



Weight Management for Adult Women Living with Obesity during Preconception, Pregnancy and Postpartum

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KEY MESSAGES FOR HEALTHCARE PROFESSIONALS



- **This chapter addresses the management of weight related to three phases of a woman's reproductive years – preconception, during pregnancy and postpartum – for adult women living with obesity.** Although these reproductive periods are addressed separately, it is important to consider that these phases represent the continuum of weight management over the reproductive years in women living with obesity.
- **During these time periods, women frequently access the healthcare system, thus providing clinicians with opportunities to support women in health-promoting behaviours and chronic disease prevention and management strategies that may have positive impacts on the short- and long-term health of both the woman and her children.**
- **Weight bias and stigma can impact access and quality of healthcare services as well as health outcomes for individuals living with obesity and should be addressed. Individuals living with obesity should be supported in a non-stigmatising manner to manage obesity-related health outcomes by continuing disease-management strategies that are safe and evidence based, and that increase the likelihood of achieving pregnancy-related weight gain targets.**
- **The obstetric and medical management for women living with obesity during pregnancy is beyond the scope of this clinical practice guideline.**

RECOMMENDATIONS



These recommendations pertain to the management of weight over the reproductive years for adult women living with obesity (i.e., body mass index (BMI) ≥ 30 kg/m²) with a singleton pregnancy, who are ≥ 18 years of age and do not have pre-existing diabetes or gestational diabetes.

- 1. General advice:** We recommend healthcare professionals (HCPs) discuss weight-management targets specific to the reproductive years with adult women living with obesity: preconception weight loss (Level 3, Grade C)¹⁻⁴, gestational weight gain (GWG) of 5 kg – 9 kg over the entire pregnancy (Level 4, Grade D^{5,6}; postpartum weight loss of – at minimum – GWG (Level 3, Grade C)^{7,8} to reduce the risk of adverse outcomes in the current or in a future pregnancy.
- 2. Combined behavioural-support interventions:** HCPs should offer behavioural support interventions, including both nutrition and physical activity, to adult women living with obesity who are considering a pregnancy (Level 3, Grade C)^{8,9}, who are pregnant (Level 2a, Grade B)¹⁰⁻¹⁶ and who are postpartum (Level 1a, Grade A)¹⁷ to increase the likelihood of achieving weight targets.
- 3. Nutrition counselling alone:** We recommend HCPs encourage and support pregnant women living with obesity to consume foods consistent with a healthy dietary pattern in order to meet their target GWG (Level 3, Grade C)¹⁸.
- 4. Physical activity counselling alone:** We recommend HCPs encourage and support pregnant women living with obesity who do not have contraindications to exercise during pregnancy to engage in at least 150 minutes per week of moderate-intensity physical activity to assist in the management of GWG (Level 3, Grade C)¹⁹⁻²².
- 5. Pharmacotherapy:** HCPs should not prescribe metformin for managing GWG in women living with obesity (Level 1b, Grade A)²³⁻²⁵. We suggest no weight-management medications during pregnancy or breastfeeding (Level 4, Grade D)²⁶.
- 6. Breastfeeding:** We recommend women living with obesity be offered additional breastfeeding support due to decreased rates of initiation and continuation (Level 3, Grade C)²⁷.

KEY MESSAGES FOR WOMEN LIVING WITH OBESITY DURING PRECONCEPTION, PREGNANCY AND POSTPARTUM



- **The reproductive years, including before, during and after pregnancy, bring many additional challenges for women living with obesity.** Since obesity is a chronic disease, it is important for women living with obesity to seek advice and support from their healthcare professionals on strategies to optimise their obesity-related health outcomes over both the short and long term.
- **When planning and entering pregnancy, aim to be at your best weight and optimal health.**
- **During pregnancy aim for weight-gain targets (5 kg – 9 kg) to reduce the risk of obesity-related health complications and poorer health outcomes.** Seek support in aiming to return to pre-pregnancy weight and health in the year after delivery.

Preconception period Background

A woman's preconception health status, particularly the optimal management of pre-pregnancy medical comorbidities, has been demonstrated to markedly impact maternal, obstetric and foetal health outcomes^{28,29}. While many pregnancies are unplanned, a preconception consultation offers women considering pregnancy the opportunity to engage in discussions with their healthcare professionals (HCPs) about their individualised health risks during pregnancy, and to make informed decisions. In addition, the preconception period is a time when interventions can be implemented to reduce the risks of common adverse pregnancy outcomes^{28,29}.

As outlined in [Table 1](#), for women living with obesity who become pregnant, a BMI of ≥ 30 kg/m² has been associated with the following: infertility^{30,31}, increased risk of congenital malformations³¹ and numerous clinically important adverse pregnancy outcomes (in a dose-response relationship by BMI), including hypertensive disorders of pregnancy, gestational diabetes, caesarean delivery, preterm birth and stillbirth^{2,32,33}. While there remains a paucity of data to specifically guide clinicians^{34,35} on how best to counsel women living with obesity about these pregnancy-associated health risks, emerging data demonstrate that obesity management prior to pregnancy may reduce many of the above risks^{1,36}. Discussion of specific nutritional supplementation (e.g., folic acid) and obstetric care is beyond the scope of this clinical practice guideline.

