



## Maternal obesity

**This is a compilation of the webpages 'Maternal Obesity' published previously on the noo.org.uk website (December 2015)**

### Overview

Approximately half of all women of childbearing age in England are either overweight or obese. Maternal obesity (defined as a Body Mass Index (BMI) of 30kg/m<sup>2</sup> or more at the first antenatal consultation) can increase health risks for both the mother and child during and after pregnancy. For mothers these risks can include gestational diabetes, high blood pressure and depression. Foetal risks include macrosomia, congenital anomalies and stillbirths. Maternal obesity has also been linked to low breastfeeding rates, adverse childhood cardiovascular and respiratory outcomes and childhood obesity.

Data on the prevalence of maternal obesity are not collected routinely in the UK, but trend data from the Health Survey for England show that the prevalence of obesity among women of childbearing age increased during the period 1997-2013. Severe obesity (a BMI of 40kg/m<sup>2</sup> or more) among women has increased since 1993 and is predicted to rise further over the next twenty to thirty years. Severe maternal obesity is associated with greater risks of birth complications, longer postnatal stays and wound infection. Recent evidence from the UK indicates that high maternal BMI is also associated with increased health service usage and healthcare costs.

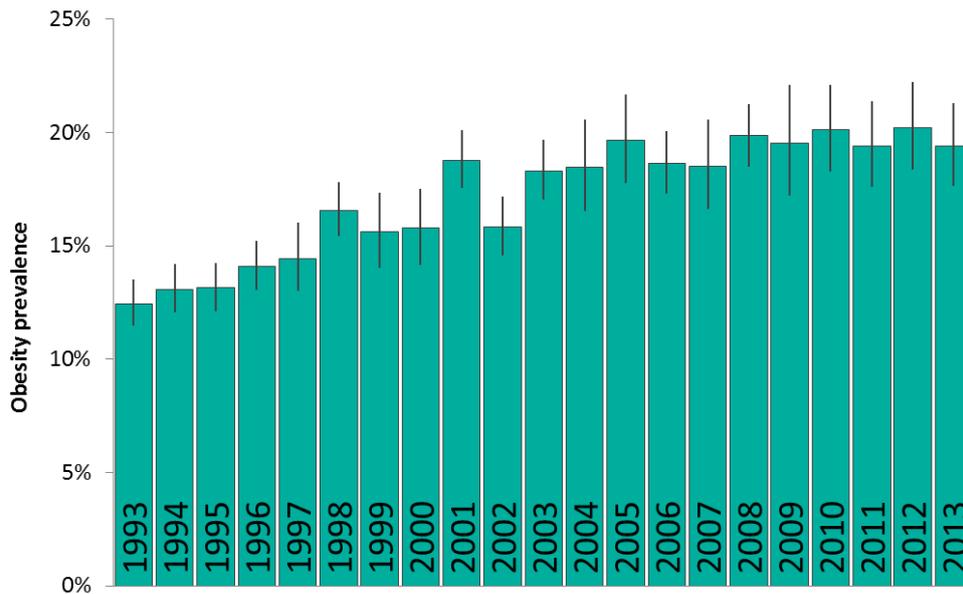
For the latest Centre for Maternal and Child Enquiries/Royal College of Obstetricians and Gynaecologists guidance on the management of women with obesity in pregnancy [click here](#).

For the latest guidance from the National Institute of Health and Care Excellence (NICE) on weight management before, during and after pregnancy [click here](#).

## Prevalence

About half of women of childbearing age (16 to 44 years) in England are either overweight or obese. The prevalence of obesity in women has increased over time from around 12% in 1993 to over 19% in 2013. (HSE, 2013)

**Figure 1: Prevalence of obesity in females aged 16-44 years between 1993 and 2013**



**Note:** Adult obesity: BMI  $\geq 30\text{kg/m}^2$ . Includes 95% confidence intervals

**Source:** Health Survey for England 1993-2013

There are currently around 11 million women of childbearing age in England, of which around 2 million (19%) are obese. Using an indicative benchmark rate from NICE it is estimated that of these obese women, 5.3%<sup>1</sup> or 110,000 women will become pregnant per year.<sup>1</sup>

A **national audit of obesity during pregnancy** was conducted across the UK by the Centre for Maternal and Child Enquiries (CMACE) between 1 March and 30 April 2009. It states that the UK prevalence of women with a known BMI of  $\geq 35\text{kg/m}^2$  at any point in pregnancy who give birth  $\geq 24+0$  weeks' gestation was 4.99%. This translates into approximately 38,500 women each year in the UK. However CMACE did not collect data on women with a BMI 30-34.99 $\text{kg/m}^2$ .<sup>2</sup>

<sup>1</sup> This assumes that the fertility of women who are obese is the same as those who are not obese.

