EARLY YEARS SERIES:
**REPORT 1**

The Food Foundation

# Preconception, Pregnancy and Healthy Weight in Childhood

How the food system can better protect future and expectant parents to ensure our next generation grows up healthy

## ABOUT THE FOOD FOUNDATION

The Food Foundation is an independent charity working to address challenges in the food system in the interests of the UK public. Working at the interface between academia and policymakers (parliamentarians, civil servants, local authorities, business leaders), we use a wide range of approaches to make change happen including events, publications, media stories, social media campaigns and multi-stakeholder partnerships. We also work directly with citizens to ensure their lived experience is reflected in our policy proposals. We work with many partners on a range of different thematic areas, working closely with academics to generate evidence and campaigners who can drive change. We are independent of all political parties and business, and we are not limited by a single issue or special interest.
**Visit: *foodfoundation.org.uk***

*For more information on the data and evidence that has been drawn upon in this report, please see the technical appendix published as a supplementary document.*


## WITH THANKS TO OUR FUNDERS:

**Impact on Urban Health**

Impact on Urban Health is a part of Guy's & St Thomas' Foundation, and is committed to achieving health equity by helping urban areas become healthier places for everyone to live. **Visit: *urbanhealth.org.uk***

**The Nuffield Foundation**

The Nuffield Foundation is an independent charitable trust with a mission to advance social wellbeing. It funds research that informs social policy, primarily in Education, Welfare and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics, the Ada Lovelace Institute and the Nuffield Family Justice Observatory. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. **Visit: *nuffieldfoundation.org***

## CONTRIBUTORS

**We gratefully acknowledge these research contributions to this report:**

- **The London School of Hygiene and Tropical Medicine**: quantitative data collection and analysis – Genevieve Hadida and Carmelia Alae-Carew.
- **The University of Hertfordshire**: qualitative data collection and analysis – Dr Lisa Whiting, Dr Rosalind Fallaize, Dr Jane McClinchy, Dr Kelly Parsons and Dr Michael Fanner.
- This report builds on the work undertaken in this area by many other organisations and professionals, with credit in particular to First Steps Nutrition in their report, *Enabling Children To Be A Healthy Weight: What We Need To Do Better In The First 1,000 Days*[1], and also the Obesity Health Alliance report, *Turning The Tide: A 10-Year Healthy Weight Strategy.*[2]

**With thanks to the following experts and advisors who have provided significant input to particular parts of this report:**

- The Food Foundation's Dietary Inequalities Project Strategy Board members:
  - Beckie Lang, Director of Network Impact at Home Start, and Dr Vicky Sibson, Director of First Steps Nutrition, for their advisory role in planning and delivering this report.
  - Dr Tim Lobstein, Policy Director, World Obesity Federation, and The Food Foundation's Research Advisor, for reviewing this report.
- Dr Kathryn Dalrymple, Research Associate at King's College London, for advising on the mechanisms linking parental and child health (**Figure 3**), and for reviewing this report.
- Jenny Rosborough (Registered Nutritionist) for researching elements of, and writing, this report.

REPORT EDITORS: **Zoe McIntyre, Dr Annie Connolly**
REPORT DESIGN: **whitecreativecompany.co.uk**

CONTENTS



| Abbreviation | Definition |
|---|---|
| AGA | Appropriate for gestational age |
| BMI | Body mass index |
| GDM | Gestational diabetes mellitus |
| GWG | Gestational weight gain |
| IOM | Institute of Medicine |
| IMD | Index of multiple deprivation |
| LGA | Large for gestational age |
| SGA | Small for gestational age |
| T2D | Type 2 diabetes |
| WHO | World Health Organization |

## Glossary

**Appropriate for gestational age (AGA):** A neonate with birth weight between the 10th and 90th centile for gestational age, as defined by UK 1990 population centiles.

**Body mass index (BMI):** An estimate of body fat based on height and weight. Measured in kilograms of weight, divided by squared height in metres ($kg/m^2$). For children, this is then compared to a reference sample of measurements gathered in 1990, which takes age and sex into account.

**Gestational diabetes mellitus (GDM):** Gestational diabetes is high blood sugar (glucose) that develops during pregnancy and usually disappears after giving birth.

**Gestational weight gain (GWG):** Currently the UK has no formal guidelines on weight gain during pregnancy; however, the USA Institute of Medicine (IOM) guidelines are commonly used in a research capacity. These vary depending on an individual's pre-pregnancy BMI category. Recommended weight gain during pregnancy in women is 13–18kg (BMI less than $18.5kg/m^2$), 11–16kg (BMI within healthy category) and 7–11kg (BMI within overweight category) and 5–9kg (BMI within obese category).[3] Anything below these cut-offs is defined as **inadequate GWG** and above these cut-offs is **excessive GWG**.

**Large for gestational age (LGA):** A baby with estimated fetal weight or actual birth weight greater than the 90th centile for gestational age, as defined by UK 1990 population centiles.

**Overweight** and **obesity** are defined by the World Health Organization (WHO) as abnormal or excessive fat accumulation that presents a risk to health.[4]

**Small for gestational age (SGA):** A baby with estimated fetal weight or actual birth weight lower than the 10th centile for gestational age, as defined by UK 1990 population centiles.

# Foreword

By the first year of school, more than a fifth of children in England are living with overweight or obesity.[5] It is too late to wait until children start school before considering effective interventions to increase levels of healthy weight in childhood – preventative measures are needed much earlier.

This report explores how maternal weight and nutritional status at the start of, and during, pregnancy can influence the development of childhood obesity. We explore the factors that can act as facilitators or barriers to a healthy diet during preconception and pregnancy, and present a range of recommendations as to what needs to be done to make improvements in this area.

This report is the first in a series that will progress, stage-by-stage, through a child's early years. Throughout the series we will be investigating the gaps and issues in policy and business practice that need addressing, and will present a set of recommendations for policies that can enable the consumption of a healthy diet during preconception and pregnancy, infancy and early childhood. By the end of the series we hope to have built a picture of the underlying systemic failures in the food system that lead to the high numbers of children living with overweight or obesity by the start of primary school. The evidence brought together in this series will inform a final report that will also take into account the feedback and views of stakeholders in the sector including frontline professionals and parents.

For more information on our ongoing early years work please see: ***foodfoundation.org.uk/initiatives/early-years***

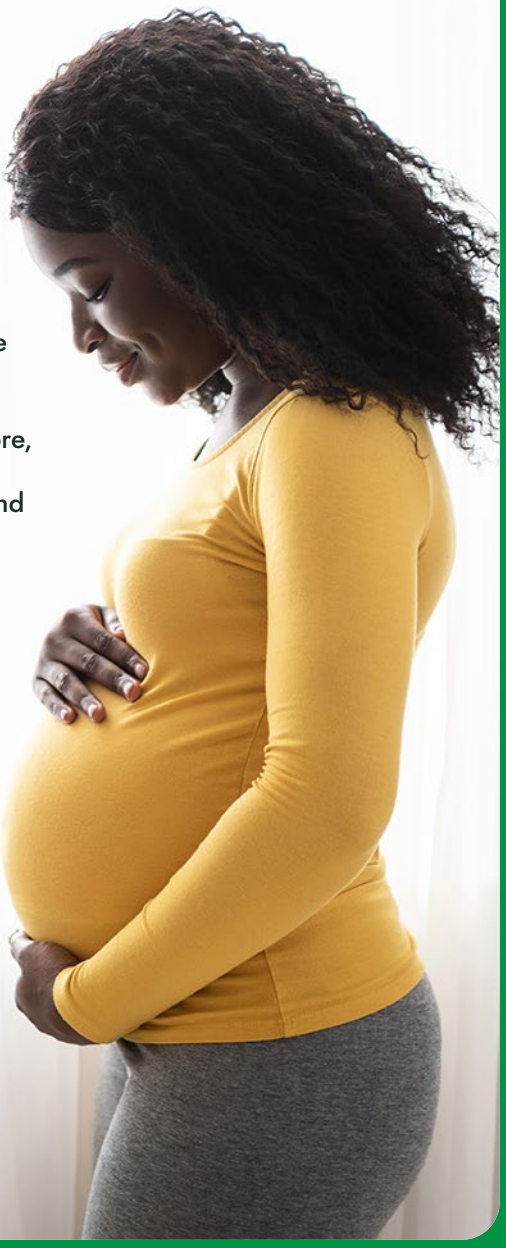
# POLICY SUMMARY

## What needs to happen in relation to diet, nutrition and healthy weight before and during pregnancy to promote healthy weight in childhood.

Women of a childbearing age are subject to the same unhealthy food environments[6] and resulting health inequalities as everyone else. Tackling these environments so that healthy food is the most affordable, available and appealing will help women preparing for and entering pregnancy. In addition, there are some targeted measures which should provide additional support during pregnancy at a time when parents are often looking for specific support on nutrition.

### THE GOVERNMENT SHOULD ENSURE THAT:

- All government work on health and wellbeing in the **early years** includes a focus on **nutrition and diet**.
- There is a **coordinated strategy across departments** to ensure policies relating to diet and obesity take a **life course approach** which explicitly includes preconception and pregnancy.
- Accurate **public health messaging** outlining the importance of nutrition before and during pregnancy is accessible to all, including a targeted approach to all people of a childbearing age.
- All **health professionals** who have contact with people before, during and between pregnancies have sufficient **training** to raise a conversation about nutrition and diet in a sensitive and non-stigmatising manner.
- There is sufficient **investment** in the **health visitor workforce** so it can provide appropriate support to parents at all stages of the early years lifespan, including between pregnancies.
- The **Healthy Start scheme** is fit for purpose to support pregnant women on low incomes. Government needs to extend eligibility, increase the allowance, and improve uptake.