Clinical strategies and resources to achieve preconception obesity-related health for women living with obesity

Combined behavioural-support interventions: There are few trials specifically conducted in women living with obesity planning a pregnancy. Agha *et al.*'s systematic review⁹ of randomised controlled trials (RCTs) in preconception women with overweight or obesity found that combined behavioural health interventions (i.e., nutrition and physical activity) were associated with significant reductions in gestational weight gain (GWG) once pregnant. This is similar to the findings of Krukowski *et al.*⁸ who examined the effectiveness of a combined behavioural health intervention (combined nutrition and physical activity) beginning in the preconception period or up to 10

weeks' gestational age. The study found that women with obesity in the intervention arm had reduced GWG at 36 weeks' gestation. In addition, as outlined in the postpartum period section, the use of combined behaviour-change interventions in the postpartum period was associated with greater postpartum weight loss, which may impact the health outcomes of future pregnancies³⁶.

Pharmacotherapy: At present, the foetal effects of several pharmacologic agents used for the purpose of weight management are not known. Therefore, in general, it is not recommended that these agents be used during pregnancy. Consideration should be given to stopping these medications prior to pregnancy to limit exposure to the developing foetus²⁶.

Table 1: **Associations Between Obesity, Gestational Weight Gain and Adverse Clinical Outcomes over the Reproductive (Preconception, Antenatal and Postpartum) Periods**

Reproductive Period	Weight Management Issue	Adverse Clinical Outcome	
Preconception	Pre-pregnancy obesity	<ul style="list-style-type: none"> ↑ Infertility³⁰ ↑ Gestational diabetes³⁷ ↑ Hypertensive disorders of pregnancy (i.e., gestational hypertension and preeclampsia)^{2,4,38-40} ↑ Maternal venous thromboembolism^{38,41} ↑ Postpartum depression³ ↑ Miscarriage²⁸ 	<ul style="list-style-type: none"> ↑ Caesarean delivery³² ↑ Congenital malformations^{32,42} ↑ Newborn asphyxia³³ ↑ Macrosomia/large-for-gestational-age³³ ↑ Stillbirth^{43,44} ↑ Neonatal death⁴³
Pregnancy	Excess gestational weight gain	<ul style="list-style-type: none"> ↑ Gestational diabetes^{42,45} ↑ Hypertensive disorders of pregnancy (i.e., Gestational hypertension and preeclampsia)^{40,46-48} ↑ Caesarean delivery^{1,46,48-50} ↑ Preterm birth (medically indicated)⁴³ 	<ul style="list-style-type: none"> ↑ Large for gestational age infants^{46,48,51,52} ↑ Neonatal hyperinsulinemia⁵² ↑ Neonatal hypoglycemia, hypomagnesemia, & hypocalcemia⁵¹ ↑ Postpartum weight retention⁵³⁻⁵⁶
	Low gestational weight gain or weight loss ⁵⁷	<ul style="list-style-type: none"> ↓ Hypertensive disorders of pregnancy (i.e., gestational HTN⁴² and pre-eclampsia³⁹) ↓ Caesarean delivery^{1,46,49,58} 	<ul style="list-style-type: none"> ↓ Large for gestational age infant^{48,49,59,60} ↑ Macrosomia^{2,58} ↑ Preterm birth and SGA⁵⁰
	Weight loss	<ul style="list-style-type: none"> ↑ Low birth weight infant⁴⁶ 	
Postpartum	Pre-pregnancy obesity	↑ Postpartum weight retention ³⁸	
	Obesity during pregnancy	↑ Obesity by 9 months postpartum ⁶¹	
	Excess postpartum weight retention	<ul style="list-style-type: none"> ↑ Gestational diabetes in future pregnancy¹ ↑ Hypertensive disorders in a future pregnancy¹ 	↑ HTN and CVD ⁶²
	Reduction in BMI by 2 kg/m ²	↓ Gestational diabetes in future pregnancy ⁷	

CVD: Cardiovascular Disease; HTN: Hypertension; SGA: Small for Gestational Age

Pregnancy/antenatal period

Background

Women living with obesity have an increased risk of numerous adverse maternal, obstetric and foetal outcomes during pregnancy, as outlined in Table 1. One promising strategy to reduce or prevent some obesity-related adverse outcomes is through aiming for the recommended guidelines for GWG during pregnancy (see below), although this remains an area of active study.

The current Health Service Executive/Irish College of General Practitioners (HSE/ICGP) recommended guidelines for weight gain during pregnancy for uncomplicated singleton pregnancies refer to the Institute of Medicine (IOM) guidance published in 2009⁵ (Table 2). The IOM recommendations were developed based on the findings of numerous observational studies. These studies consistently demonstrate that GWG above or below these recommended ranges is associated with several important adverse clinical outcomes for women and their offspring, including birthweight, large for gestational age, small for gestational age, caesarean delivery, preterm delivery, postpartum maternal weight retention and childhood obesity⁶³. However, the data on the association between GWG and small for gestational age infants remain contradictory^{46,49,58,59,63}. More recently, the International Federation of Obstetricians and Gynaecologists (FIGO) Committee guideline for the management of pre-pregnancy, pregnancy and postpartum obesity have outlined specific guidance³⁵. In Ireland, clinical reports from the four largest maternity hospitals demonstrate that less than 50% of women have a BMI in the 18.5 kg/m² – 24.9 kg/m² range at primary antenatal appointments⁶⁴.