A large retrospective study among maternity services in England found that in 2007, incidence of first trimester obesity (>30kg/m<sup>2</sup>) was 15.6%. Ten per cent of the women had a BMI of 30.0-34.9kg/m<sup>2</sup>, 3.8% had a BMI of 35.0-39.9kg/m<sup>2</sup>, 1.6% had a BMI of 40.0-49.9kg/m<sup>2</sup> and 0.2% had a BMI of ≥50kg/m<sup>2</sup>.<sup>3</sup> Secondary analysis of this dataset showed that Black and South Asian women had a higher incidence of first trimester obesity compared with White women.<sup>4</sup>

Data on maternal obesity prevalence is not be routinely prospectively collected and reported nationally. However from November 2014, NHS-funded maternity service providers in England were mandated to collect data locally for inclusion in the **Maternity Services Data Set (MSDS)**. Central submissions commenced in June 2015 and data will be available once the quality and coverage is at a sufficient level.

In Scotland, the **Information Services division** reported 23.8% of women delivering in 2012/13 were known to be overweight at the time of booking and 18.1% were obese.

## Trends

A large retrospective study of 619,323 births in England between 1989 and 2007 found that first trimester maternal obesity has significantly increased over time, more than doubling from 7.6% to 15.6% over the 19 year period.<sup>3</sup>

An Irish study of 42,362 women who gave birth in a large maternity hospital in Dublin between 2009 and 2013, found that overall maternal obesity rates remained stable at 16.8%. However the absolute number of women with severe obesity (BMI ≥40.0kg/m<sup>2</sup>) increased by 48.5 % (n=103-153).<sup>5</sup>

Older studies have shown an increase in the prevalence of obesity among pregnant women presenting to hospital for booking. The prevalence of obesity in these studies increased as follows:

Region	Period	Sample size	Obesity prevalence (%)
Glasgow <sup>6</sup>	1990 – 2002/4	515	9.4 – 19.9
Middlesborough <sup>7</sup>	1990 – 2004	36,821	9.9 – 16.0
Cardiff <sup>8</sup>	1990 – 1999	8,350	3.2 – 8.9

## Maternal obesity and pregnancy outcomes

There is a large body of evidence which links maternal obesity to adverse pregnancy outcomes.<sup>9,10</sup> In the UK, the Centre for Maternal and Child Enquiries (CMACE) summarises these risks as follows:

- severe morbidity
- miscarriage
- cardiac disease
- spontaneous first trimester and recurrent miscarriage
- pre-eclampsia
- gestational diabetes
- thromboembolism
- post-caesarean wound infection
- infection from other causes, postpartum haemorrhage
- low breastfeeding rates<sup>11</sup>

A recent UK study found that increasing levels of overweight and obesity leads to greater risks of gestational diabetes, hypertensive disorders of pregnancy, caesarean section, macrosomia (baby weighing more than 4kg at birth) and neonatal unit admission. Women with severe obesity were at risk of additional adverse outcomes, including stillbirth, a longer postnatal stay, and wound problems following caesarean section.<sup>12</sup> A large systematic review and meta-analyses concluded that overweight and obese women have increased risk of both induced preterm birth before 37 weeks and overall preterm birth before 32 weeks.<sup>13</sup> A recent systematic review of reviews found that gestational diabetes, pre-eclampsia, gestational hypertension, depression, instrumental and caesarean birth, and surgical site infection to be more likely to occur in pregnant women with obesity compared with women with a healthy weight.<sup>14</sup>

It has been estimated that 29% of diabetes in pregnancy, 12% of caesarean section, 5% of post-partum haemorrhage, 4% of preterm delivery, 7% of macrosomia, and 5% of admissions to a neonatal intensive care unit or special care baby unit could potentially be avoided if all pregnant women were of normal BMI at the start of pregnancy.<sup>15</sup>

Weight gain in pregnancy is also linked to increased susceptibility to future development of weight gain and obesity in women.<sup>16</sup> Excessive gestational weight gain (GWG) can also add to the risks of adverse pregnancy outcomes associated with obesity.<sup>17</sup> However, there is a lack of agreement internationally over what constitutes appropriate or excessive GWG.<sup>18</sup> In the UK, NICE have not incorporated GWG advice into their guidelines for **Weight management before during and after pregnancy**. They have called for further research to assess how appropriate the **US Institute of Medicine guidelines on weight gain during pregnancy** are for the UK (particularly relating to applicability to UK specific society, such as ethnic groups).