# Introduction

The health of a child is intrinsically linked to the health of their parents. In 2018, the UK Government committed to halving the levels of childhood obesity by 2030.[7] However, since then, rates of childhood obesity have increased to unprecedented levels (see **Figure 1**).[8] A woman's weight and nutritional status at the start of, and during, pregnancy can impact her child's health both in childhood and later life.[9] Despite this, policies targeting preconception and pregnancy are largely absent from government strategies to improve diet-related health.[10,11]

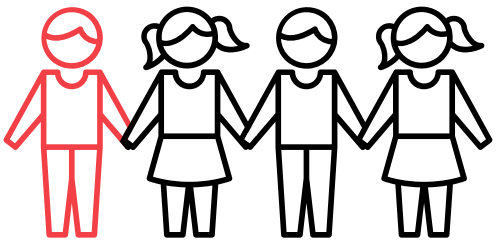
> *"Data consistently show that rates of obesity are more than twice as high in children living in the most deprived areas compared to the least."*

Data consistently show that rates of obesity are more than twice as high in children living in the most deprived areas compared to the least (see **Figure 2**).[12] In order to reduce health inequalities, nutritious food must be accessible to all and policies targeting those anticipating or entering pregnancy must include a focus on equal access to a healthy diet. Women of a childbearing age are subject to the same diet-related inequalities and unhealthy food environments as the wider population. The overall challenge is therefore to create social, environmental and economic conditions conducive for optimum nutrition for everyone.

This report explores the pathways that link maternal dietary intake and BMI and excessive gestational weight gain before and during pregnancy to the development of overweight and obesity in the child, and shares insight into the key drivers of dietary intake during these periods – both from parents and from expectant parents as well as from professionals working within a health, nutrition and food context.

## What's in scope

- The focus of the present report is on preconception and pregnancy as periods when risk factors for later childhood obesity can be identified, and it explores the underlying systemic failures in the food system and the disparities in exposure to risk across population groups according to indices of deprivation.
- Although factors beyond nutrition – for example, exercise and smoking – are important during pregnancy for child health outcomes, this report focuses specifically on diet.
- Although outside the scope of this report, there are other important infant and childhood health outcomes that have their origins prenatally that are distributed inequitably in society and that are linked to systemic failures in the food system. These include premature delivery[13] and infant brain development.[14] Here, we are focused on the origins of childhood obesity.
- There is an emerging body of evidence that explores the relationship between paternal health and offspring outcomes[15] which is referred to below. However, as this area of research is still evolving, this report predominantly focuses on maternal links.
- Although the links between mental health, diet and weight are an important area of research, we do not explore them in this report.
- This report has summarised findings from data sets that are, when available, UK-wide as well as a qualitative study from health professionals and citizens across the UK. The policy recommendations in this report relate specifically to England. More information on the data collection can be found in this report's technical appendix.



**MORE THAN 1/5** (22%) of children aged four and five start school in England are living with **overweight** or **obesity** (**Figure 1**)

These rates are more than **TWICE AS HIGH** in children living in the **MOST DEPRIVED** areas compared to the least (**Figure 2**)

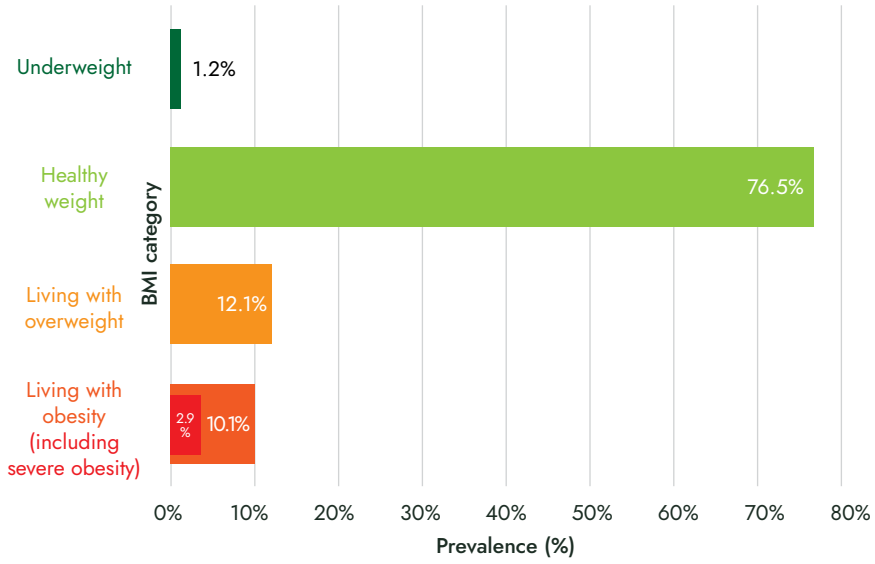
In this report, overweight and obesity are used as clinical terms. We refer to **Body mass index (BMI)** throughout the report as it is the most commonly used population-level measure of overweight and obesity and the metric is often used in data sets and research. However, there are limitations of BMI as an accurate indicator, and it should be considered with caution when used at an individual level because it may not correspond to the same degree of body fat in different individuals.[16] Therefore, healthcare professionals may consider other factors for an accurate measure of health.

BMI is not a suitable measure during pregnancy due to the growth of the fetus. In the data set used, BMI was typically recorded when booking for maternity care in early pregnancy* – before Gestational weight gain (GWG) has occurred. During pregnancy we refer to GWG. Currently, the UK has no formal guidelines on weight gain during pregnancy; however, the USA Institute of Medicine (IOM) guidelines are commonly used in a research capacity.[17] These vary depending on an individual's pre-pregnancy BMI category.

*The 'booking' visit is the first appointment with a midwife.

FIGURE 1

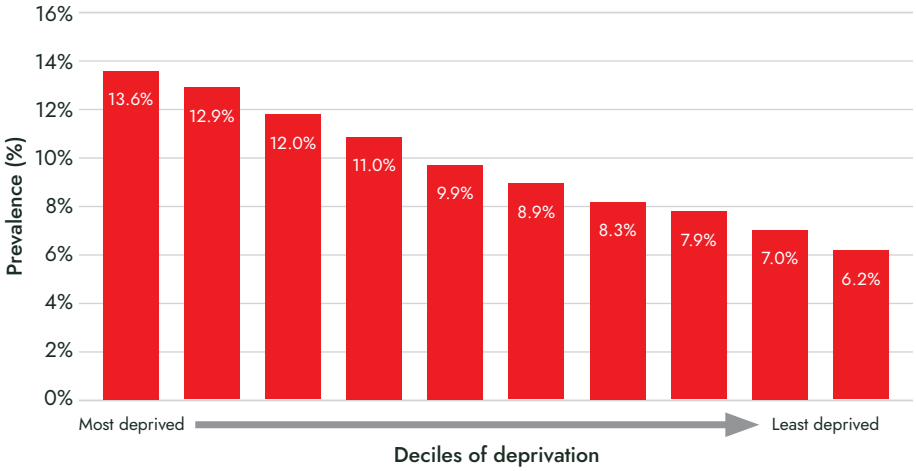
**Body mass index (BMI) category prevalence for Reception children[18]**




For more information: Table 1a National Child Measurement Programme, England, 2021/22 School Year

FIGURE 2

**Prevalence of Reception children living with obesity by level of deprivation*[19]**




For more information: Table 6a National Child Measurement Programme, England, 2021/22 School Year

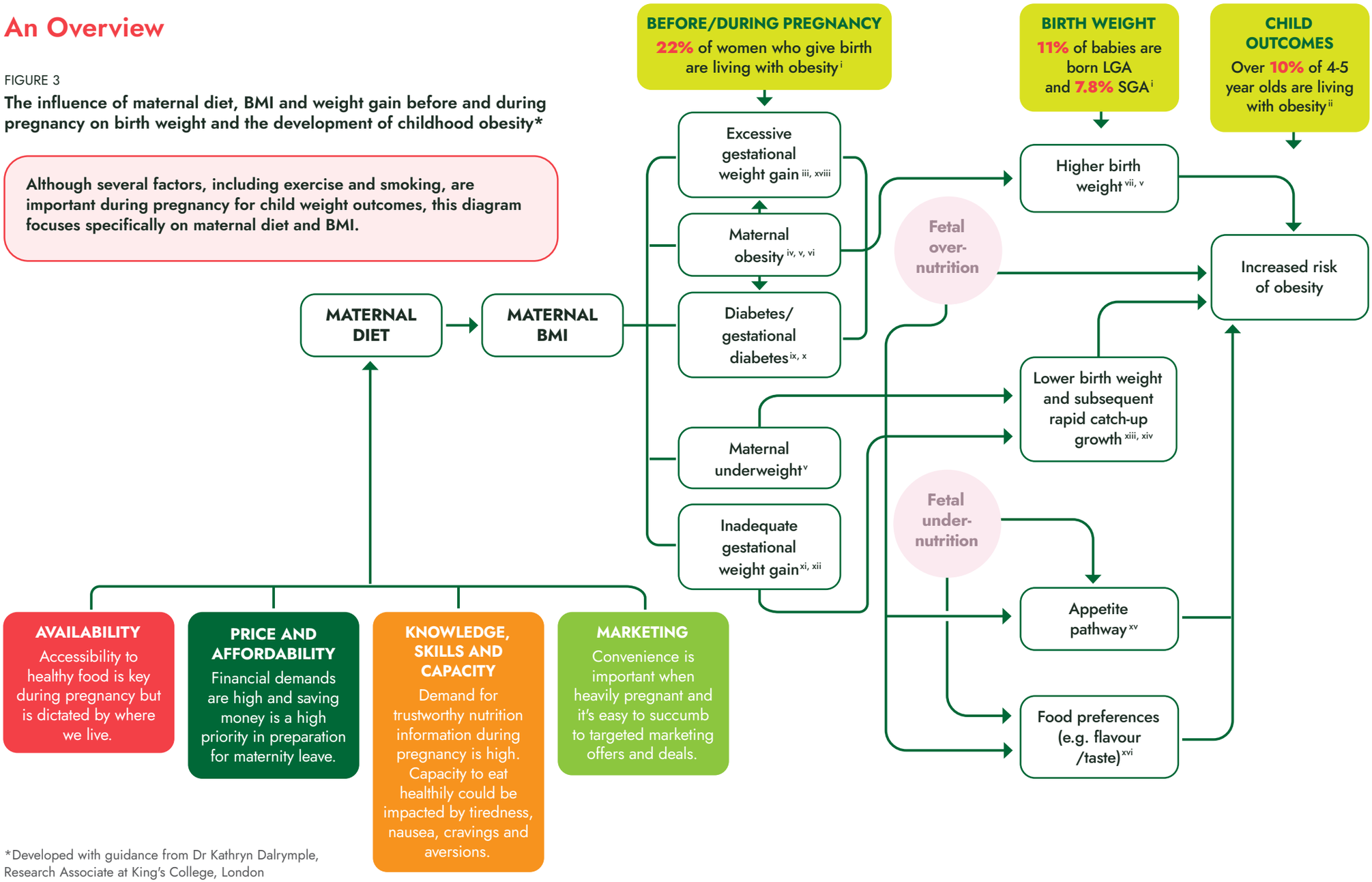
*Index of multiple deprivation is based on the postcode of the child.