There is currently a lack of national GWG data of women in Ireland during pregnancy. However, individual studies conducted in Ireland have reported excessive GWG in almost two-thirds of women, while approximately one in four women meet GWG recommendations in pregnancy⁶⁵. It is important to note that concerns of inappropriate GWG are prevalent for all women irrespective of BMI⁶⁶. One Irish study demonstrated similar levels of GWG among women with a

BMI in the 'ideal' (32.9%), overweight (34.1%) and obese (28.1%) range categories⁶⁷. In a secondary analysis of the of the Pregnancy Exercise and Research Study (PEARS) study in Ireland, Edmonton Obesity Staging System (EOSS) scores were examined in 348 women with a BMI > 25kg/m² in early (14 to 16 weeks) and late (28 weeks) pregnancy. The researchers found that 81.9% and 98.9% had raised EOSS scores in early and late pregnancy, respectively⁶⁸.

Several factors influence GWG for women living with obesity, including genetics, depression⁶⁹, health behaviours⁷⁰, patient expectations and knowledge⁷¹, educational attainment/socio-economic status⁷², maternal age, parity and ethnicity⁷³. Importantly, obesity prior to pregnancy is also an independent risk factor for excess GWG⁷⁴⁻⁷⁷. Although there are no data specifically for women with obesity, there is evidence that advice from a maternity HCP is both desired by women⁷⁸⁻⁸¹ and can positively influence gestational weight management⁸².

Considerations for weight management during pregnancy for women living with obesity

Women with a singleton pregnancy can expect to gain approximately 8.5 kg during a full-term pregnancy, regardless of the increase in their own adipose tissue mass, as a result of the following physiologic increases in weight: term baby (approximately 3 kg), the placenta, amniotic fluid, uterine muscle, increase in intravascular blood volume and the increase in total body water volume. For women with obesity, this weight gain amount is just below the upper limit of the IOM/FIGO recommendations for optimal GWG (5 kg – 9 kg throughout the entire pregnancy). As a result, weight management can be challenging for women with obesity, and should therefore be addressed at the first prenatal appointment and throughout pregnancy. An evidence-based point-of-care tool, The 5As (ask, assess, advise, agree and assist) of Healthy Pregnancy Weight Gain is available to support HCPs in discussing healthy pregnancy weight gain with women^{83,84}

Table 2: IOM Gestational Weight Gain Recommendations⁵

Pre-pregnancy BMI	Total Weight Gain		Rates of Weight Gain* 2nd and 3rd Trimester	
	Range in kg	Range in lbs	Mean (range) in kg/week	Mean (range) in lbs/week
< 18.5 kg/m ²	12.5 – 18	28–40	0.51 (0.44–0.58)	1 (1–1.3)
18.5 - 24.9 kg/m ²	11.5 – 16	25–35	0.42 (0.35–0.50)	1 (0.8–1)
25.0 - 29.9 kg/m ²	7 – 11.5	15–25	0.28 (0.23–0.33)	0.6 (0.5–0.7)
> 30.0 kg/m ²	5 – 9	11–20	0.22 (0.17–0.27)	0.5 (0.4–0.6)

Source: Institute of Medicine and National Research Council. 2009. Weight Gain During Pregnancy: Re-examining the Guidelines. <https://doi.org/10.17226/12584>. Reproduced with permission from the National Academy of Sciences, courtesy of the National Academies Press, Washington, D.C.

Advice from maternity HCPs positively influences the likelihood of achieving GWG targets⁸⁵⁻⁸⁸. Further, pregnant women report that they want to discuss GWG with their HCPs⁸⁹⁻⁹³. Although data from Canada shows that most HCPs reported routinely weighing pregnant women, only a minority routinely discussed the actual weight results⁹⁴⁻⁹⁷. Weight-related discussions are often perceived by HCPs as sensitive in nature and are therefore often avoided⁹⁸⁻¹⁰¹. This hesitation in raising the topic could be mitigated to some extent by establishing a good rapport in the patient-HCP relationship, and engaging in non-judgemental, empathetic consultations¹⁰². HCPs who have a longitudinal relationship with their patients (e.g., general practice) are in a particularly advantageous position to be able to support women living with obesity to aim for the recommended targets for GWG. A theoretical framework that is relevant to clinicians is the 5As of Healthy Pregnancy Weight Gain, which has been shown to be effective at initiating HCP-mediated GWG counselling^{84,103}:

1. Ask permission to discuss weight — even though weight gain in pregnancy is expected, asking permission is an important first step.
2. Assess weight, drivers/complications/barriers to guideline-discordant pregnancy weight gain using the 4 Ms framework (mental, mechanical, metabolic and milieu), and pregnancy-related health beliefs.
3. Advise on pregnancy weight-gain risks, health and wellbeing as well as management options including activity, mental health, nutrition, sleep and stress.
4. Agree on a plan relating to health-behaviour outcomes.
5. Assist by identifying and addressing barriers, providing educational resources, referring for more specialist care as appropriate and arranging follow-up.

Clinical strategies and resources to achieve recommended gestational weight-gain targets for women living with obesity

Based upon the above, a number of interventions and models of care could be helpful to women living with obesity during pregnancy, when approached from a patient-centred perspective.

Nutrition counselling: When implemented early in pregnancy, nutrition counselling can assist women with obesity in managing pregnancy weight gain. Wolff *et al.*¹⁸ randomised pregnant women with obesity to either an intervention arm (n = 23), consisting of 10 one-hour sessions with a trained dietitian, or usual care (n = 27). The sessions focused on providing advice on eating a healthy diet according to Danish national dietary recommendations, with the use of food records to identify unhealthy eating patterns and to give individualised feedback for improvement. At 36 weeks' gestation, the mean GWG for the intervention group was 6.6 kg, compared to a mean GWG of 13.3 kg for the control group (p = 0.002).