## Mortality

There is strong evidence that maternal obesity is independently associated with higher risk of dying from specific pregnancy complications.<sup>2,19</sup> The UK Confidential Enquiries into Maternal Deaths and Morbidity 2009-2012 found that out of all the women who died during, or within six weeks of the end of their pregnancy, 22% were overweight and 27% obese. Thromboembolism was the most common direct cause of death and heart disease the most common indirect cause. It should be noted however that maternal mortality is relatively rare in the UK with an incidence rate of 10.1 per 100,000 maternities.<sup>20</sup>

## Breastfeeding

There is some evidence that maternal obesity is associated with lower breastfeeding rates.<sup>12,14</sup> A recent systematic review found that maternal obesity was a risk factor for decreased intention and initiation of breastfeeding, a shortened duration of breastfeeding and a less adequate milk supply. However socio-economic status as a potential confounding factor was not included in all studies.<sup>21</sup> High gestational weight gain alongside pre-pregnancy overweight and obesity has also been linked to unsuccessful initiation and ability to sustain breastfeeding.<sup>22</sup>

## Psychological issues

There is some evidence that maternal obesity is associated with depression. A recent review found that women who are obese when they become pregnant had significantly higher odds of depression than normal weight women in both antenatal and postnatal periods (43% and 30% increased risk respectively).<sup>23</sup>

The psychological impact of obesity during pregnancy is relatively unexplored, although issues raised in smaller qualitative studies include:<sup>24,25,26,27</sup>

- a sense of greater social acceptance of increased body size during pregnancy
- difficulties experienced in adjusting to post-pregnancy body shape
- anxieties experienced by both women and healthcare professionals about raising the topic of obesity during pregnancy<sup>28</sup>
- information needs of obese women not met and a lack of encouragement for women to make a lifestyle change during routine care
- a lack of awareness of the risks associated with obesity during pregnancy amongst some women
- the potential for a negative impact on the psychological wellbeing of mothers by attention to their weight

There is mixed evidence on psychological factors affecting excess gestational weight gain (GWG). Potential factors highlighted by recent systematic reviews include negative attitudes, inaccurate perceptions and less knowledge about weight gain, perceived barriers to healthy eating and low levels of support. However there is conflicting evidence relating to the impact of depression or negative body image on GWG.<sup>29,30</sup>

## Maternal obesity and child outcomes

There is a large body of evidence to suggest that increased maternal BMI is linked to adverse child health outcomes.<sup>14</sup> This includes increased risk of foetal death, stillbirth, neonatal death and infant death as well as congenital anomalies, prematurity and neonatal intensive care admissions. Other factors relating to the health of the baby include macrosomia, post-date and pre-term deliveries, increased requirement for neonatal intensive care, low Apgar score at five minutes, foetal distress<sup>9</sup> and foetal growth restriction.<sup>31</sup> There is growing evidence that maternal obesity is also associated with higher risk of chronic health conditions in children and childhood overweight and obesity. The reasons for these relationships are unclear, relating to complex interactions between the mother, foetus and placenta, along with genetic factors and lifestyle influences.<sup>32</sup>

### Stillbirth, foetal, neonatal and infant death

There is strong evidence that maternal obesity is associated with increased risk of stillbirth, foetal, neonatal and infant death; with risk increasing with greater BMI. In 2005, 22.9% of mothers in the UK who had late foetal loss were obese, as were

30.4% of the women who experienced stillbirths and 30.6% of those who experienced neonatal deaths.<sup>33</sup> A study from the north of England found that the risk of foetal and infant death was two to three times greater for women who were obese at the start of pregnancy compared with women with a healthy BMI.<sup>34</sup>

A recent systematic review and meta-analysis on maternal obesity and infant mortality found that for obese mothers with a BMI  $\geq 30$  kg/m<sup>2</sup>, the odds of having an infant death compared to women with a healthy BMI (18.5-24.9kg/m<sup>2</sup>) were 1.42, increasing to 2.03 for those with BMI  $>35$ kg/m<sup>2</sup>.<sup>2,35</sup> It has been suggested that this increased mortality risk is mostly due to birth asphyxia, other neonatal morbidities and an increase in preterm births.<sup>36</sup> A further systematic review and meta-analysis showed that every 5 unit rise in maternal BMI amongst overweight and obese women increased the risk of foetal death by 21%, miscarriage by 16%, stillbirth by 24%, neonatal death by 15%, post neonatal death by 14% and infant death by 18%.<sup>37</sup>

The link between maternal obesity, increased stillbirth and late foetal loss may be due to increased potential to misdiagnose conditions such as macrosomia or growth restriction in utero. Foetal distress may not be detected due to a reduced ability to accurately monitor the foetal heart rate during labour.<sup>25</sup> There is also some evidence that women who are overweight or obese are less likely to have a live birth following in vitro fertilisation (IVF).<sup>38,39</sup>

### Chronic health conditions in children

There is a growing body of evidence which links maternal obesity and increased risk of some chronic health conditions in children. Recent findings from the Helsinki Birth Cohort Study found that higher maternal BMI in late pregnancy was associated with an increased risk of cardiovascular disease, type 2 diabetes and cancer among the offspring. Potential influencing factors were identified as pre-pregnancy overweight combined with weight gain during pregnancy, and by maternal weight and blood glucose control at the end of pregnancy.<sup>40</sup> Maternal pre-pregnancy weight, as well as higher maternal gestational weight gain in early pregnancy have also been associated with greater cardio-metabolic risk factors in childhood.<sup>41</sup>

Other childhood conditions with links to maternal obesity include:

- Asthma

There is some evidence that both maternal obesity and high gestational weight gain are associated with an elevated risk of childhood asthma.<sup>42,43</sup>

<sup>2</sup> The authors warn that the results may be influenced by confounding factors such as undiagnosed diabetes, gestational age at birth and dietary quality.

