Behavioral Health & Wellness Program

University of Colorado Anschutz Medical Campus
School of Medicine

DIMENSIONS: Well Body Toolkit for Healthcare Providers

SUPPLEMENT

Priority Populations: **Pregnant and Postpartum**

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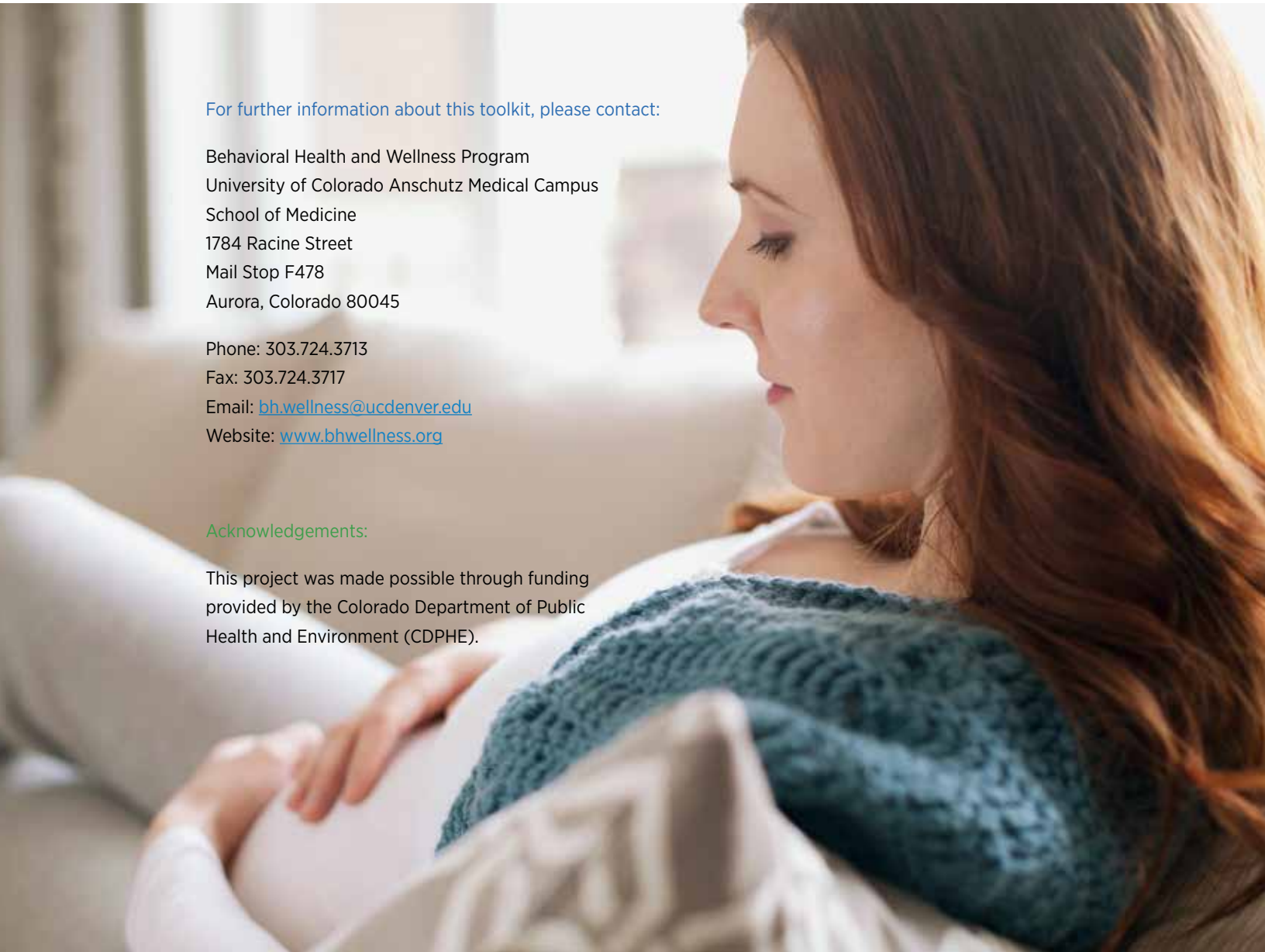

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Priority Populations: Pregnant and Postpartum

1. Why Focus on the Pregnant and Postpartum Population?
2. Consequences of Overweight and Obesity
3. Contributing Factors
4. Assessment and Interventions
5. Treatment
6. Resources

Why Focus on the Pregnant and Postpartum Population?

In the United States, over half of all reproductive aged women are either overweight or obese.[1] Women who are overweight or obese before, during, and after pregnancy are at risk for many serious health problems that can negatively affect the short- and long-term health of both mother and child.[2,3]

Since women are more likely to visit healthcare providers during their pregnancy and postpartum than in other times of their lives, healthcare providers who work with this population have a unique opportunity. In particular, providers have the chance to interact with women who are at high risk for unhealthy behaviors and chronic disease, but who would not otherwise seek medical care, such as women who have low incomes and/or limited access to resources.[4]

During pregnancy and postpartum, women are also highly motivated to achieve the best possible outcomes for themselves and their babies.[5] As such, provider interventions during this time that support good nutrition, weight management, and overall health and well-being can have a significant positive effect on future health behaviors. These behaviors benefit not only women but also their families for generations to come.

