatal care in preventing excessive gestational weight gain: randomised controlled trial." BMC Obes 3: 7.	Does not meet criteria for grading (Study protocol)

Study	Reason for exclusion
Daley, A., K. Jolly, et al. (2014). "The feasibility and acceptability of regular weighing of pregnant women by community midwives to prevent excessive weight gain: RCT." 4(3): 233-234.	Does not meet criteria for grading (Abstract of study included in this review (Daley et al 2015))
Devlieger, R., K. Benhalima, et al. (2016). "Maternal obesity in Europe: Where do we stand and how to move forward?. A scientific paper commissioned by the European Board and College of Obstetrics and Gynaecology (EBCOG)." European Journal of Obstetrics Gynecology and Reproductive Biology 4.	Narrative review
Galtier, F., I. Raingeard, et al. (2008). "Optimizing the outcome of pregnancy in obese women: from pregestational to long-term management." Diabetes & Metabolism 34(1): 19-25.	Narrative review
Harrison, C. L., H. J. Teede, et al. (2014). "How effective is self-weighing in the setting of a lifestyle intervention to reduce gestational weight gain and postpartum weight retention?" Australian & New Zealand Journal of Obstetrics & Gynaecology 54(4): 382-385.	Does not answer question
Lam, S., L. Kindinger, et al. (2012). "Weight gain in pregnancy." Archives of Disease in Childhood: Fetal and Neonatal Edition 97 SUPPL. 1: A114.	Does not meet criteria for grading (Abstract only)
Lam, S., L. Kindinger, et al. (2012). "Weight gain in pregnancy." BJOG: An International Journal of Obstetrics and Gynaecology 119 SUPPL. 1: 43-44.	Does not meet criteria for grading (Abstract only)
Lombard, C., C. Harrison, et al. (2011). "A randomized controlled trial investigating self-weighing and the prevention of excess weight gain in early pregnancy." Endocrine Reviews 32(3).	Does not meet criteria for grading (Abstract only)
Oken, E. (2015). "Routine weighing of women during pregnancy is of limited value and should be abandoned: AGAINST: Routine weighing in pregnancy is the first step to preventing adverse birth outcomes." BJOG: An International Journal of Obstetrics & Gynaecology 122(8): 1101.	Does not meet criteria for grading (Abstract only)
Preston, H. M. M. and J. E. Norman (2016). "Repeated weighing during pregnancy is ineffective in minimising maternal weight gain." BJOG: An International Journal of Obstetrics and Gynaecology 123(2): 262.	Does not meet criteria for grading (Abstract only)
Richens, Y, Smith, DM & Lavender, T (2013). "The role of the Midwife during pregnancy, labour an dpost-partum" in *Obesity: A Ticking Time Bomb for Reproductive Health.* 1 edn, Elsevier Inc., London, pp. 343-355.	Does not answer research question
Steer, P. J. (2015). "Routine weighing of women during pregnancy is of limited value and should be abandoned: FOR: Routine weighing does not solve the problem of obesity in pregnancy." BJOG: An International Journal of Obstetrics & Gynaecology 122(8): 1101.	Does not meet criteria for grading (Abstract only)

Study	Reason for exclusion
Van Der Plight, P., K. Campbell, et al. (2013). "Primary and secondary prevention of excess gestational weight gain: General practitioner's perspectives and opportunities for provision of support." Journal of Paediatrics and Child Health 49 SUPPL. 2: 72.	Does not meet criteria for grading (Abstract only)
van der Pligt, P., K. Campbell, et al. (2011). "Opportunities for primary and secondary prevention of excess gestational weight gain: General Practitioners' perspectives." BMC Family Practice 12: 124.	Does not meet criteria for grading (Abstract only)

3 What are the additional considerations for Aboriginal and Torres Strait Islander women?

Evidence summary

Results of previous review

The literature review conducted to inform Module I of the Guidelines (Australian Health Ministers' Advisory Council 2012) identified one study that reported an association between a BMI <20 with an increased risk of a low birth weight baby among Aboriginal and Torres Strait Islander women (Panaretto et al 2006). This informed the narrative.

Results of current review

No studies identified.

4 What are the additional considerations for women from culturally and linguistically diverse groups?

Evidence summary

Results of previous review

No studies identified.

Results of current review

No studies identified.

References

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Australian Health Ministers' Advisory Council (2012) Clinical Practice Guidelines: Antenatal care — Module I. Canberra: Australian Government Department of Health. Available at: http://www.health.gov.au/antenatal

Brownfoot FC, Davey MA, Kornman L (2015) Routine weighing to reduce excessive antenatal weight gain: a randomised controlled trial. *BJOG* 123(2): 254–61.

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Daley AJ, Jolly K, Jebb SA et al (2015) Feasibility and acceptability of regular weighing, setting weight gain limits and providing feedback by community midwives to prevent excess weight gain during pregnancy: randomised controlled trial and qualitative study. *BMC Obes* 2: 35.

Furber CM, McGowan L, Bower P et al (2013) Antenatal interventions for reducing weight in obese women for improving pregnancy outcome. *Cochrane Database Syst Rev*(1): CD009334.

Herring SJ, Platek DN, Elliot P et al (2010) Addressing Obesity in Pregnancy: What Do Obstetric Providers Recommend? *J Womens Health* 19(1): 65–71.

Jeffries K, Walker SP, Hiscock R et al (2009) Reducing excessive weight gain in pregnancy: a randomised controlled trial. *MJA* 191(8): 429–33.

Muktabhant B, Lawrie TA, Lumbiganon P et al (2015) Diet or exercise, or both, for preventing excessive weight gain in pregnancy. *Cochrane Database Syst Rev*(6): CD007145.

van der Pligt P, Campbell K, Willcox J et al (2011) Opportunities for primary and secondary prevention of excess gestational weight gain: General Practitioners' perspectives. *BMC Fam Pract* 12: 124.