- Type 1 diabetes  
There is limited evidence that maternal obesity in early pregnancy may be associated with increased risk of type 1 diabetes in the offspring of parents without diabetes. A recent Swedish study found that among children of parents who didn't have diabetes, having a mother who was obese during pregnancy increased the risk of their children developing type 1 diabetes by one third compared to children of mothers of a healthy weight.<sup>44</sup>

### Childhood obesity

There is evidence of a significant relationship between maternal obesity, macrosomia and the subsequent development of childhood and adult obesity in their offspring.<sup>32,45,46,47,48</sup> One large meta-analysis concluded that maternal obesity was associated with a three-fold higher risk of subsequent offspring overweight or obesity.<sup>49</sup> However questions remain as to the precise mechanisms involved as well as the impact of environmental, lifestyle and genetic factors.<sup>50,51</sup>

There is also growing evidence that excessive gestational weight gain (GWG) is linked to childhood overweight and obesity.<sup>52</sup> One study found that compared with offspring of women with moderate GWG, offspring of women who gained excess weight had 40% increased risk of offspring obesity.<sup>53</sup> Another study found that excessive weight gain during both early and later periods of pregnancy was associated with more than twice the risk of offspring obesity compared to overall non-excessive GWG.<sup>54</sup> The underlying biological mechanism linking the two remains unclear.

Obese women also have an increased risk of type 2 diabetes,<sup>55</sup> impaired glucose tolerance, and gestational diabetes.<sup>12,56</sup> Life course studies show that women who have diabetes during pregnancy are likely to have obese offspring. This is independent of genetic factors suggesting that the intra-uterine environment may be altered in a diabetic pregnancy.<sup>57</sup>

### Congenital anomalies

There is good evidence that maternal obesity is associated with an increased risk of congenital anomalies including neural tube defects, spina bifida, cardiovascular anomalies, septal anomalies, cleft lip and palate,<sup>58</sup> anorectal atresia, hydrocephaly and limb reduction anomalies<sup>59</sup> eye anomalies and ventricular septal defects.<sup>60</sup> It has been suggested that the risk of congenital anomalies may be linked to undiagnosed diabetes and hyperglycaemia in obese pregnant women<sup>59</sup> or to lower levels of circulating nutrients.<sup>61</sup> Antenatal ultrasound detection of congenital anomalies are

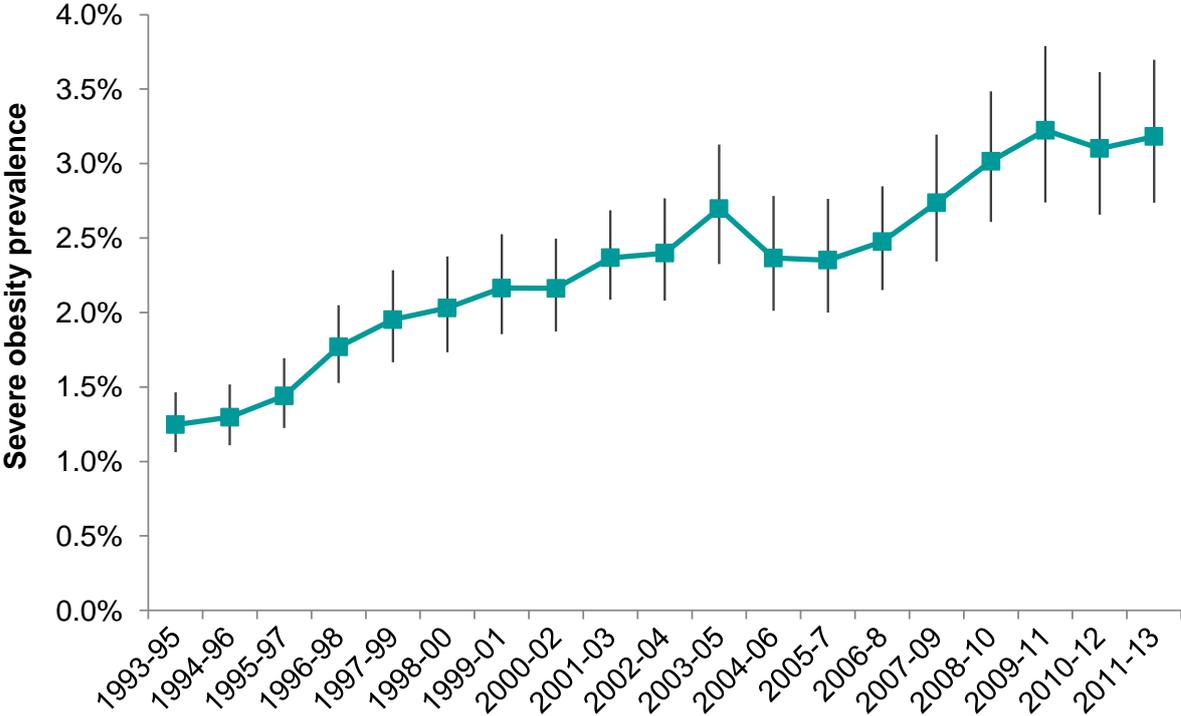
also decreased in obese pregnant women, which has implications for the scanning and counselling of obese women.<sup>62</sup>