About This Toolkit

This supplemental toolkit provides information and guidance for healthcare professionals who want to improve health outcomes for pregnant and postpartum women through evidence-based interventions for overweight and obesity. Health and weight management interventions for this population are similar to evidence-based strategies for the general population. However, there are factors unique to this population that are important to consider.

This toolkit contains information about this population and ways to partner with individuals to help them reach their health goals. It is designed to be used in conjunction with the DIMENSIONS: Well Body Toolkit for Healthcare Providers, which contains evidence-based information about assessment, skills building, and interventions to provide support and resources around health and weight management.

Consequences of Overweight and Obesity

In the United States, 27% of women who are of reproductive age (18-44) are overweight (BMI 25 to 30) and an additional 25% are obese (BMI >30).[6] Moreover, approximately half of normal weight women and over two-thirds of overweight and obese women gain more weight during pregnancy than is recommended by the 2009 Institute of Medicine (IOM) gestational weight gain guidelines.[7,8] The health consequences for being overweight or obese for women are numerous and affect many aspects of a woman's health before, during, and after pregnancy.

Increased Risk for Many Serious Medical Conditions

Infertility

The consequences of obesity begin even before pregnancy. Compared with normal-weight women, obese women are less likely to achieve pregnancy spontaneously or after treatment with assisted reproductive technologies. Obesity has also been associated with increased risk for miscarriage.[9] A recent study has shown that meaningful weight loss (at least 10%) among obese women undergoing infertility treatments significantly increased conception rates and live births.[10]

Gestational Diabetes

Gestational diabetes occurs when women who have never had diabetes before experience high blood glucose (sugar) levels (i.e. hyperglycemia) during pregnancy. According to a recent report from the Centers for Disease Control (CDC), the prevalence of gestational diabetes in the U.S. is as high as 9.2%.[11] Pre-pregnancy obesity is the single biggest risk factor for the development of gestational diabetes, and excessive gestational weight gain also increases this risk.[12,13] An analysis of over 20 studies showed that the risk of developing gestational diabetes was 4 times higher for obese women compared with women of a healthy weight.[14]

If not managed properly during late pregnancy, extra blood glucose travels through the placenta to the growing baby. This results in high blood glucose levels, extra insulin production, and more energy than a developing baby needs. Gestational diabetes can lead to macrosomia, which is excessive birth weight or large size for gestational age.[15] Treating gestational diabetes reduces macrosomia, and it may also reduce the risk of childhood obesity.[16]

State Snapshot: Obesity Among Reproductive Aged Women[17]

Among a sample of Colorado women who gave birth in 2011, 39% were either overweight (23%) or obese (16%) prior to their pregnancy. This pre-pregnancy overweight/obesity percentage differed depending on women's race/ethnicity:

- Black – 18% overweight, 23% obese
- Hispanic – 26% overweight, 23% obese
- White – 23% overweight, 13% obese

Macrosomia

Macrosomia presents a variety of concerns for babies. Babies that are too large present difficulties during labor and delivery. Extra insulin can cause low blood glucose levels and breathing difficulties immediately after delivery, leading to low APGAR (appearance, pulse, grimace response, activity, respiration) scores and increased referral to neonatal intensive care.[18]

Special Topic: Metabolic Programming

We now know that genetics, sedentary lifestyles, and high caloric food intake alone cannot account for the dramatic increase in obesity observed over the last three decades. Metabolic programming appears to be a critical factor contributing to this large gap in obesity rates. Metabolic programming occurs when fetal nutrition during critical periods of development permanently alters an individual's physiology and metabolism.[19] It is now widely accepted that the intrauterine environment influences important developmental processes and has long-lasting effects on health and disease.[20]

Metabolic programming explains why malnutrition, undernutrition, and overnutrition can all lead to the same consequence: obesity and metabolic disorders in childhood and adulthood. In order to address the U.S. obesity epidemic, interventions need to start before children are born.

Undernutrition. The idea of metabolic programming originated from Barker's "thrifty phenotype hypothesis."[21] This idea suggests that offspring respond to environmental cues during early development in utero. When there is a shortage of available food and nutrients, the fetus is "programmed" to develop a metabolism that is "thrifty," using available nutrients in the most conservative way possible. Paradoxically, infants who were undernourished in utero, but who are later exposed to nutrient-rich environments, may be more prone to metabolic disorders, such as obesity and type II diabetes. Infants who receive adequate nutrition in utero are "programmed" to develop metabolisms that can better cope with a rich diet.