# An Overview

FIGURE 3

**The influence of maternal diet, BMI and weight gain before and during pregnancy on birth weight and the development of childhood obesity***

**Although several factors, including exercise and smoking, are important during pregnancy for child weight outcomes, this diagram focuses specifically on maternal diet and BMI.**




*Developed with guidance from Dr Kathryn Dalrymple, Research Associate at King's College, London

# Preconception, pregnancy and the development of childhood obesity

The influence of maternal diet, BMI and weight gain, before and during pregnancy, on birth weight and the development of childhood obesity – what the research tells us.

A woman's weight pre-pregnancy and, to a lesser extent, excessive weight gain during pregnancy can influence child health outcomes.[20] Babies born to women with obesity are more likely to be Large for gestational age (LGA) at birth. A higher birth weight is also associated with obesity in the child later in life.[21,22]

Maternal obesity is also associated with the development of Gestational diabetes mellitus (GDM).[23] Current estimates suggest that 5% of women in the UK are affected by this condition during their pregnancy.[24] However, maternal obesity is associated with a 3- to 5-fold increased risk.[25,26] This

> *"Babies born to women with obesity are more likely to be Large for gestational age (LGA) at birth."*

in turn increases the risk of having a baby that is LGA.[27] The development of GDM in pregnancy has long-term consequences for both the mother and her child. The mother is at greater risk of developing type 2 diabetes (T2D) later in life and it is likely that exposure to diabetes during pregnancy also predisposes the offspring to T2D.[28] There is some evidence showing that the babies of women with GDM show significantly increased fat mass compared to those born to women without, and this is linked to an increased risk of later obesity in the child.[29,30]

Paradoxically, babies that are Small for gestational age (SGA) are also at risk of

**1/2**

(50.2%)

**of women giving birth in Great Britain between 2015 and 2017 had a BMI ABOVE A HEALTHY WEIGHT (Figure 4)**

**JUST OVER**

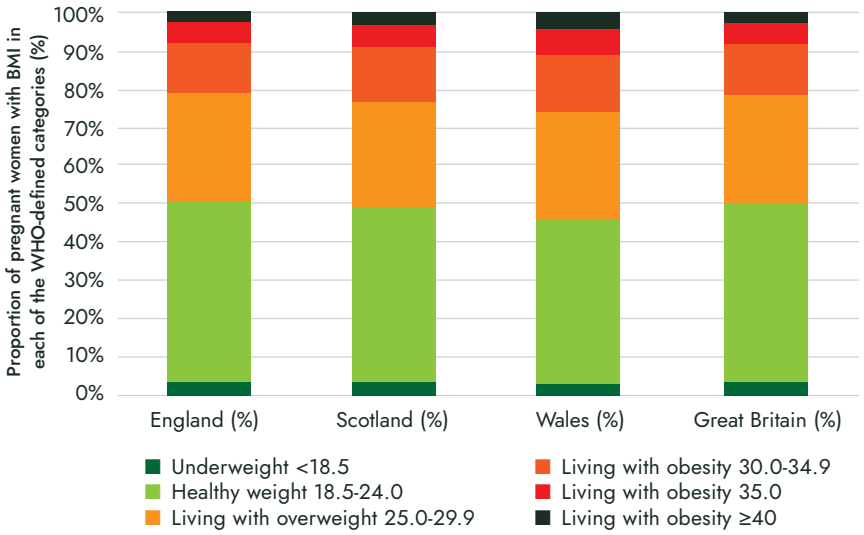
**1/5**

(21.8%)

**of women giving birth were LIVING WITH OBESITY (Figure 4)**

FIGURE 4

**Distribution of BMI in women giving birth[41]**




(England, Wales, Scotland 2015–2017)

Rates of overweight and obesity in pregnant women increase as the level of deprivation increases. Women living in the most deprived areas are more likely to be underweight or living with obesity (**Figure 5**). The number of pregnant women living with obesity also varies by ethnicity and age, with the highest proportions in black women and women aged 40 or over.[42]

later developing obesity and diabetes.[31] Being SGA followed by rapid catch-up growth is associated with increased central adiposity in childhood[32] and increased BMI in adolescence.[33] Risk factors for a baby that is SGA are a low pre-pregnancy BMI and inadequate gestational weight gain[34,35] which can be impacted by under- or malnutrition.[36]

It is important to note that although birth weight may provide an indication of the in utero environment and subsequent child growth trajectories, many pregnant women living with obesity have babies with a healthy birth weight. Associations between maternal and infant weight continue throughout childhood[37] and further understanding of how body composition, not just weight, in the newborn links to disease risk later in life is needed.[38]

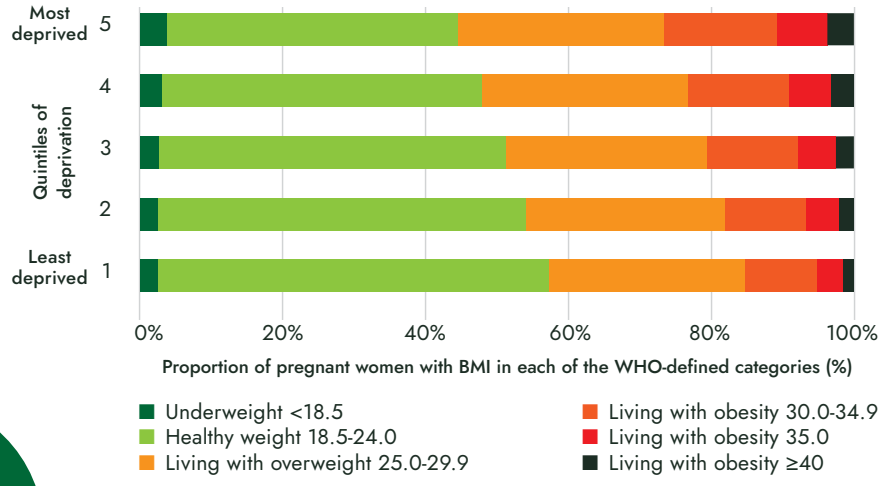
**Levels of pre-existing diabetes are highest in pregnant women living with obesity (Figure 6)**

There is an emerging body of evidence which explores the relationship between paternal health and offspring outcomes.[39] To date, it has been reported that paternal obesity can negatively impact birth weight and cognitive outcomes, and increase the risk of developing fatty liver, kidney and metabolic disease.[40] It is hypothesised that these relationships are mediated through the quality of the sperm and, therefore, paternal obesity can independently influence early embryo and fetal development. However, this area of research is still in its infancy.

**The number of pregnant women with type 2 diabetes increases as the level of social deprivation increases; 40% of all pregnant women with type 2 diabetes are in the most deprived quintile (Figure 7). Pregnant women with type 2 diabetes are more likely to come from a deprived area and/or be of a minority ethnicity.[45]**

FIGURE 5

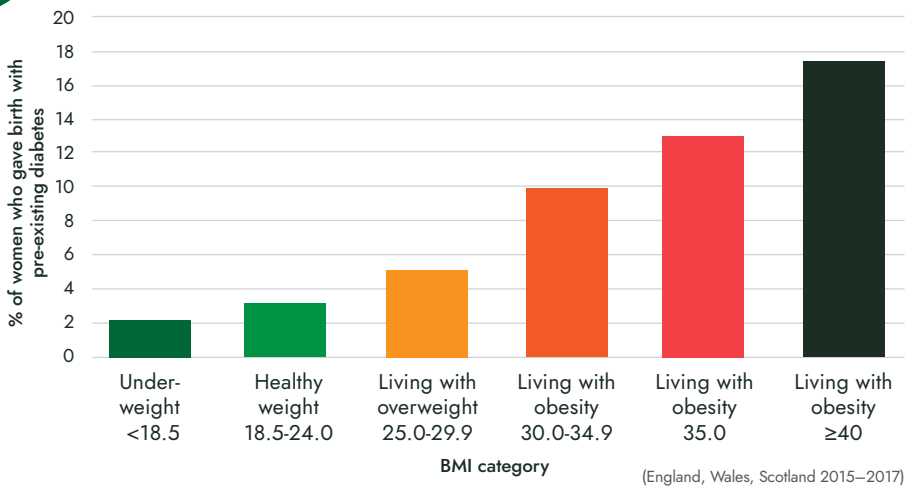
**BMI category by level of deprivation in pregnant women[43]**




(England, Wales, Scotland 2015–2017)

FIGURE 6

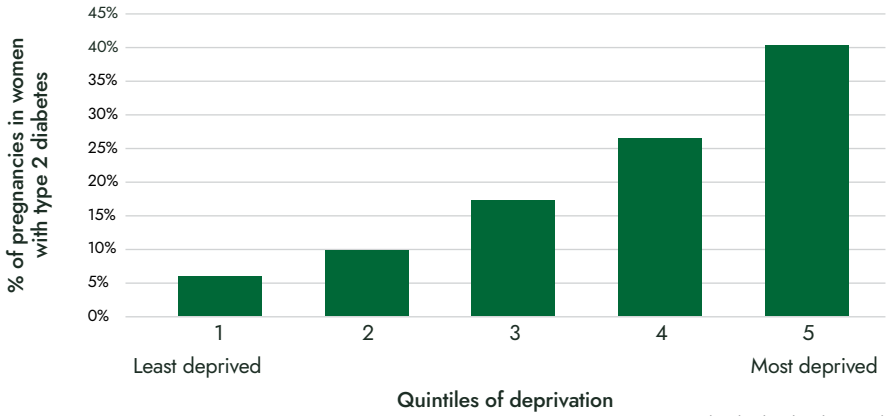
**Levels of pre-existing diabetes in pregnant women by BMI[44]**




(England, Wales, Scotland 2015–2017)