There is some evidence of an association between increased maternal BMI, severe obesity in particular, and congenital heart defects in offspring. However the precise mechanism for this relationship remains unclear.<sup>63</sup> Recent evidence from a large Scottish study suggests that maternal obesity is associated with an increased risk of premature death from cardiovascular disease in their adult offspring, however it was not possible to separate out the influence of genetic and lifestyle factors.<sup>64</sup>

### Severe maternal obesity

In 2013, 3.6 % of women of childbearing age (16 to 44 years) in England were severely obese (BMI  $\geq 40\text{kg/m}^2$ ), up from 1.2% twenty years ago. (HSE, 2013)

**Figure 2: Prevalence of severe obesity in females aged 16-44 years between 1993 and 2013. Three-year combined average**



Note: Severe adult obesity: BMI  $\geq 40\text{kg/m}^2$ . Includes 95% confidence intervals  
Source: Health Survey for England  
<http://www.hscic.gov.uk/catalogue/PUB16077>

The CMACE national audit of obesity during pregnancy conducted throughout the UK between 1 March and 30 April 2009 found that of the women reported to have given birth during this period:

- 3.0% reported a BMI of 35.0-39.9kg/m<sup>2</sup> at any time during pregnancy
- 1.8% reported a BMI of 40.0-49.9kg/m<sup>2</sup>
- 0.19% reported a BMI ≥50kg/m<sup>2</sup>

Similar figures for first trimester obesity were also reported in a large retrospective study among maternity services across England. In 2007, 3.81% of pregnant women had a BMI of 35.0-39.9kg/m<sup>2</sup>, 1.61% had a BMI of 40.0-49.9kg/m<sup>2</sup> and 0.18% had a BMI ≥50kg/m<sup>2</sup>.<sup>3</sup>

There is strong evidence that severely obese women are at increased risk of poor outcomes for both mother and child compared to less obese women.<sup>12</sup> A recent systematic review and meta-analysis concluded that severely obese women (BMI ≥40kg/m<sup>2</sup>) have greater risks of preterm birth and large-for-gestational age offspring, relative to not only healthy weight but also women with a BMI of 30.0-34.9kg/m<sup>2</sup> or 35.0-39.9kg/m<sup>2</sup>. This risk increased with higher BMI. In addition, many other maternal and infant adverse health outcomes were also more common in severely obese women, including preeclampsia, gestational diabetes, caesarean section, bleeding, low umbilical artery pH and Apgar and neonatal intensive care unit admission.<sup>65</sup> Another systematic review and meta-analysis found that women with a BMI of 40kg/m<sup>2</sup> have a two to three-fold increased risk of foetal death, stillbirth and infant death compared to those with a BMI of 20kg/m<sup>2</sup>.<sup>37</sup>

Between March 2007 and August 2008, analysis of data from the UK Obstetric Surveillance System (UKOSS) showed that more than one in every 1,200 women giving birth in the UK has a BMI of 50kg/m<sup>2</sup> or greater. These women had more complications than those with a BMI below 50kg/m<sup>2</sup> including preeclampsia (9% compared to 2%), gestational diabetes (11% compared to 2%), general anaesthesia (6% compared to 1%) and intensive care unit admission (3% compared to 1%).<sup>66</sup>

## Inequalities

Maternal obesity increases with social disadvantage, parity and advancing age. It contributes to the health risks of offspring and this can amplify health inequalities across generations.<sup>5,67,68</sup>

There is strong evidence that maternal obesity is related to socioeconomic deprivation, with risk increasing with greater levels of deprivation.<sup>3,69,70</sup> A large study among maternity units across England found that obese pregnant women were more

than twice as likely to be living in areas of greatest deprivation compared with those women living in areas of least deprivation.<sup>3</sup> This association became stronger as the obesity classification increased and women with extreme obesity (BMI >50kg/m<sup>2</sup>) were almost five times as likely to be living in areas of greatest deprivation compared with least deprivation.<sup>71</sup>

Women who are obese are also more likely to be older in pregnancy and to have a higher number of pregnancies, compared with women who are not obese.<sup>3,5,12</sup>

There is growing evidence of inequalities associated with ethnicity and maternal obesity. A large retrospective study among maternity services in England between 1995 and 2007 found that Black and South Asian women have a higher incidence of first trimester obesity compared with White women. This was most pronounced among Pakistani women, compared with Bangladeshi and Indian women. The rate of maternal obesity increased most rapidly for Black women compared with women of all other ethnic groups during this time period.