Physical activity: Physical activity (a term used synonymously with exercise in this chapter) during pregnancy has been shown to be beneficial to women with obesity in managing their pregnancy weight gain¹⁰⁴. Daly *et al.*²¹ compared total GWG at 36 weeks' gestation between 88 pregnant women assigned to either an intervention consisting of intensive, medically supervised exercise or to usual care. Fewer women in the exercise intervention group gained weight in excess of the guidelines compared to women in the control group (23.5% vs. 45.2%, p < 0.05). Barakat *et al.*²⁰ compared total GWG between pregnant women randomised to an exercise intervention or to standard care as an analysis of a secondary outcome in a RCT. The intervention consisted of 50- to 55-minute training sessions (three days per week) from nine to 11 weeks' gestation until 38 to 39 weeks' gestation (85 sessions in total). Among women with obesity (n = 54), 44.0% of women in the intervention group experienced excess GWG compared with 51.7% of women in the control group. In a case-control study undertaken by Claesson *et al.*²², the intervention consisted of motivational talks to assist with behaviour change and regular exercise (aqua aerobics). The intervention group experienced significantly lower weight gain than the control group (8.7 kg vs. 11.3 kg; p < 0.001).

Combined behavioural-support interventions: A comprehensive approach targeting both nutrition and exercise has been shown to be effective in managing GWG. Vinter *et al.*¹⁴ randomised 360 women with obesity at 10 to 14 weeks' gestation to a comprehensive behavioural intervention or standard care (Lifestyle in Pregnancy Study: LiP). Women in the intervention group received four 30- to 60-minute nutrition counselling sessions delivered by trained dietitians and were encouraged to be moderately physically active for 30 to 60 minutes daily. At 35 weeks' gestation, women in the intervention group had gained significantly less weight than women in the control group (7.4 kg vs. 8.6 kg, p = 0.014).

Petrella *et al.*¹⁵ randomised 38 women with obesity to a therapeutic behaviour-support programme consisting of 1800 kcal/day and 30 minutes of physical activity of moderate intensity on at least three days per week, or to usual care. At delivery, women in the intervention group experienced significantly lower GWG than women in the control group (6.7 kg vs. 10.1 kg, p = 0.047). In addition, 77.8% of women receiving the intervention experienced guideline concordant GWG, compared with 30.0% of women in the control group (p = 0.003).

Poston *et al.*¹¹ randomly assigned 1,555 pregnant women with obesity who were between 15- and 18-weeks' gestation to either a theory-based intensive behavioural intervention or to standard antenatal care (UK Pregnancies Better Eating and Activity Trial: UPBEAT). The intervention consisted of eight 60-minute weekly sessions addressing nutrition and physical activity by setting and achieving SMART goals. At delivery (mean gestational age 39.5 weeks for both groups), women in the intervention group had gained less weight than women in the control group (7.19 kg vs. 7.76 kg, p = 0.041).

Haby *et al.*¹² conducted a RCT evaluating a prenatal behavioural intervention compared to usual care for women with obesity, with GWG as one of the outcomes. The intervention group (n = 459) received two 30-minute midwife-delivered personalised counselling sessions on food and physical activity during early pregnancy. Individualised dietary advice from a dietitian, food discussion groups with a dietitian, aqua aerobics led by a physiotherapist, prescriptions for physical activity, walking poles, pedometers and information about community resources were also available to the intervention group if desired. The control group (n = 895) received usual care. Per-protocol analysis showed significantly lower GWG in the intervention group compared to the control group (8.9 kg vs. 11.2 kg; p = 0.031).

Renault *et al.*¹⁰⁵ undertook a RCT with 425 women with obesity being assigned to one of three groups: physical activity plus diet, physical activity alone or control. Both interventions resulted in less GWG than the control (p = 0.008). The median GWG, compared with the control group (10.9 kg), was lower in both intervention groups: physical activity plus diet 8.6 kg (p = 0.01) and physical activity alone 9.4 kg (p = 0.042).

Peaceman *et al.*¹⁰⁶ evaluated the effects of a varied randomised lifestyle-intervention programmes to limit GWG using prospective meta-analysis (n = 1,150 pregnant women with overweight or obesity). They found the percent with excess GWG per week was significantly lower in the intervention group compared with the standard care group (61.8% vs. 75.0%; odds ratio [95% CI]: 0.52 [0.40 to 0.67]). Total GWG from enrollment to 36 weeks' gestation was also lower in the intervention group (8.1 ± 5.2 kg vs. 9.7 ± 5.4 kg; mean difference: -1.59 kg [95% CI: -2.18 kg to -0.99 kg]). The results from the individual trials were similar. The intervention and standard care groups did not differ in pre-eclampsia, gestational diabetes, caesarean delivery or birth weight. Overall, the moderate positive effect appeared to be consistent across groups and different lifestyle interventions.

An Irish study by Kennelly *et al.* performed a RCT of 565 women with BMI > 25 kg/m² (average BMI 29.3 kg/m²) comparing routine care with a complex nutrition and physical activity intervention supported by a specifically designed smartphone application and grounded in behaviour-change theory^{107,108}. The intervention consisted of low glycaemic index eucaloric nutrition intervention and a daily exercise prescription of at least 30 minutes moderate exercise daily. The intervention group showed improved insulin resistance, less GWG (11.3 kg vs. 12.66 kg, p = 0.01) and less large for gestational age (LGA) infants (4.1% vs. 8.7%, p = 0.03). The smartphone application is now available for download free on Google Play "Hollestic"^{107,108}. This intervention was also found to be cost effective; costs per case of excessive GWG averted and case of LGA averted were €2,117 and €5,911, respectively¹⁰⁹.