FIGURE 7

**Pregnancies in women with type 2 diabetes by level of deprivation (%)[46]**

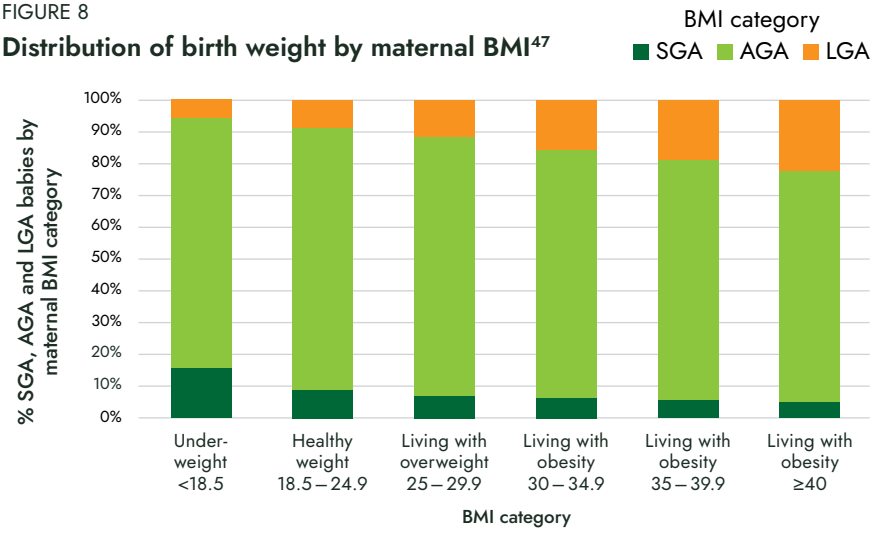



(England and Wales 2020)

**Maternal body composition has a direct impact on the health outcomes of the baby. As the mothers' BMI increases, so does the proportion of babies born Large for gestational age (LGA) (Figure 8).**

FIGURE 8

**Distribution of birth weight by maternal BMI[47]**




(England, Wales, Scotland 2015–2017)

## Dietary intake in pregnant women

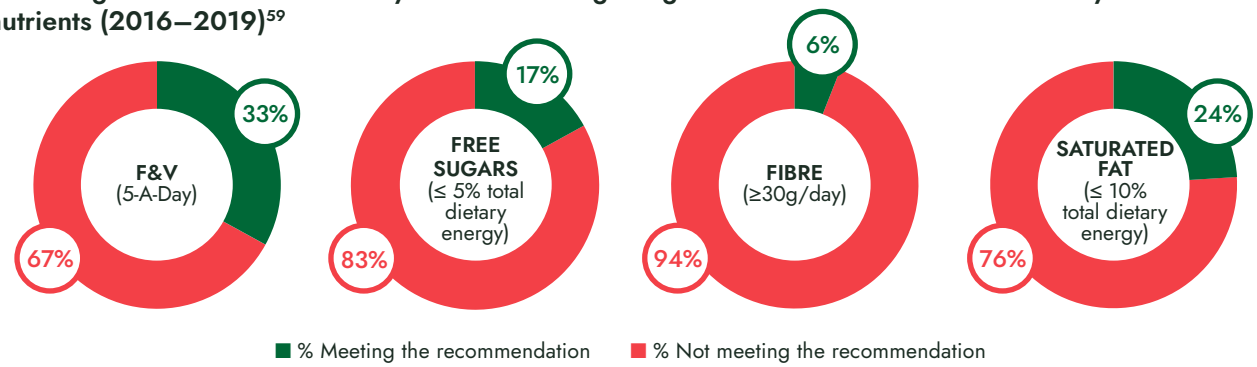
Nutritional exposures in the womb can impact the long-term health outcomes of the baby. Nutrient requirements, such as iron and folate, increase during pregnancy to meet the increased demands from both the mother and the developing fetus. Poor micronutrient intake, especially around the time of conception and in the early stages of pregnancy, can impact the development of the fetus. Many adaptations occur in the body to prioritise fetal nutrient supply but inadequate intake can impact birth weight, body composition and later health of the child.[48] Suboptimal levels of certain micronutrients – for example, iron, B12,[49] iodine[50,51] and folate – are associated with a lower infant birth weight.[52]

There is a lack of national data on the dietary intake and nutritional status of pregnant women in the UK. Women are routinely assessed for anaemia in pregnancy, but not other micronutrient deficiencies. A recent study assessing diet quality in pregnant women living with obesity reported that intakes of sugar and saturated fatty acids were higher than the recommended amount, and fibre, alongside several key micronutrients (iron, iodine, folate and vitamin D), were significantly lower (although the analysis excluded supplementation).[53] This is reflected in national data which show that the majority of women aged 19–64 are not meeting the government recommendations for the intake of key food groups and nutrients (**Figure 9**). Pregnant women living with obesity appear to carry a greater risk of being deficient in some micronutrients, especially in lower income groups[54] and subsequently the recommended dose for folic acid and vitamin D supplementation before and during pregnancy for women living with obesity is currently under review.[55]

Both under- and over-nutrition during pregnancy impact the baby's appetite pathway and the hormone responsible for regulating levels of fullness in the brain.[56,57] A mother's diet during pregnancy may also influence her unborn baby's food preferences as the flavour of foods and drinks she consumes passes into the amniotic fluid, which can affect the child's future acceptance and enjoyment of foods, in turn affecting the variety and nutritional quality of the diet.[58]

FIGURE 9

**Percentage of UK women 19–64 years old meeting the government recommendation for key foods and nutrients (2016–2019)[59]**



# Factors impacting dietary intake and access to healthy food during preconception and pregnancy

*"There are a lot of people that are excluded from having a healthy diet. And there can be a disconnect between the advice that we're giving and the information that is available to pregnant women and families and what is the reality... of their lives. And that's not just the food they can afford but the fuel to cook it and the facilities to prepare it, the time to consume it. It's just such a complex picture."*

HEALTH PROFESSIONAL

Our food system and the environment that we live in can influence and shape our ability to secure a healthy diet. These factors affect women preparing for or entering pregnancy in the same way as everyone else. Common drivers of diet quality include price and affordability, marketing and advertising, availability, and knowledge, skills and capacity.

The Food Foundation commissioned research with parents, expectant parents, and a range of professionals working within a nutrition, health or diet context from across the four UK nations, to gain their perspective on the facilitators and barriers to having a healthy diet during preconception and pregnancy.

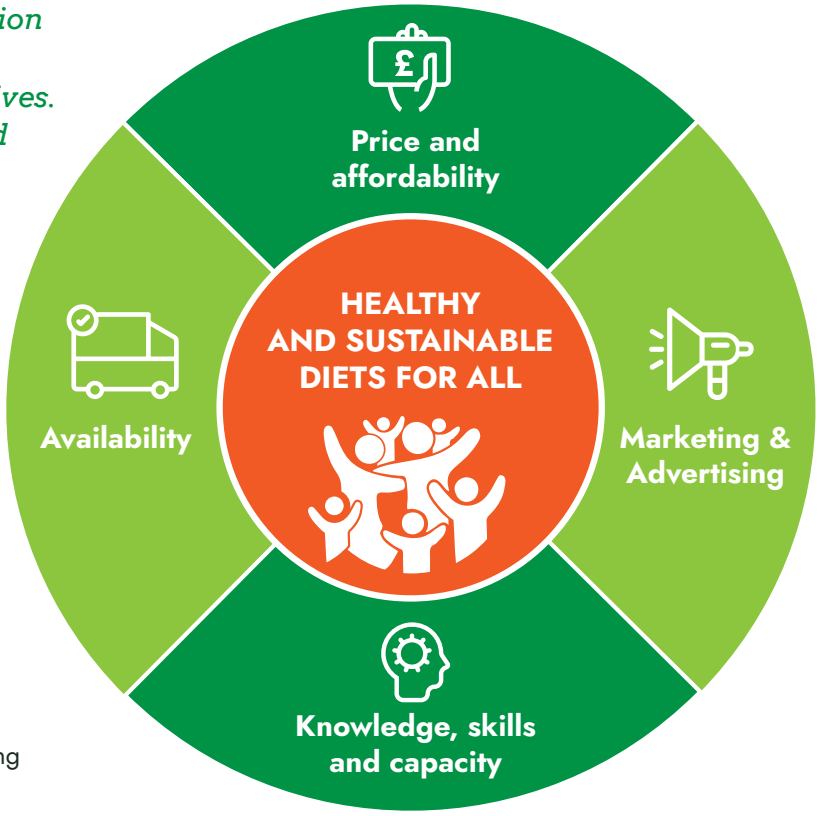
This qualitative research was undertaken by the University of Hertfordshire[60] and incorporated eight focus groups and four interviews. It involved nineteen parents and expectant parents, and twelve professionals. Professional participants included a midwife, nutritionists, health visitors, childcare providers and people working with food banks. Parent participants came from a range of demographic backgrounds. Full participant details are available in the technical appendix to this report.

## Price, affordability and availability

Our research showed that, as with the wider population[61], price and affordability are key factors affecting the ability of women before and during pregnancy to access a healthy diet, particularly if they are on a low income. To meet the government-recommended healthy diet guidelines for example, which are applicable from age two onwards, the poorest fifth of UK households would need to spend 43% of their disposable income; this compares to only 10% in the richest households.[62] The average cost of healthier calories is almost three times higher than less healthy foods.[63]

FIGURE 10

**The key dietary drivers affecting access to healthy and sustainable food***




*"I feel like if you want to eat healthily it certainly racks up the grocery bill. The more sorts of fresh fruit and veg you're adding, the more variety you're adding to your basket, the more your grocery shop is going to cost."* (Parent)

*Framework developed by The Food Foundation

*"We shop at Tesco at the start of the month, and then buy meat, veggies, make a lot of meals. Then by the end of the month … we live off frozen chicken nuggets and chips for a week, sort of thing. It's far cheaper."* (Parent)

However, during pregnancy, financial pressures can be even greater than normal. In our focus groups some parents commented on having less household income during maternity/parental leave, which added pressure to budgets and made food purchasing decisions more difficult.

*"When you've got a baby on the way and … you are starting to try and save with obviously maternity pay not being a lot. You think, 'Am I going to just sacrifice having less healthy meals for the money?' Which is bad, really, because, obviously, you want to eat healthily, especially when you're pregnant. But sometimes, it's just not possible."* (Parent)

One health professional recognised that healthy eating becomes much more difficult for expectant parents on such low incomes that they are having to decide whether they can buy food or put on the heating.