Once the World Health Organization Asian-specific BMI of >27.5kg/m<sup>2</sup> was applied<sup>3</sup> instead of the general population criteria for obesity, there was a twofold increase in the proportion of South Asian women classified as obese. This suggests that using a general population BMI criteria for Asian women in pregnancy may increase inequalities, as a large proportion of South Asian women are potentially being wrongly assigned to low risk care.<sup>4</sup>

## Implications for healthcare services

### Resources

Maternal obesity impacts on resources required for screening and prevention interventions (eg oral glucose tolerance tests for screening for gestational diabetes, medications to prevent thromboembolism; dietetic services to support women with weight management to prevent excessive GWG and associated complications). Extra resources may also be needed for the management of complications and co-morbidities (eg treatment of gestational diabetes in pregnancy and prevention of type 2 diabetes postnatally; caesarean section; and preeclampsia treatment). In addition there are likely to be additional costs associated with adhering to guidelines for optimal provision of care of obese pregnant women (eg consultant obstetrician led care; anaesthetic referrals; and higher risk labour wards rather than birthing units).

<sup>3</sup> The WHO consultation identified that due to the increased risk of morbidity among Asian populations at a lower BMI than the general population, the criteria for Asian populations should be reduced to reflect this risk.

Other resource implications for healthcare services relating to maternal obesity include:<sup>9,12,25,72,73-75</sup>

- increases in caesarean and operative deliveries
- admission to hospital for complications
- longer hospital stay
- requirements for neonatal intensive care
- a need for appropriate equipment to manage safely the care of obese mothers

There are also additional clinical management challenges to consider during pregnancy for overweight and obese women. These include difficulties in performing ultrasound examinations; the size of blood pressure cuffs required; difficulties with foetal monitoring; women having reduced awareness of foetal movements; problems with surgical deliveries and equipment; and implications for regional and general anaesthesia.<sup>72</sup>

Maternal obesity rates are influenced by social, economic and demographic changes in the population, which is important to consider when planning public health strategies and interventions.<sup>5</sup> The rise in severe obesity is likely to impact maternity services by increasing clinical risk, technical challenges and associated costs.<sup>5</sup>

It is important to note that women who are overweight are also at increased risk of adverse outcomes and should be monitored closely during pregnancy and delivery to ensure optimum outcomes.<sup>12</sup>

## Costs

Recent economic studies from the UK have found that maternity costs are significantly higher for overweight or obese women compared to women of a healthy BMI. A Welsh study found that there was an increase in total health service costs during pregnancy for overweight women of 23% and for obese women of 39% compared with women of a healthy weight. This equated to an additional £698 for each overweight woman and £1,171 for each obese woman. Overweight and obese women had approximately 15-20% greater usage of all hospital services, a 30% higher mean number of days spent in hospital and a 10% higher mean usage of GP visits.<sup>76</sup>

A large Scottish study calculated that additional maternity admission costs were £150 for overweight women, £399 for obese women and £755 for severely obese women. Fifty percent of these increased costs were explained by an increase in clinical

complications. Compared with women of a healthy weight, women who were overweight, obese or severely obese were associated with a 16%, 46% and 88% increase in the number of admissions.<sup>74</sup>

The costing report for the NICE guidance on 'weight management before, during and after pregnancy' states that as women who are obese when they become pregnant face an increased risk of complications during pregnancy and childbirth, it is reasonable to assume that a reduction in obesity has the potential to result in savings.<sup>1</sup>

### Weight management interventions

There is strong evidence that diet and/or exercise interventions during pregnancy can help to reduce excessive weight gain in pregnancy. In 2012 a Health Technology Assessment concluded that dietary and physical activity interventions in pregnancy are effective at reducing maternal weight gain. Interventions that are mainly based on diet were effective in reducing obstetric complications such as pre-eclampsia, gestational hypertension and shoulder dystocia. There was no evidence of harm to the mother or foetus from the diet or physical activity components of the interventions.<sup>77</sup>

A recent Cochrane review found that weight management interventions led to a reduction in the number of women gaining excess weight by a fifth (range 13-27%) over the pregnancy. They also concluded that interventions may reduce caesarean deliveries, especially with combined diet and exercise interventions, as well as maternal hypertension. In addition the likelihood of having a baby over 4kg and the chances of the newborn having breathing difficulties after birth could be reduced, especially in overweight and obese women. Moderate-intensity exercise appeared to be an important part of weight-control strategies in pregnancy, however more research is needed on side-effects to inform safe guidelines.<sup>78</sup>