Metformin: To date, RCT evidence for the use of metformin in the management of GWG for women with obesity who do not have diabetes is conflicting, and therefore metformin is not recommended. Although a Cochrane review by Dodd *et al.*¹¹⁰ of three studies of metformin (up to 3,000 mg/day) in pregnant

women with overweight or obesity found that women who received metformin may have a slightly lower GWG compared with placebo, the heterogeneity of the studies prevented meaningful evaluations.

HCP behaviours^{111,112}: There are limited data specifically focused on pregnant women with obesity. Observational studies in the general population show that a more patient-centred approach by HCPs influences patients' adherence to weight gain recommendations¹¹³⁻¹¹⁵, patients' perception of "finding common ground"¹¹⁶, increased patient satisfaction and decreased burden of symptoms¹¹⁷.

A recent review suggests that HCPs should maintain open communications while discussing gestational obesity and take a patient-centred approach to any nutrition or physical activity health behaviours being discussed. Nagpal and colleagues suggest that HCPs may benefit from sensitivity training to support their confidence and skills in supporting women and discussing obesity in pregnancy in a non-stigmatising way¹¹⁸.

Callaghan *et al.* completed a systematic review on HCP knowledge of appropriate GWG recommendations for pregnancy¹¹⁹ which saw a substantial gap between self-reported and directly assessed knowledge, with the former being significantly higher. This gap formed the basis of Callaghan's recently completed doctoral thesis¹²⁰. The thesis explored Irish health professional roles in delivering nutrition, GWG and physical activity advice during pregnancy alongside the barriers and enablers to their implementation in routine care using a mixed-methods approach. The key findings were that HCPs considered their profession as central in supporting women and saw it as a partnership with women in providing holistic care. However, the engagement in routine care was described as largely absent and "missed care" by these key HCPs. Barriers were identified at individual, interpersonal and organisational levels¹²⁰.

Lindberg *et al.*¹²¹ examined the weight outcomes before and after implementation of a "best practice alert" in the electronic medical record, which provided tailored GWG goals and patient education materials based on patients' pre-pregnancy BMI and the 2009 IOM guidelines for weight gain during pregnancy. Overall, the intervention was associated with a significant increase in the proportion of women with obesity who had guideline-concordant GWG.

Surveys of HCPs identified the following gaps requiring additional clinical support: increasing HCP knowledge, improving skills and self-efficacy in discussing GWG and supporting women to make positive health-behaviour changes in pregnancy^{94,119}. System-related changes identified included flexibility in the time available for perinatal health appointments and changes to how charges are applied in private health settings. To address similar clinical gaps for HCPs in discussing weight gain in pregnancy, Alberta Health Services from Canada developed and evaluated an evidence-based, accredited online continuing medical education module which includes information about assessing, discussing

and supporting healthy GWG in pregnant women. Interactive activities, self-testing and case scenarios help build capacity and provide opportunity to practice gained skills and knowledge. The module is available at <https://ecme.ucalgary.ca/programs/hpwg>.

Routine weighing: To date, RCTs of routine weighing of pregnant women during antenatal visits have not found routine weighing to be associated with significant impacts on GWG. First, a trial by Brownfoot *et al.*¹²² of an intervention (regular weighing in antenatal clinics) compared with control (routine care) on GWG found no difference in the proportion of participants whose GWG was above, within or below the IOM recommended ranges among women with obesity. Second, McCarthy *et al.*¹²³ randomised 382 women with overweight or obesity and a singleton pregnancy, at less than 20 weeks' gestation and without diabetes to serial self-weighing and simple dietary advice (intervention $n = 190$) or standard prenatal care (control $n = 192$). There was no difference in GWG, for women with obesity, between the intervention and control groups (7.40 kg vs. 8.77 kg). Thirdly, Daley *et al.*⁹³ randomised women to either regular antenatal appointment weighing with maximum weight gain limits set between visits and brief feedback ($n = 329$) compared with usual care ($n = 327$). No evidence was found that the intervention decreased excessive GWG. At 38 weeks, the proportions with excessive GWG were 27.6% intervention versus 28.9% usual care (adjusted OR 0.84, 95% CI: 0.53 to 1.33) with no difference in anxiety, depression or physical activity between groups⁹³.

Postpartum period Background

The postpartum period is recognised to begin immediately following the birth of a baby, though its duration is not well defined. While many of the physiologic changes of pregnancy resolve by six weeks postpartum¹²⁴⁻¹²⁶, several physiologic and psychological changes continue to exist for over a year postpartum, particularly if women continue to breastfeed⁶⁰. Thus, a period of one year after giving birth is generally considered as the working definition of the postpartum period⁶⁰.

A wide range of diverse and complex factors influence maternal weight after pregnancy. Higher GWG is recognised as a major risk factor for postpartum weight retention^{13,54-56}. The evidence is mixed with regard to the association between pre-pregnancy weight and postpartum weight retention, as several^{55,127-130} but not all studies¹³¹⁻¹³³ have demonstrated that having a higher pre-pregnancy BMI is associated with higher postpartum weight retention. Other factors, such as sleep patterns¹³⁴, psychological factors (e.g., depression, anxiety and stress)¹³⁵⁻¹³⁹ and maternal characteristics, including age^{55,140}, ethnicity^{55,132,141}, parity^{131,142}, socioeconomic status^{55,140,143} and educational attainment^{55,143}, are associated with postpartum weight retention.