*"The mental health pressure that people are under when they're struggling to afford food is they're struggling to afford anything, so they're really up against it. So, this is going to be low down on their priority list, I would imagine. There must be a realistic expectation of people who are in those kinds of circumstances."* (Health professional)

The difficulty to afford healthy food was also recognised by a professional working with food banks:

*"It comes down to being able to afford to have those choices … people just don't have the choice to even contemplate a healthy diet or [think] about what's best for their bodies while they're pregnant."* (Health professional)

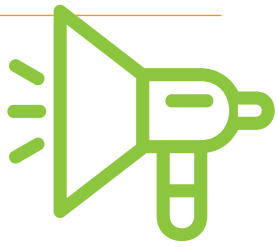
There are schemes in place to support pregnant women on low incomes to access healthy food, such as Healthy Start. The scheme provides expectant parents (and those with young children) with vouchers worth £4.25 per week to spend on fruit, vegetables, milk and supplements. Evaluations have shown that these vouchers result in increased household expenditure on fruit and vegetables.[64] However, there are many problems relating to the delivery of the scheme (these are outlined later in the report), and many women are missing out. These issues were noted by health professionals we spoke to:

*"The Healthy Start scheme is important for a certain group of low-income mums or mums to be. But, you know, we have challenges in that what it is on paper and how it's delivered in practice diverge and we've got low uptake. So that's sort of an important reality in the background as well."* (Health professional)

The food options which are available vary depending on where we live – a factor which may further contribute to unequal access to healthy food. For example, in the least deprived areas, 22% of places to buy food are fast-food outlets. This rises to 31% in the most deprived areas.[65]

*"It may well be that their hometown may be a low socioeconomic town and they have a lot of fast food and a lot of these kind of unhealthy avenues available to them."* (Health professional)

## Marketing



Food companies spend millions of pounds each year to influence our food choices, through a variety of marketing strategies that encourage the purchasing of predominantly unhealthy food. A third (32%) of advertising spend is on less healthy food and drink compared to 1% on fruit and vegetables.[66] Companies employ a combination of activities including advertising, product placement and promotional activity, to which pregnant women and those of childbearing age, along with the rest of the population, are regularly exposed. Evidence demonstrates the impact of advertising on food-related beliefs and behaviours in adults.[67] Before and during pregnancy, a period when a healthy diet is extremely important, women are subject to these same influences on their food purchases.

Some of the parents we spoke to explained how they were aware of, and influenced, by marketing tactics.

> *"Being pregnant, I felt that I was able to eat little and often, so I was needing to eat every few hours … it was little things that I could pick up and snack … so, again, that sabotaged the healthy eating a bit, because it was much easier for those things to be small biscuits, or sweeties and things like that at the till – just something just to give me that little bit of nourishment to keep the sicky feelings at bay."* (Parent)

> *"I think just on how people shop and what we're sold on TV and in shops and convenience and all that definitely is affecting how people are eating … Doing my shopping last night and all the deals that come up, you know if you click on sort of like Price Match This Week, or any discounted, it's all the kind of sweets and crisps that come up, so maybe that's targeted marketing for me, I don't know."* (Parent)

## Knowledge, skills and capacity

As well as issues relating to price and affordability, women and their families may face other barriers to accessing a healthy diet. In the preconception period they face the same every day challenges around time constraints, mental load, confidence around cooking, etc., but during pregnancy may also struggle with additional levels of fatigue or nausea, or have other pregnancy-related health problems.

Tiredness associated with pregnancy on top of other work and household commitments were referred to as barriers to a healthy diet by parents we spoke to.

> *"Definitely while I was pregnant, I was quite tired a lot of the time, didn't want to cook, I was trying to get things back to work, my job is quite stressful, so having the kind of energy and the enthusiasm to cook something healthy and nutritious, I don't always have that sort of feeling."* (Parent)

A stronger awareness of the need and ambition to eat healthily during pregnancy were said to be curtailed due to nausea, aversions and cravings towards certain foods.

> *"I had hyperemesis gravidarum, so just constant sickness from week 5 to week 38 … everybody around me was sort of saying, 'You need to be eating this because you need to make sure you're getting your iron and taking your folic acid' but I literally just could barely keep anything down. So, my pregnancy diet consisted of Mini Cheddars and Mini Milk ice lollies."* (Parent)

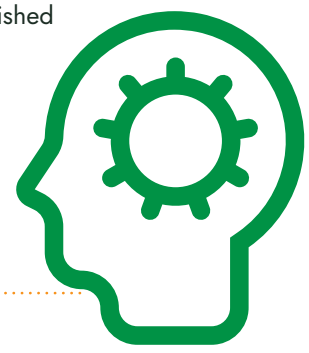
> *"I really craved everything sweet, doughnuts, biscuits, cakes, which was really annoying, but ultimately, no, my diet didn't really change, it just stayed the same as before and as now, really, except I probably ate more."* (Parent)

Parents spoke of how time pressures of work and family life as well as pregnancy tiredness made less healthy, convenient options more appealing.

> *"I haven't got the time to sit down and learn about recipes and things … For me, it's all about convenience and what's quick and easy to make."* (Parent)

> *"Probably in the run-up to having the baby, convenience was a factor, especially working long hours and things. There was probably a bit more like take-aways and that sort of thing … Like Uber Eats sending emails with 25% off or whatever definitely makes it easier."* (Parent)

While we know a range of published information and advice on healthy diets is available in different formats, for example from the NHS Better Health Start for Life[68], both health professionals and expectant



parents with whom we spoke perceived poor access to clear, trustworthy and easily accessible information to be a barrier to a healthy diet during the preconception and pregnancy period.

Parents and expectant parents saw nutrition advice from health professionals in the preconception and pregnancy period as important. Some commented that they hadn't been provided with recommendations for a healthy diet, and the advice they received was limited to foods that should be avoided, supplement requirements or specialist advice for those with pre-existing conditions such as obesity.

> *"My midwife just looked at me and she was, like, oh yes, you're not overweight, like you're fine basically."* (Parent)

> *"I would just say when I went to the midwife appointments, there wasn't really any comment much about diet. I think because my weight was within a healthy BMI and all the rest of it, I was quite a middle of the road weight beforehand. They didn't really comment much on my diet at all."* (Parent)

Some parents described how advice from health professionals, family members and online was sometimes conflicting. Experiences of using publicly available NHS resources were mixed among parents, with some commenting that they sought out their own information but online searches proved confusing.

> *"There were no leaflets or anything, I think they put them up in the room when you're waiting, but there's no sort of actual information booklet on what sort of meals you should be eating or what you should be having."* (Parent)

Parents referred to being frequently exposed to information from non-professional sources – family, friends, social media – that reinforced common myths around portion size and the idea that pregnant women need to 'eat for two'.

> *'Oh, you're eating for two now,' everybody always says that, and we know that's incorrect ... but then that means pregnant women are eating double what they should be eating. So, I think there is definitely something around portion sizing, the messaging and education around that."* (Health professional)

# Policy recommendations: what needs to happen?

The nutritional status and weight of a woman entering pregnancy can greatly affect the future health of her infant and a child's risk of developing obesity in later life. Ensuring that our social security system and wages level sufficiently support people to feed themselves, that our food environment promotes the consumption of nutritious food and that healthy food is affordable for those on a lower income is paramount to addressing the wider determinants of poor diet and making sure both expectant parents and parents of the future are protected.

Over the last 30 years, the Government has published 14 public health strategies containing almost 700 policies that have failed to reduce levels of obesity or health inequalities.[69] This is largely due to poor or absent implementation and evaluation of the proposed policies, plus an over-reliance on individuals to change their own behaviour without addressing the food environment. In particular, policies specific to supporting the intake of a nutritious diet during the preconception and pregnancy phases are lacking, yet this is the crucial time point to lay foundations for a child's healthy growth trajectory – which, in turn, impacts adult health and future generations.

In not taking a life course approach, the Government's recent and highly anticipated Food Strategy[70] lacked the scope and meaningful ambition to address dietary drivers of poor health and inequality, particularly in relation to preconception, pregnancy and the early years. In addition, the Government's 2021 report *The Best Start for Life: The Early Years Healthy Development Review Report*[71] which was published following the Early Years Healthy Development Review, commissioned by the Prime Minister and chaired by Rt Hon Dame Andrea Leadsom, lacked attention to maternal health and diet.

Below we set out possible interventions which target families at the point of pregnancy, but these should be taken within the context of the need for a system-wide approach to food system change that we discuss in our *Broken Plate* report (2022).[72]

**WHAT NEEDS TO HAPPEN >>**

- **All government work focusing on health and wellbeing in the early years should include a focus on nutrition and diet.**
- **There should be a coordinated strategy across government departments to ensure policies relating to diet and healthy weight take a life course approach which explicitly includes preconception and pregnancy.**

## Before pregnancy

A woman's nutritional status and weight entering pregnancy impacts fetal development and child health outcomes later in life, making health in the preconception phase an important window of opportunity. However, 45% of pregnancies are unplanned or associated with feelings of ambivalence[73] and the preconception period can be short. In addition, research highlights that women are less likely to visit a health professional unless they are experiencing problems conceiving,[74] limiting their exposure to important information related to diet and health.

**WHAT NEEDS TO HAPPEN >>**

- The Government should ensure that accurate **public health messaging** outlining the importance of nutrition before and during pregnancy is accessible to all, including a targeted approach to all people of a childbearing age. This should start in schools as part of personal, social, health and economic (PSHE) education.
- The Government should ensure that relevant **health professionals** who come into contact with parents who are considering having a baby or are pregnant, for example at family planning and sexual health clinics, are trained to discuss the importance of a healthy diet in a sensitive and non-stigmatising manner and refer to support services where appropriate.