Evidence for the cost-effectiveness of weight management interventions for pregnant women is limited. A modelled economic evaluation of the implementation of a postnatal weight management programme in the UK suggested that whilst it was likely to be cost-effective, long-term follow-up would be needed to evaluate the effectiveness of such programmes.<sup>79</sup>

Up to 50% of pregnancies are likely to be unplanned. Commissioners may wish to consider weight management interventions that impact on all women of childbearing age so they are encouraged to achieve a healthy weight before they become pregnant.<sup>1</sup> A life course approach which targets obesity in girls and women of child bearing age can help prevent long lasting consequences of maternal obesity for both mothers and their children.<sup>80</sup>

## National guidance and recommendations

Guidance and recommendations relevant to maternal obesity include:

### The National Institute for Health and Clinical Excellence (NICE)

NICE guidance on the management of obesity<sup>81</sup> and behaviour change<sup>82</sup> and the Foresight report<sup>77</sup> identify pregnancy as a critical period to address obesity in a woman's life course and to initiate behaviour change. However, caution is required to avoid compromising foetal growth. NICE also refers to the management of obesity during pregnancy in its guidance on maternal and child nutrition<sup>83</sup> and in its clinical guidelines for antenatal care,<sup>84</sup> diabetes in pregnancy<sup>85</sup> and intrapartum care.<sup>86</sup> Overall, these guidelines consider obese women to be among the high risk groups that require additional screening, intervention and monitoring.

In July 2010 NICE published guidance on **weight management before, during and after pregnancy** (next review date: January 2016). It includes advice on:

- how to help women lose weight before pregnancy
- how to help pregnant women eat healthily and keep physically active during pregnancy
- how to help pregnant women eat healthily and keep physically active
- the role of community-based services
- the professional skills needed to achieve the above

NICE have also developed implementation **support materials** for these guidelines including slide sets, audit tools, uptake reports and recommended research.

In March 2011, NICE produced **commissioning guidance** on weight management before, during and after pregnancy. It highlights the potential benefits of robust commissioning including:

- reducing morbidity and mortality by reducing obesity-related complications
- increasing referrals by raising awareness among healthcare professionals of the health benefits of weight management and the risks of being overweight or obese
- reducing inequalities and improving access to weight management information, advice and support, including dietary and physical activity interventions

- reducing associated obesity-related complications costs
- increasing effectiveness and cost effectiveness

### The Centre for Maternal and Child Enquiries (CMACE formerly CEMACH) and the Royal College of Obstetricians and Gynaecologists (RCOG)

The Centre for Maternal and Child Enquiries and the Royal College of Obstetricians and Gynaecologists have developed national standards of care and service provision for women with obesity and their babies. The joint guideline **Management of Women with Obesity in Pregnancy** was published in March 2010. It provides recommendations for women with maternal obesity, covering interventions before conception and during and after pregnancy.

Recommendations were also made in **Saving mothers' lives: reviewing maternal deaths to make motherhood safer: 2003-2005** regarding the management of thromboembolism, the leading cause of maternal death and the provision of anaesthesia for morbidly obese women during pregnancy. They advise that obese women should be assisted with weight loss prior to conception or receiving any form of assisted reproductive technologies and receive pre-pregnancy counselling and advice.

The RCOG have produced **Green-top Guidelines** on reducing the risk of thromboembolism during pregnancy, birth and following delivery, including recommendations for women with a BMI  $>30\text{kg/m}^2$ .

The **Confidential Enquiry into Maternal and Child Health. Why mothers die 2000-2002** recommends that due to the increased risk of developing problems, the care of women with a BMI of more than  $35\text{kg/m}^2$  should be shared with an obstetrician and the mother advised to deliver in a consultant led obstetric unit.

### Institute of Medicine (IOM), United States

The Institute of Medicine in the US published updated **guidelines on weight gain in pregnancy** in 2009. It includes weight gain recommendations for pregnant women according to BMI group.

## Websites relevant to maternal obesity

### Child and Maternal Health Observatory (ChiMat)

[www.chimat.org.uk](http://www.chimat.org.uk)

The National Child and Maternal Health Observatory (ChiMat) provides information and intelligence to improve decision-making for high quality, cost effective services. It supports policy makers, commissioners, managers, regulators, and other health stakeholders working on children's, young people's and maternal health.

### First Steps Nutrition Trust

[www.firststepsnutrition.org](http://www.firststepsnutrition.org)

First Steps Nutrition Trust is an independent public health nutrition charity that provides information and resources to support eating well from pre-conception to five years.

### Health and Social Care Information Centre (HSCIC)

[www.hscic.gov.uk/maternityandchildren/maternity](http://www.hscic.gov.uk/maternityandchildren/maternity)

The Maternity Services Data Set (MSDS) forms part of an overall Maternity and Children's Data Set (MCDS) that has been developed as a key driver to achieving better outcomes of care for mothers, babies and children. Maternity Service providers have been mandated to collect data locally from November 2014, with central submissions commencing from June 2015.