The findings that weight gain during pregnancy and the potential lack of, or limited weight loss after pregnancy increases the risk of longer-term obesity or the risk of moving into a higher BMI

category are consistent across studies and worldwide. Wallace and colleagues³⁸, for example, examined inter-pregnancy weight change using data from the Aberdeen Maternity and Neonatal Databank and identified that 86% of women who were initially categorised in the obesity BMI categories gained a further 9 kg by their third pregnancy. In Ireland, Mullaney⁶¹ investigated the trajectory of postpartum weight change and found that 90% of women with obesity in early pregnancy retained obesity at four and nine months postpartum. In a prospective cohort study of Canadian women¹²⁴, BMI increased by approximately 1.5 kg/m² from pre-pregnancy to 10 to 12 weeks postpartum across all pre-pregnancy BMI categories. A population-based study of 58,534 Canadians who experienced successive pregnancies 144 demonstrated that approximately 25% of women were ≥ 5 kg heavier at the beginning of a subsequent pregnancy, approximately 9% were heavier by 10 kg or more and approximately 2% of women developed obesity after starting the previous pregnancy with a lower BMI. Retaining or gaining weight following pregnancy may also be associated with adverse pregnancy outcomes in future pregnancies. These adverse outcomes are described in the pre-conception and antenatal sections and in [Table 1](#).

Many of the pregnancy-related contributors to GWG, such as fluid gained during pregnancy and increased organ size (e.g., of the uterus), are lost in the first six weeks postpartum. After this period, postpartum weight retention is mainly due to increased fat mass¹²⁴. Despite the adverse long-term health impact of postpartum weight retention, no detailed guidelines have been established to define cut-points for excess postpartum weight retention¹⁴⁵. The dietary reference intakes established by the IOM 2005¹⁴⁶ recommend a weight loss of approximately 0.8 kg/month in the first six months postpartum, but this amount of weight loss is not specifically for women with obesity. These guidelines are based on a 1998 review by Butte and Hopkinson¹⁴⁷ of nine longitudinal studies conducted with affluent postpartum women, which showed that well-nourished women experience an average weight loss of 0.8 kg/month in the first six months postpartum. Weight stability is assumed after this period¹⁴⁶, and there is no consensus about the amounts or timelines for continued weight loss after the first six months postpartum¹⁴⁸. An observational study found that a 300 kilocalorie per day postpartum energy deficit (relative to intake during pregnancy) was associated with approximately 5 kg weight loss across 12 months in women with obesity using objective energy assessment methods (double-labelled water)¹⁴⁹.

For women who entered pregnancy with obesity, a postpartum weight loss of at least the amount gained during gestation should be achieved to not increase the risk of adverse pregnancy outcomes in future pregnancy^{7,150}. Sorbye and colleagues⁷ demonstrated that postpartum weight loss by more than two BMI units protects against the development of gestational diabetes in future pregnancies among women with obesity. Postpartum weight gain increases the risk of gestational diabetes in the next pregnancy. McBain *et al.*¹⁵⁰ also found that women in the overweight/obesity BMI categories were more likely to remain in the same BMI category in the next pregnancy.

Notably, evidence shows that women want an opportunity to discuss postpartum weight loss with HCPs and suggests that it should be a part of standard care⁹¹. This discussion could take place either during the six-week postnatal check-up or even during pregnancy in order for women to have the opportunity to start thinking about postpartum weight loss early on⁹¹. According to Ohlendorf *et al.*¹⁵¹, 67% of postpartum women are attempting behavioural interventions or maintaining healthy behaviour at four-weeks postpartum, and 84% at eight-weeks postpartum. Most (82%) postpartum women with obesity reported that they planned to seek information about losing pregnancy weight through their doctors and midwives, as well as media¹⁵².

Clinical strategies and resources to achieve postpartum weight management for women living with obesity

Considering the above evidence, the following clinical interventions should be considered to assist with weight management of postpartum women with obesity:

Physical activity and motivational interviewing: Physical activity and motivational interviewing during pregnancy have been shown to be beneficial to women with obesity in managing their postpartum weight loss. Claesson *et al.*²² undertook a study involving pregnant women with obesity who participated in a programme to limit GWG by including regular physical activity (aqua aerobics class) and using motivational interviewing to identify and plan for individual behaviour change. Study participants had a significantly lower body weight at 10 to 12 weeks postpartum compared with controls (mean with standard deviation) (93.2 [13.32] kg versus 96.5 [14.48] kg; $p = 0.037$). The intervention was delivered weekly during pregnancy and every six months during the two first years after childbirth. The effects of the intervention were assessed 12 and 24 months later¹⁵³. The mean weight change in the intervention group was -2.2 kg compared to +0.4 kg in the control group from early pregnancy to the follow-up 12 months after childbirth ($p = 0.046$). More women in the intervention group showed sustained weight loss 24 months after delivery than women in the control group over the same time period ($p = 0.034$). Women with obesity in the intervention group who gained less than 7 kg during pregnancy had a significantly lower weight than the controls at the 24-month follow-up ($p = 0.018$).

Combined behavioural-support intervention^{154,155}: A comprehensive approach targeting both nutrition and exercise has been shown to be beneficial for women with obesity in managing postpartum weight loss. Vesco and colleagues¹³ randomly assigned 114 pregnant women with obesity to either a group-based intervention or to a usual care control group to test the effectiveness of the intervention on maternal weight change from randomisation to two weeks postpartum. The intervention programme included a combination of dietary and exercise recommendations, as well as the use of behavioural self-management techniques and attendance at weekly group

meetings until delivery. Control participants received one-time dietary advice. The intervention group lost more weight at two-weeks postpartum compared to control group (-2.6 kg vs. +1.2 kg, mean difference of -3.8 kg; [95% CI; -5.9 to 1.7]; $p < 0.001$). However, the maternal weight-related benefits of this intervention did not persist at one-year postpartum¹⁵⁶.