## During pregnancy

Dietary advice can be provided by multiple services during and between pregnancies – including midwife appointments, antenatal contact by the health visitor and relevant health practitioners, for example in Children's Centres.[75] Sadly, the number of Children's Centres has dropped significantly in recent years, and while the Government's plan to invest in a new programme of Family Hubs is welcome, it remains to be seen whether the Hubs will be able to plug the substantial gaps in provision and support for families. There are examples of good practice, but budget cuts, funding constraints and inconsistent approaches to training are creating a postcode lottery in terms of early years provision.[76]

Research suggests that living with obesity is a stigmatised condition, and may lead to feelings of inadequacy, shame and low self-esteem.[77] Despite the existence of government recommendations and resources to train health professionals,[78] there is research highlighting that midwives can struggle to provide dietary advice, especially on sensitive topics such as obesity.[79] Offering sufficient training that includes the views of individuals living with obesity and provides health professionals with a comprehensive understanding of the stigma and psychological impacts that may arise from it, may support health professionals to be empowered in this area of practice.[80]

It is essential that there is an adequate national and local safety net to support expectant parents on a low income, especially against a backdrop of the rising cost of living. Studies on the effects of Healthy Start have shown that it plays an important role in helping pregnant women and their children access healthier foods.[81] Some women may also use the funds to stockpile infant formula during pregnancy rather than to improve their own nutrition by buying fruit, vegetables or cows' milk.[82]

### HEALTHY START

*Healthy Start is a means-tested scheme in England, Wales and Northern Ireland for low-income pregnant women and families with children under the age of four.[83] For pregnant mothers, it offers universal entitlement for under 18 years of age and after that eligibility is set at a household income of £408 per month or less, excluding benefits. Those taking up the scheme can obtain £4.25 per week towards fruit, vegetables and milk and free supplements containing folic acid, vitamin D and vitamin C.[84]*


*However, the current threshold for Healthy Start entitlement means that many families experiencing food insecurity do not benefit. While the Government did increase the value of Healthy Start from £3.10 to £4.25 in April 2021, the value of payments has failed to keep up with high levels of inflation and rising food prices. In addition, uptake is low due to a lack of awareness, especially compared to the high uptake of Best Start in Scotland (77%).[85] The Department for Health has now set an overall target to reach a 75% uptake by the end of March 2023.[86]*

WHAT NEEDS TO HAPPEN >>

- **All healthcare professionals who have contact with new patients must have sufficient training to acquire the knowledge, skills and confidence to maximise opportunities to raise a conversation about nutrition and diet in a sensitive, non-stigmatising manner.**

  **The information covered in the training should:**
  - Be culturally diverse to meet the needs of the population.
  - Be relevant to a range of dietary needs (e.g. vegetarian).
  - Focus on what to include, not just what to avoid.
  - Challenge myths around portion sizes and eating for two.
  - Include the role of paternal health.

- **There needs to be targeted support for pregnant women on low incomes via the Healthy Start scheme:**
  - The Government must **extend the Healthy Start scheme** to all families in receipt of Universal Credit so that more pregnant mothers can benefit.
  - The Department of Health must immediately deliver on their promised consultation to **permanently extend** Healthy Start to families with no recourse to public funds.
  - The Government must **increase the allowance amount** to reflect inflation rates and commit to reviewing this every six months.
  - The Government must **improve the uptake** of the scheme by committing to a **£5 million promotional campaign**, as recommended in the National Food Strategy[87], which targets eligible families and the healthcare professionals who work with them, and retailers.
  - The Government must **improve the uptake** of the scheme with a clear strategy to meet its own targets. Midwives, health visitors and GPs should be part of the strategy to improve uptake and ensure parents are being signposted to Healthy Start when first seen in pregnancy. Retailers willing to add value and promote the scheme should also play a part.
  - Uptake and accessibility to the scheme should be improved by ensuring that the **digitisation process makes access as easy as possible and by automating registration**. The Department for Work and Pensions should amend the Universal Credit application form and online journal, where eligible claimants can consent to their data being used to automatically register for Healthy Start vouchers.

## Between pregnancies

Data show that 18% of women were living with obesity at the time of their first midwife appointment to prepare for their first pregnancy, compared to 23% at a subsequent pregnancy.[88] This can be impacted by excessive gestational weight gain, making the period in between pregnancies an important opportunity for intervention.

Health visitors play an important role both in antenatal health, as well as supporting parents through pregnancy and when a baby is born. However, in England there have been particular concerns regarding the decrease in health visitors since the move to commissioning of public health services by local authorities along with cuts to public spending.[89] Without these issues being adequately addressed, we risk leaving parents without the support they need and the opportunities for intervention between pregnancies untapped.

WHAT NEEDS TO HAPPEN >>

- Health visitors who have contact with new parents must have sufficient **training** in their core curricula to acquire the knowledge, skills and confidence to maximise opportunities to raise a conversation about nutrition and diet in a sensitive, non-stigmatising manner during postnatal visits, in preparation for future pregnancies.

- The Government needs to invest sufficiently in the **health visitor workforce** so that they can provide the above support needed to parents between pregnancies as well as at other stages of the early years lifespan.

# Conclusion

This report has presented evidence to show that a child's health is influenced before conception. Appetite pathways develop in the womb and, for a number of reasons, a child is predisposed to obesity if their parents, especially the mother, is living with obesity. We are calling for the Government to ensure that policies related to promoting healthy weight in childhood take a life course approach which explicitly includes preconception and pregnancy.

Our research indicates that accurate guidance on a nutritious diet before and during pregnancy should be accessible to parents who are considering having a baby, supported by a frontline health professional workforce. However, it is crucial that this is in conjunction with policies designed to create a more equitable food system and health-promoting food environment. This will work to ensure that all women, regardless of their income, have optimum nutritional status well before they conceive, at least as early as adolescence.

Health inequalities experienced by parents are passed on to the infant and continue to develop throughout childhood, adolescence and adulthood – an intergenerational cycle that must be broken. The Government has acknowledged the need to reduce levels of childhood obesity but it is clear that this will be impossible to achieve without recognising that a child's health starts in the womb.

# REFERENCES

References for **Figure 3**, page 7.


i Relph, S., and NMPA Project Team, 2021. NHS Maternity Care for Women with a Body Mass Index of 30 kg/m$^2$ or Above: Births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland. *https://maternityaudit.org.uk/FilesUploaded/NMPA%20BMI%20Over%2030%20Report.pdf*

ii NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme*

iii Badon, S.E., et al., 2020. Gestational Weight Gain, Birthweight and Early-childhoold Obesity: Between and Within-family Comparisons. *Int J Epidemiol* Oct 1;49(5):1682–1690. doi: 10.1093/ije/dyaa110. PMID: 32830276; PMCID: PMC7746402. *https://europepmc.org/article/med/32830276*

iv Voerman, E., et al., 2019. Maternal Body Mass Index, Gestational Weight, and the Risk of Overweight and Obesity across Childhood: An Individual Participant Data Meta-analysis. *PLoS Med* 16(2): e1002744. *https://doi.org/10.1371/journal.pmed.1002744*

v Yu, Z., et al., 2013. Pre-pregnancy Body Mass Index in Relation to Infant Birth Weight and Offspring Overweight/obesity: a Systematic Review and Meta-analysis. *PLoS One* 8: e61627. *https://pubmed.ncbi.nlm.nih.gov/23613888/*

vi Larsson, S.C., and Burgess, S., 2021. Causal Role of High Body Mass Index in Multiple Chronic Diseases: A Systematic Review and Meta-analysis of Mendelian Randomization Studies. *BMC Med* 19, 320. *https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-021-02188-x*

vii Scifres, C.M., 2021. Short- and Long-Term Outcomes Associated with Large for Gestational Age Birth Weight. *Obstetrics and Gynecology Clinics* 48, 325–337. *https://pubmed.ncbi.nlm.nih.gov/33972069/*

viii Kong, L., et al., 2020. Relationship of Prenatal Maternal Obesity and Diabetes to Offspring Neurodevelopmental and Psychiatric Disorders: a Narrative review. *International Journal of Obesity* 44, 1981–2000. *https://www.nature.com/articles/s41366-020-0609-4*

ix Kim, S.Y., et al., 2014. Association of Maternal Body Mass Index, Excessive Weight Gain, and Gestational Diabetes Mellitus with Large-for-gestational-age Births. *Obstet Gynecol* 123: 737–44. *https://pubmed.ncbi.nlm.nih.gov/24785599/*

x A. Lawlor, D., et al., 2010. Association of Existing Diabetes, Gestational Diabetes and Glycosuria in Pregnancy with Macrosomia and Offspring Body Mass Index, Waist And Fat Mass In Later Childhood: Findings From A Prospective Pregnancy Cohort. *Diabetologia* 53, 89–97. *https://pubmed.ncbi.nlm.nih.gov/19841891/*

xi Heaman, M., et al., 2012. Risk Factors for Preterm Birth and Small-for-gestational-age Births among Canadian Women. *Paediatr Perinat Epidemiol* 2013; 27: 54–61. *https://pubmed.ncbi.nlm.nih.gov/23215712/*

xii Liu, Y., et al., 2012. Prepregnancy Body Mass Index and Gestational Weight Gain with the Outcome of Pregnancy: A 13-Year Study Of 292,568 Cases In China. *Arch Gynecol Obstet* 286, 905–911. *https://pubmed.ncbi.nlm.nih.gov/22695822/*

xiii Nam, H. K., and Lee, K.H., 2018. Small for Gestational Age and Obesity: Epidemiology and General Risks. *Annals of Pediatric Endocrinology & Metabolism* 23, 9–13. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5894562/*

xiv Biosca, M., et al., 2011. Central Adiposity in Children Born Small and Large for Gestational Age. *Nutr Hosp* 26: 971–6. *https://pubmed.ncbi.nlm.nih.gov/22072340/*

xv Ross, M.G., and Desai, M., 2014. Developmental Programming of Appetite/Satiety. *Ann Nutr Metab* 64(suppl 1):36–44. *https://pubmed.ncbi.nlm.nih.gov/25059804/*

xvi Mennella, J.A., et al., 2001. Prenatal and Postnatal Flavor Learning by Human Infants. *Pediatrics* Jun;107(6):E88. doi: 10.1542/peds.107.6.e88. PMID: 11389286; PMCID: PMC1351272. *https://pubmed.ncbi.nlm.nih.gov/11389286/*

xvii Weschenfelder, F., et al., 2019. Gestational Weight Gain Particularly Affects the Risk of Large for Gestational Age Infants in Non-obese Mothers. *Geburtshilfe Frauenheilkd* Nov;79(11):1183–1190. doi: 10.1055/a-0891-0919. Epub 2019 Sep 3. PMID: 31736507; PMCID: PMC6846725. *https://pubmed.ncbi.nlm.nih.gov/31736507/*