### MBRRACE-UK (Mothers and Babies - Reducing Risk through Audits and Confidential Enquiries across the UK)

[www.hqip.org.uk/maternal-newborn-and-infant-programme](http://www.hqip.org.uk/maternal-newborn-and-infant-programme)

MBRRACE-UK has run the national Maternal, Newborn and Infant Clinical Outcomes Review Programme since 2012. The programme incorporates the Confidential Enquiries into Maternal Deaths (CEMD, established in 1952). CEMD is recognised as having led to major improvements in the health and care of women and their babies and was most recently carried out by the Centre for Maternal and Child Enquiries (CMACE). The programme investigates the deaths of women and their babies during or after childbirth, and also cases where women and their babies survive serious illness during pregnancy or after childbirth. The aim is to identify avoidable illness and deaths so the lessons learned can be used to prevent similar cases in the future leading to improvements in maternal and newborn care for all mothers and babies.

## National Academy of Medicine (NAM), formerly the Institute of Medicine (IoM)

<http://www.nationalacademies.org/hmd/>

The US-based National Academy of Medicine provides science-based advice on matters of biomedical science, medicine, and health by working outside the framework of government to ensure scientifically informed analysis and independent guidance. Their report: **Weight Gain During Pregnancy: Reexamining the Guidelines** was published in 2009.

## Maternity Service Liaison Committees (MSLCs) website

[www.chimat.org.uk/mslc](http://www.chimat.org.uk/mslc)

Maternity Service Liaison Committees (MSLCs) are a forum for maternity service users, providers and commissioners of maternity services to come together to design services that meet the needs of local women, parents and families. This site has been established to support Maternity Service Liaison Committees (MSLCs) by providing them with information, contacts, policy updates and news to help them work effectively.

## National Collaborating Centre for Women's and Children's Health (NCC-WCH)

[www.ncc-wch.org.uk](http://www.ncc-wch.org.uk)

The NCC-WCH is one of four National Collaborating Centres funded by the National Institute for Health and Care Excellence (NICE) to develop clinical guidelines. It specialises in producing national clinical guidelines for healthcare professionals who care for women, children and their families in the NHS. These guidelines aim to improve the quality of patient care through training and educating NHS staff and influencing the development of national quality standards and future research.

## National Institute for Health and Clinical Excellence (NICE)

[www.nice.org.uk](http://www.nice.org.uk)

NICE is an independent organisation responsible for providing national guidance on promoting good health and preventing and treating ill health in the UK. It provides a number of guidance documents for NHS services and is currently developing guidance on weight management in pregnancy, and weight management following childbirth.

## National Perinatal Epidemiology Unit (NPEU)

[www.npeu.ox.ac.uk](http://www.npeu.ox.ac.uk)

The NPEU is a multidisciplinary research team dedicated to improving the care provided to women and their families during pregnancy, childbirth and the postpartum period, as well as the care provided to the newborn. The NPEU has a UK-wide

Obstetric Surveillance System (UKOSS) to describe the epidemiology of a variety of rare disorders of pregnancy, and they carried out [surveillance of extreme obesity in pregnancy](#) between March 2007 and August 2008.

### Royal College of Midwives (RCM)

[www.rcm.org.uk](http://www.rcm.org.uk)

The RCM provides support and information to midwives working in the UK, both NHS and private.

### Royal College of Obstetricians and Gynaecologists (RCOG)

[www.rcog.org.uk](http://www.rcog.org.uk)

The RCOG encourages the study and advancement of the science and practice of obstetrics and gynaecology through postgraduate medical education and training development, and the publication of clinical guidelines and reports on aspects of the specialty and service provision. The RCOG International Office works with other international organisations to help lower maternal morbidity and mortality in under-resourced countries.

### The American College of Obstetricians and Gynecologists (ACOG)

[www.acog.org](http://www.acog.org)

The ACOG is a professional association of physicians specializing in obstetrics and gynaecology in the US. In January 2013 it published a Committee on Obstetric Practice document on [obesity in pregnancy](#).

### Tommys

[www.tommys.org](http://www.tommys.org)

Tommy is a registered UK charity that funds research into pregnancy problems and provides information to parents. They have produced an online guide to help health professionals discuss weight management and work positively with patients for a healthy pregnancy is available from [www.tommys.org/obesitymanagementguide](http://www.tommys.org/obesitymanagementguide). It covers causes of obesity, weight and nutrition in pregnancy, physical activity in pregnancy, information on pregnancy after weight-loss surgery, and ideas for effective communication about pregnancy and weight management. There is also a [PDF version including full references](#). Tommys have also produced resources for pregnant women on [managing weight in pregnancy](#).

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