Lim *et al.* conducted a systematic review and meta-analysis to test the effect of combined diet and physical activity interventions in postpartum women to identify effective intervention characteristics.¹⁵⁷ Though the results were not separated for women with BMI 25 kg/m² or higher, there was a mean difference of -33.17 kg [95% CI; -33.41 to -11.31, $I^2 = 87\%$] across 13 included studies ($n = 1,200$)¹⁵⁷. Although combined across all BMIs, the review identified HCP-delivered interventions had significantly greater weight loss than those delivered by non-HCPs (mean difference -3.22 kg [95% CI; -4.83 to -1.61] vs. -0.99 kg [-1.53 to -0.45], $p = 0.01$ for subgroup differences). Diet and physical activity combined had significantly greater weight loss compared with physical activity-only interventions (-3.15 kg [95% CI; -4.34 to -1.96] vs. -0.78 kg [-1.73 to 0.16], $p = 0.009$ for subgroup differences). The extent of weight loss was not influenced by intervention intensity (duration, number of sessions) and setting (individual or group).

A recent US Preventative Services Task Force report examined 13 RCTs ($n = 4841$) evaluating the effects of GWG interventions on postpartum weight retention. GWG interventions were associated with significantly less postpartum weight retention at 12 months (10 trials; MD, -0.63 kg [95% CI; -1.44 to -0.01]; $I^2 = 65.5\%$) but not at six months (three trials; MD, -0.85 kg [95% CI; -3.67 to 0.81]; $I^2 = 70.6\%$) or less than six-months postpartum (nine trials; MD, -0.81 kg [95% CI; -2.40 to 0.55]; $I^2 = 84.4\%$). In stratified analyses, effect estimates of GWG interventions on likelihood of postpartum weight retention did not differ by BMI category at follow-up time of up to six months or 12 months⁵⁷.

Breastfeeding¹⁵⁸: Breastfeeding has been shown to improve a range of maternal and infant health outcomes, though the impacts on postpartum weight retention remain under study³². Weight loss can be safely engaged in when breastfeeding is established without affecting milk composition or infant growth¹⁵⁹. However, studies have demonstrated that women with obesity have additional challenges with breastfeeding requiring individualised support³². Preconception obesity is a risk factor for breastfeeding initiation, exclusive and any breastfeeding, while excessive GWG is a risk factor for any breastfeeding duration when women were living with obesity or overweight preconception^{160,161}.

Chang *et al.*¹⁶² explored breastfeeding experiences and support for women with overweight or obesity in a mixed-methods systematic review. They identified maternal physical (larger breasts, challenges with positioning, lactation onset delays, self-perceived low supply issues, caesarean section) and psychological (low breastfeeding self-efficacy, negative body image, embarrassment related to public breastfeeding, obesity stigma) barriers. Enablers were social support from HCPs and family in addition to training

for HCPs to provide personalised, evidence-based breastfeeding support to women living with overweight or obesity¹⁶². Recent qualitative evidence from Ireland supports these findings and identifies three themes to successful breastfeeding in women with overweight/obesity – knowledge, support and self-efficacy¹⁶³.

A recent systematic review in women with overweight/obesity or gestational diabetes found breastfeeding intervention increased any breastfeeding at \geq six months (OR 1.43, 95% CI; 1.05 to 1.95), and women in the intervention group were 90% more likely to exclusively breastfeed at one to two weeks (OR 1.9, 95% CI; 1.17 to 3.09) and more than twice as likely to exclusively breastfeed at four to six weeks (OR 2.23, 95% CI; 1.27 to 3.90) within the sensitivity analysis¹⁶⁴. The reviews did not separate out women with obesity so the results should be interpreted with caution^{164,165}. Of note, the safety of pharmacotherapy agents for weight maintenance has not yet been established during breastfeeding; therefore, these agents are generally avoided^{26,166,167}.

Weight stigma in reproductive care settings

The evidence relating to weight bias and stigma in reproductive care settings is an emerging one. The themes identified echo those of weight-bias research in other healthcare settings, where women report the use of “fear and shame” inducing language, derogatory verbal and non-verbal behaviour, assertions about ability to parent, a lack of care and referral for non-weight-related concerns and inaccessible equipment for those with higher weights^{168,169}. Women report not receiving their preferred treatment as medical decisions were based on the “certainty” of complications occurring due to their higher weight¹⁷⁰. Feelings of blame are heavily represented in the literature where women are exposed to concrete warnings of gestational diabetes, pre-eclampsia, macrosomia and placing their fetus at risk due to their weight¹⁷¹. Women seeking fertility treatment report a lack of referral into services with BMI given as the reason for irregularities in menstrual cycles or an inability to conceive¹⁷². The enforcement of weight loss before sanctioning fertility treatment situates blame on the woman, which is reflective of weight bias when medical decisions are based on automatic stereotypes that are not determined by the woman’s individual medical history^{172,173}. Care avoidance results where women are reluctant to engage with reproductive healthcare services. The Weight gain, Obesity, Maternal-child Biobehavioral pathways, and Stigma (WOMBS) framework proposes psychophysiological mechanisms linking pregnancy-related weight stigmatisation to increased risk of weight gain and, in turn, downstream childhood obesity risk and provides a useful tool to guide the emerging pregnancy-related weight stigma research and, ultimately, support stigma-reduction efforts in this critical context¹⁷⁴.