## REFERENCES


1. Sibson, V., and Crawley, H., 2021. Enabling Children to be a Healthy Weight: What We Need to Do Better in the first 1,000 days. First Steps Nutrition Trust. *https://static1.squarespace.com/static/59f75004f09ca48694070f3b/t/60ae5c369213347627bb9075/1622039612853/Obesity+report+May2021+for+web.pdf*
2. Obesity Health Alliance, 2021. Turning the Tide: A 10-Year Healthy Weight Strategy. *https://obesityhealthalliance.org.uk/wp-content/uploads/2021/09/Turning-the-Tide-A-10-year-Healthy-Weight-Strategy.pdf*
3. Rasmussen, K. & Yaktine A. (Eds), 2009. Weight Gain During Pregnancy: Reexamining the Guidelines. Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. National Academies Press (US). doi:10.17226/12584. *https://pubmed.ncbi.nlm.nih.gov/20669500/*
4. World Health Organization, 2021. Overweight and Obesity. *https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight*
5. NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme/2021-22-school-year/age*
6. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*
7. Department of Health and Social Care, 2018. Obesity, Food and Nutrition, Childhood Obesity: A Plan for Action, Chapter 2. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718903/childhood-obesity-a-plan-for-action-chapter-2.pdf*
8. NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme*
9. Godfrey, K.M. et al., 2017. Influence of Maternal Obesity on the Long-term Health of Offspring. *The Lancet. Diabetes & Endocrinology* 5 1: 53–64. *https://www.thelancet.com/journals/landia/article/PIIS2213-8587(16)30107-3/fulltext*
10. HM Government, 2016. Childhood Obesity: A Plan for Action. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/546588/Childhood_obesity_2016__2__acc.pdf*
11. Department of Health and Social Care, 2018. Obesity, Food and Nutrition, Childhood Obesity: A Plan for Action, Chapter 2. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718903/childhood-obesity-a-plan-for-action-chapter-2.pdf*
12. NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme*
13. Best, K. P., et al., 2022. ISSFAL Statement Number 7 – Omega-3 Fatty Acids During Pregnancy To Reduce Preterm Birth. *Prostaglandins, Leukotrienes, And Essential Fatty Acids* 186, 102495. *https://doi.org/10.1016/j.plefa.2022.102495*
14. Basak, S., and Duttaroy, A. K., 2022. Maternal PUFAs, Placental Epigenetics, and Their Relevance to Fetal Growth and Brain Development. *Reproductive sciences. https://doi.org/10.1007/s43032-022-00989-w*
15. Campbell, J.M., and McPherson, N.O., 2019. Influence of Increased Paternal BMI on Pregnancy and Child Health Outcomes Independent of Maternal effects: A Systematic Review and Meta-analysis. *Obes Res Clin Pract https://pubmed.ncbi.nlm.nih.gov/31767240/*
16. Nuttall F.Q., 2015. Body Mass Index: Obesity, BMI, and Health: A Critical Review. *Nutr Today* 50(3):117-128. doi: 10.1097/NT.0000000000000092. Epub 2015 Apr 7. PMID: 27340299; PMCID: PMC4890841.
17. Rasmussen, K. and Yaktine, A. (Eds) 2009. Weight Gain During Pregnancy: Reexamining the Guidelines. National Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. Academies Press (US). doi:10.17226/12584 *https://pubmed.ncbi.nlm.nih.gov/20669500/*
18. NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme*
19. NHS Digital, 2022. National Child Measurement Programme, England, 2021/22 School Year. *https://digital.nhs.uk/data-and-information/publications/statistical/national-child-measurement-programme*
20. Voerman, E., et al., 2019. Maternal Body Mass Index, Gestational Weight Gain, and the Risk of Overweight and Obesity across Childhood: An Individual Participant Data Meta-analysis. *PLoS Med* 16(2): e1002744. *https://doi.org/10.1371/journal.pmed.1002744*
21. Scifres, C.M., 2021. Short- and Long-term Outcomes Associated with Large for Gestational Age Birth Weight. *Obstetrics and Gynecology Clinics* 48, 325–337. *https://pubmed.ncbi.nlm.nih.gov/33972069/*
22. Yu, Z., et al., 2013. Pre-pregnancy Body Mass Index in Relation to Infant Birth Weight and Offspring Overweight/Obesity: A Systematic Review and Meta-analysis. *PLoS One* 8: e61627. *https://pubmed.ncbi.nlm.nih.gov/23613888/*
23. Kong, L., et al., 2020. Relationship of Prenatal Maternal Obesity and Diabetes To Offspring Neurodevelopmental and Psychiatric Disorders: A Narrative Review. *International Journal of Obesity* 44, 1981–2000. *https://www.nature.com/articles/s41366-020-0609-4*
24. Diabetes UK. Gestational Diabetes. *https://www.diabetes.org.uk/diabetes-the-basics/gestational-diabetes*
25. Poston, L., et al., 2015. Effect of a Behavioural Intervention in Obese Pregnant Women (the UPBEAT study): A Multicentre, Randomised Controlled Trial. *Lancet Diabetes Endocrinol. https://pubmed.ncbi.nlm.nih.gov/26165396/*
26. Torloni, M.R., et al., 2009. Prepregnancy BMI and the Risk of Gestational Diabetes: A Systematic Review of the Literature with Meta-analysis. *Obes. Rev.* 10, 194–203. *https://pubmed.ncbi.nlm.nih.gov/19055539/*
27. Kim, SY., et al, 2014. Association of Maternal Body Mass Index, Excessive Weight Gain, and Gestational Diabetes Mellitus with Large-for-gestational-age births. *Obstet Gynecol* 123(4):737–44. *https://pubmed.ncbi.nlm.nih.gov/24785599/*
28. Dabelea, D., et al., 2000. Intrauterine Exposure To Diabetes Conveys Risks For Type 2 Diabetes And Obesity: A Study Of Discordant Sibships. *Diabetes 49*(12), 2208–2211. *https://doi.org/10.2337/diabetes.49.12.2208*
29. Catalano, P.M., and Ehrenberg, H.M., 2006. The Short- and Long-term Implications of Maternal Obesity on the Mother and her Offspring. *Br J Obstet Gynaecol* 113: 1126–1133. *https://pubmed.ncbi.nlm.nih.gov/16827826/*

30. Wells, J.C., 2007. The Thrifty Phenotype as an Adaptive Maternal Effect. *Biol Rev Camb Philos Soc* 82: 143–172. *https://pubmed.ncbi.nlm.nih.gov/17313527/*

31. Nam, H.K., and Lee, K.H., 2018. Small for Gestational Age and Obesity: Epidemiology and General Risks. *Ann Pediatr Endocrinol Metab.,* 23, 9–13. *https://pubmed.ncbi.nlm.nih.gov/29609444/*

32. Biosca, M., et al., 2011. Central Adiposity in Children Born Small and Large for Gestational Age. *Nutr Hosp* 26: 971–6. *https://pubmed.ncbi.nlm.nih.gov/22072340/*

33. Meas, T., et al., 2008. Consequences of Being Born Small for Gestational Age on Body Composition: An 8-Year Follow-Up Study. *J Clin Endocrinol Metab* 93: 3804–3809. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2579646/*

34. Heaman, M., et al., 2013. Risk Factors for Preterm Birth and Small-for-gestational-age Births among Canadian Women. *Paediatr Perinat Epidemiol* 27: 54–61. *https://pubmed.ncbi.nlm.nih.gov/23215712/*

35. Kramer, M.S., 2003. The Epidemiology of Adverse Pregnancy Outcomes: An Overview. *The Journal of Nutrition*, 133(5) 1592S–1596S. *https://academic.oup.com/jn/article/133/5/1592S/4558557*

36. Thompson, J.M., et al., 2010. Maternal Dietary Patterns in Pregnancy and the Association with Small-for-gestational-age Infants. *Br J Nutr* 103: 1665–73. *https://pubmed.ncbi.nlm.nih.gov/20211035/*

37. Berkowitz, R.I., et al., 2005. Growth of Children at High Risk of Obesity during the First 6 years of Life: Implications for Prevention. *The American Journal of Clinical Nutrition* 81, 140–146. *https://pubmed.ncbi.nlm.nih.gov/15640473/*

38. Scientific Advisory Committee on Nutrition, 2011. The Influence of Maternal, Fetal and Child Nutrition on the Development of Chronic Disease in Later Life. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/339325/SACN_Early_Life_Nutrition_Report.pdf*

39. Campbell, J.M., and McPherson, N.O., 2019. Influence of Increased Paternal BMI on Pregnancy and Child Health Outcomes Independent of Maternal Effects: A Systematic Review and Meta-analysis. *Obesity Research & Clinical Practice 13*(6), 511–521. *https://pubmed.ncbi.nlm.nih.gov/31767240/*

40. Campbell, J.M., and McPherson, N.O., 2019. Influence of Increased Paternal BMI on Pregnancy and Child Health Outcomes Independent of Maternal Effects: A Systematic Review and Meta-analysis. *Obesity Research & Clinical Practice 13*(6), 511–521. *https://pubmed.ncbi.nlm.nih.gov/31767240/*

41. Relph, S., NMPA Project Team, 2021. NHS Maternity Care for Women with a Body Mass Index of 30 kg/m2 or Above: Births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland. *https://maternityaudit.org.uk/FilesUploaded/NMPA%20BMI%20Over%2030%20Report.pdf*

42. Public Health England, 2019. Health of Women Before and During Pregnancy: Health Behaviours, Risk Factors and Inequalities. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844210/Health_of_women_before_and_during_pregnancy_2019.pdf*

43. Relph, S., NMPA Project Team, 2021. NHS Maternity Care for Women with a Body Mass Index of 30 kg/m2 or Above: Births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland. *https://maternityaudit.org.uk/FilesUploaded/NMPA%20BMI%20Over%2030%20Report.pdf*

44. Relph, S., NMPA Project Team, 2021. NHS Maternity Care for Women with a Body Mass Index of 30 kg/m2 or Above: Births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland. *https://maternityaudit.org.uk/FilesUploaded/NMPA%20BMI%20Over%2030%20Report.pdf*

45. NHS Digital, 2020. National Pregnancy in Diabetes Audit Report. *https://digital.nhs.uk/data-and-information/publications/statistical/national-pregnancy-in-diabetes-audit*

46. NHS Digital, 2020. National Pregnancy in Diabetes Audit Report. *https://digital.nhs.uk/data-and-information/publications/statistical/national-pregnancy-in-diabetes-audit*

47. Relph., S., NMPA Project Team, 2021. NHS Maternity Care for Women with a Body Mass Index of 30 kg/m2 or Above: Births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland. *https://maternityaudit.org.uk/FilesUploaded/NMPA%20BMI%20Over%2030%20Report.pdf*

48. Scientific Advisory Committee on Nutrition, 2011. The Influence of Maternal, Fetal and Child Nutrition on the Development of Chronic Disease in Later Life. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/339325/SACN_Early_Life_Nutrition_Report.pdf*

49. Rogne, T., et al., 2017. Associations of Maternal Vitamin B12 Concentration in Pregnancy With the Risks of Preterm Birth and Low Birth Weight: A Systematic Review and Meta-Analysis of Individual Participant Data, *American Journal of Epidemiology* 185(3), 1 February 2017, Pages 212–223. *https://pubmed.ncbi.nlm.nih.gov/28108470/*

50. Snart, C.J.P., et al., 2020. Maternal Iodine Status, Intrauterine Growth, Birth Outcomes and Congenital Anomalies in a UK Birth Cohort. *BMC Med* 18, 132. *https://doi.org/10.1186/s12916-020-01602-0*

51. Farebrother, J., et al., 2021. Iodine Status of Pregnant Women with Obesity from Inner City Populations in the United Kingdom. *European Journal of Clinical Nutrition* 75, 801–808. *https://pubmed.ncbi.nlm.nih.gov/33184453/*

52. Keats, E.C., et al., 2019. Multiple-micronutrient Supplementation for Women during Pregnancy. *The Cochrane Database of Systematic Reviews* 3(3), CD004905. *https://doi.org/10.1002/14651858.CD004905.pub6*

53. Charnley, M., et al., 2021. Pregnant Women Living with Obesity: A Cross-Sectional Observational Study of Dietary Quality and Pregnancy Outcomes. *Nutrients* 13, 1652. *https://doi.org/10.3390/nu13051652*

54. World Health Organization Europe, 2016. Good Maternal Nutrition: The Best Start in Life. *https://www.euro.who.int/__data/assets/pdf_file/0008/313667/Good-maternal-nutrition-The-best-start-in-life.pdf*

55. National Institute for Health and Care Excellence, 2021. NICE Guideline: Maternal and Child Nutrition Final Scope. *https://www.nice.org.uk/guidance/gid-ng10191/documents/final-scope*

56. Ross, M.G., and Desai, M., 2014. Developmental Programming of Appetite/Satiety. *Annals of nutrition & metabolism* 64 Suppl 1, 36–44. *https://doi.org/10.1159/000360508*

57. Patel, N., et al., 2018. Mode of Infant Feeding, Eating Behaviour and Anthropometry in Infants at 6-months of Age Born to Obese women – a Secondary Analysis of the UPBEAT Trial. *BMC Pregnancy Childbirth* 18, 355 *https://doi.org/10.1186/s12884-018-1995-7*

58. Mennella, J. A., et al., 2001. Prenatal and Postnatal Flavor Learning by Human Infants. *Pediatrics* 107(6), E88. *https://doi.org/10.1542/peds.107.6.e88*

59. Public Health England, 2020. National Diet and Nutrition Survey Rolling programme: Years 9 to 11. (2016 to 2017 and 2018 to 2019). *https://www.gov.uk/government/statistics/ndns-results-from-years-9-to-11-2016-to-2017-and-2018-to-2019*

60. Whiting, L., et al. 2022. Gaining Insights into Food, Diet Practices and Nutrition during the Early Year's Lifespan: Preconception and Pregnancy: Final Report. University of Herefordshire. *https://doi.org/10.18745/PB.25454*

61. Power, M., et al., 2021. "The Reality is that on Universal Credit I cannot Provide the Recommended Amount of Fresh Fruit and Vegetables Per Day for my Children": Moving from Behavioural to a Systematic Understanding of Food Practices. *Emerald Open Res* 3:3. *https://doi.org/10.35241/emeraldopenres.14062.1*

62. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*

63. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*

64. Ohly, H., et al., 2019. A Realist Qualitative Study to Explore How Low-income Pregnant Women Use Healthy Start Food Vouchers. *Maternal & Child Nutrition 15*(1), e12632. *https://doi.org/10.1111/mcn.12632*

65. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*

66. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*

67. Obesity Health Alliance, 2019. Unhealthy Food Marketing: The Impact on Adults. *https://obesityhealthalliance.org.uk/wp-content/uploads/2019/05/JFM-Impact-on-Adults-Boyland-May-2019-final-002.pdf*

68. See *https://www.nhs.uk/start4life/pregnancy/healthy-eating-pregnancy/*

69. Theis, D.R.Z., and White, M., 2021. Is Obesity Policy in England Fit for Purpose? Analysis of Government Strategies and Policies, 1992–2020. *The Milbank Quarterly* 99: 126–170. *https://doi.org/10.1111/1468-0009.12498*

70. HM Government, 2022. Government Food Strategy. https://*www.gov.uk/government/publications/government-food-strategy/government-food-strategy*

71. HM Government, 2021.The Best Start for Life: A Vision for the 1,001 Critical Days. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/973112/The_best_start_for_life_a_vision_for_the_1_001_critical_days.pdf*

72. The Food Foundation, 2022. The Broken Plate. *https://foodfoundation.org.uk/sites/default/files/2022-07/FF_Broken_Plate_Report%202022_DIGITAL_3.pdf*

73. Public Health England, 2018. *Health Matters: Reproductive Health and Pregnancy Planning. https://www.gov.uk/government/publications/health-matters-reproductive-health-and-pregnancy-planning/health-matters-reproductive-health-and-pregnancy-planning*

74. McGowan, L., et al., 2020. Exploring Preconception Health Beliefs Amongst Adults of Childbearing Age in the UK: a Qualitative Analysis. *BMC Pregnancy and Childbirth* 41:20. *https://doi.org/10.1186/s12884-020-2733-5*

75. Public Health England, 2020. Maternity High Impact Area: Supporting Healthy Weight Before And Between Pregnancies. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/942476/Maternity_high_impact_area_3_Supporting_healthy_weight_before_and_between_pregnancies_.pdf*

76. Local Government Association, 2019. The Reduction In The Number Of Health Visitors In England, House Of Commons. *https://www.local.gov.uk/parliament/briefings-and-responses/reduction-number-health-visitors-england-house-commons-23;* Institute of Health Visiting, 2020. *H*ealth Visiting in England: State of Health Visiting in England. *https://ihv.org.uk/wp-content/uploads/2020/02/State-of-Health-Visiting-survey-FINAL-VERSION-18.2.20.pdf*

77. Duarte, C., et al. The Impact of Shame, Self-Criticism and Social Rank on Eating Behaviours in Overweight and Obese Women Participating in a Weight Management Programme. *PLoS One* 12(1):e0167571. doi: 10.1371/journal.pone.0167571. PMID: 28107449; PMCID: PMC5249118.

78. Public Health England, 2020. Maternity High Impact Area: Supporting Healthy Weight Before And Between Pregnancies. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/942476/Maternity_high_impact_area_3_Supporting_healthy_weight_before_and_between_pregnancies_.pdf*

79. Heslehurst, N., 2011. Identifying 'At Risk' Women and the Impact of Maternal Obesity on National Health Service Maternity Services. *Proc Nutr Soc* 70(4):439–49. doi: 10.1017/S0029665111001625. Epub 2011 Aug 22. PMID: 21854697. *https://pubmed.ncbi.nlm.nih.gov/21854697/*

80. Blackburn, M., et al., 2015. Raising the Topic of Weight in General Practice: Perspectives of GPs and Primary Care Nurses. *BMJ Open 5:e008546. doi: 10.1136/bmjopen-2015-008546*

81. McFadden, A., et al., 2014. Can Food Vouchers Improve Nutrition and Reduce Health Inequalities in Low-income Mothers and Young Children: A Multi-method Evaluation of the Experiences of Beneficiaries and Practitioners of the Healthy Start Programme in England. *BMC Public Health* 14, 148. *https://doi.org/10.1186/1471-2458-14-148*

82. Ohly, H., et al., 2019. A Realist Qualitative Study to Explore how Low-income Pregnant Women use Healthy Start Food Vouchers. *Maternal & Child Nutrition* 15(1), e12632. *https://doi.org/10.1111/mcn.12632*

83. Scotland has a separate scheme, Best Start Foods, which provides a prepaid card to those who are pregnant or have a child under 3 to buy healthy foods like milk or fruit and on government payments or benefits. See: *https://www.mygov.scot/best-start-grant-best-start-foods/how-it-works*

84. NHS Digital. Healthy Start. *https://www.healthystart.nhs.uk/what-youll-get-and-how-to-shop/#:~:text=You%27ll%20get%3A,1%20and%204%20years%20old*

85. Scottish Government, 2022. Best Start Foods: Evaluation. *https://www.gov.scot/publications/evaluation-best-start-foods/*

86. Letter from Maggie Throup, MP Parliamentary Under Secretary of State for Vaccines and Public Health to Kath Dalmeny, Chief Executive of Sustain, sent 6 September 2023. *https://foodfoundation.org.uk/sites/default/files/2023-01/DHSC%20response.pdf*

87. Dimbleby, H., 2021. National Food Strategy: The Plan. *https://www.nationalfoodstrategy.org/*

88. Public Health England, 2019. Health of Women Before and During Pregnancy: Health Behaviours, Risk Factors and Inequalities. *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844210/Health_of_women_before_and_during_pregnancy_2019.pdf*

89. Institute of Health Visiting, 2021. State of Health Visiting in England: December 2021. *https://mcusercontent.com/6d0ffa0c0970ad395fc6324ad/files/4a342579-e909-b467-c981-0441a83d7c13/State_of_Health_Visiting_Survey_2021_FINAL_VERSION_25.11.21.pdf*


The Food Foundation
International House, 6 Canterbury Crescent, London, SW9 7QD
foodfoundation.org.uk @Food_Foundation