To prevent further weight bias and stigma for women living with obesity during their reproductive years, the new obesity definition in this guideline needs to be considered. Obesity is a complex chronic disease, characterised by dysfunctional or excess body fat (adiposity), that impairs health. Based on this definition, a

woman with a high BMI or weight does not have obesity if she is not experiencing adiposity-related impairments (e.g., 4Ms of obesity in [Chapter 6 Clinical Assessment of People Living with Obesity assessment](#)). Similarly, like any chronic disease, obesity can be treated, and treatment strategies should be lifelong. Importantly, when obesity is being treated adequately, individuals can achieve health and wellbeing regardless of the weight loss achieved. Many individuals may not lose weight as part of their obesity-management strategies. As described in this guideline, the goal of obesity-management strategies is to achieve health and wellbeing, not just weight loss. Pregnancy is a period where weight gain is necessary for healthy pregnancy-related outcomes. In the antenatal period, the goal should be to achieve obesity-related health outcomes. For example, women living with obesity who are planning to get pregnant can discuss strategies with their obesity HCPs to help them maintain their personal obesity-related health status or to prevent obesity-related complications (e.g., 4Ms of Obesity). This could mean, for example, that women can obtain support to address the root causes of their chronic disease (obesity) before pregnancy. Similarly, during pregnancy, the goal should not be to help women avoid weight gain altogether but to achieve weight gain targets that will facilitate pregnancy-related outcomes. During pregnancy, women can be supported to maintain their obesity-related health outcomes by continuing their disease-management strategies that are safe and evidence based. The same applies after pregnancy. So rather than focusing solely on weight, it is important to consider how and if a person’s weight or adiposity is affecting their health- and pregnancy-related outcomes. There is more information on this topic in [Chapter 1 Reducing Weight Bias in Obesity Management, Practice and Policy](#).

Gaps in the literature/future research for women with obesity over the reproductive years

- 1. Health outcomes in women with obesity (BMI \geq 30 kg/m²):** There remains a paucity of data specific to women with obesity (BMI \geq 30 kg/m²), as many studies aggregate women with pre-pregnancy BMI \geq 25 kg/m² into a single group for analysis for studies over the three reproductive periods. This is an important distinction, as women with a pre-pregnancy BMI \geq 30 kg/m² may have different trajectories of GWG than those whose BMI is 25 – 29.9 kg/m² ^{175,176}.
- 2. Preconception weight management:** There are emerging intervention studies on weight management preconception for women with obesity to improve fertility and obstetric outcomes. More data are needed, however, to examine how to implement these interventions into clinical practice to engage a broader range of women with obesity and their HCPs.
- 3. Preconception counselling on pregnancy risks:** Numerous observational studies have demonstrated that women with obesity have increased risks of several adverse pregnancy outcomes. Research is needed to identify effective counselling strategies to discuss pregnancy risks using a patient-centred approach.

4. **Low weight gain or weight loss during pregnancy:** While HCPs commonly recommended GWG below guidelines for women with obesity, this advice is not consistent with the current recommendations. Research is needed to examine both the clinical outcomes and HCPs' reasons for providing this advice¹⁷⁷. Research on the impact of low weight gain or weight loss during pregnancy among women with different classes of obesity is also needed¹⁷⁸.
5. **Patient-HCP relationship:** The impacts of the relationship between HCPs and women in their care on GWG has not been extensively examined. Compared with women with lower weight, data demonstrate that HCPs asked fewer lifestyle questions and gave less lifestyle information to women with overweight and obesity. Point-of-care tools developed based on principles of patient-centredness and pregnant women's self-efficacy to manage GWG may be simple clinical tools, though these require further study^{84,176}.
6. **Duration of pregnancy:** The current recommendations for total GWG pertain to term pregnancies, typically defined as 37 to 41 completed weeks' gestation. However, evidence suggests that this group does not have homogeneous foetal outcomes^{179,180}. Future research needs to separate the independent effects of GWG from the independent effects of gestational age during this five-week period.
7. **Postpartum weight management:** In general, there remains a paucity of specific literature to guide women living with obesity and their HCPs on the optimal timing, rate and amount of weight loss in the postpartum period and the impacts on clinically important health outcomes. In addition, more research is needed to examine factors that motivate and support women with obesity to engage in and maintain weight-management strategies in the postpartum period¹⁵¹.
8. **Breastfeeding:** Better designed, specific trials are needed to answer questions about social, educational or physical support, or the combining of these to support women with obesity to breastfeed. Interventions need to be delivered by trained Internationally Board Certified Lactation Consultants or equivalents to ensure clinical issues can be addressed promptly, and more research is needed to understand how these scarce resources can be better utilised implementing programmes. Breastfeeding initiation in women with raised BMIs needs to be examined — not just focusing on recruiting women that already have an intention to breastfeed. Most trials to date have taken place in the United States, so greater diversity in countries and healthcare settings is needed^{167,181}.

The Weight Management for Adult Women Living with Obesity during Preconception, Pregnancy and Postpartum chapter is adapted from the Canadian Adult Obesity Clinical Practice Guidelines (the "Guidelines"), which Obesity Canada owns and from whom we have a license. ASOI adapted the Guidelines having regard for any relevant context affecting the Island of Ireland using the [ADAPTE Tool](#).

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