Overnutrition. If developing infants are exposed to more glucose than they need for proper growth in utero (i.e., fetal overnutrition), they can be "programmed" to become overweight and develop metabolic disorders later in life. In this way, obesity can be transmitted from generation to generation once it is established in a population. Large analyses of multiple studies indicate that both pre-pregnancy obesity and excessive weight gain during pregnancy increase the risk of childhood obesity. Specifically, maternal obesity was associated with a three-fold higher risk of offspring obesity, whereas excessive gestational weight gain was associated with a 33% increased risk of offspring obesity.[22,23] Macrosomic infants born to obese mothers have a two-fold increased risk for metabolic syndrome as children.[24]

Gestational Hypertensive Disorders

This group of disorders is characterized by high blood pressure during pregnancy. Hypertensive disorders are one of the most common medical complications during gestation, affecting 2-3% of all pregnancies.[25] Chronic hypertension doubles the risk of stillbirth because some women with high blood pressure during pregnancy will develop preeclampsia.[26] Preeclampsia is diagnosed when high blood pressure and signs of damage to another organ system (often the kidneys) are both present. Preeclampsia can potentially lead to dangerous and sometimes fatal complications for women and their infants. It can cause slow fetal growth, low birth weight, pre-term birth, or stillbirth. It can also lead to placental abruption (in which the placenta separates from the uterus before delivery) or damage to other maternal organ systems.

Pre-pregnancy obesity is strongly associated with the risk of gestational hypertensive disorders.[27] In fact, studies show that the risk of preeclampsia doubles with each 5-7 unit increase in pre-pregnancy BMI.[28,29]

Thrombosis

Thrombosis is the formation of a clot inside of a blood vessel. Because blood flows more slowly from the legs to the heart during pregnancy, clots are more likely to form than at other times. Although rare, blood clots can travel to the lungs and become lodged there, resulting in fatal embolisms. In fact, venous thromboembolism (VTE) is among the main causes of maternal death in the developed world.[30] Obesity and inactivity both increase the risk of blood clots during pregnancy.[31]

Infection

Women who are obese during pregnancy are at increased risk of having cesarean sections. As C-sections always carry an increased risk for infection, obese women are at higher risk for postpartum infections. Notably, they are also at increased risk for urinary tract infections and other postpartum infections, regardless of whether the baby was born vaginally or by C-section.[32]

Congenital Anomalies

Obese women are more likely than normal weight women to deliver infants with congenital anomalies such as neural tube defects, cleft lip and palate, hydrocephalus (an excess of cerebrospinal fluid surrounding the brain), limb abnormalities, and cardiac defects.[33,34] Moreover, ultrasounds that would normally detect such anomalies are particularly difficult to conduct when women are overweight or obese.[35]

Pre-Term Birth

Pre-term birth (defined as less than 37 weeks of gestation) is perhaps the most important factor influencing an infant's subsequent health and survival. Despite medical advances, more than 500,000 infants in the U.S. are born pre-term each year, accounting for over a third of infant deaths during the first year.[36,37] Women who deliver pre-term are more likely to be either underweight or obese before pregnancy.[38] Children who survive a pre-term delivery are at increased risk of physical and mental disabilities, including cognitive, neurologic, and behavioral disturbances.[39,40]

State Snapshot: Pre-Term Labor[41]

Among a sample of Colorado women who gave birth in 2011, 19% experienced a pre-term, or early, labor. By race/ethnicity these percentages were:

- Black women – 33%
- Hispanic women – 20%
- White women – 19%

Infant and Fetal Mortality

Obese women are at greater risk of suffering the loss of a fetus before it is born (intrauterine fetal demise, or IUFD). Women with a BMI of at least 35 have a three-fold increase of IUFD.[42] Similarly, infants born to obese women are at greater risk of dying soon after birth, even when other complications are taken into account.[43] Some of these infant deaths can be explained due to the increased risk of pre-term birth among obese women, but even infants born to obese mothers at full-term are at increased risk of mortality. Compared to normal weight women, those with a BMI of at least 35 have double the risk of suffering the loss of an infant.[44]

Shorter Duration of Breastfeeding

Breastfeeding can be challenging for obese women. Obesity is associated with decreased prolactin responses to infant suckling, which can lead to a diminished milk production and the decision to discontinue breastfeeding.[45] Several studies have shown an association between obesity and breastfeeding failure, even when socioeconomic status is controlled.[46,47]

Poor Health for Children

In addition to childhood obesity and metabolic syndrome, children born to overweight and obese mothers are at increased risk for other indicators of poor cardiovascular and respiratory health. Both pre-pregnancy obesity and excessive gestational weight gain – particularly in early pregnancy – have been associated with higher blood pressure, adverse lipid profiles, and higher inflammatory markers in childhood.[48,49,50] Pre-pregnancy obesity and excessive gestational weight gain are also associated with childhood asthma.[51,52] For each unit increase in maternal pre-pregnancy BMI, risk for childhood asthma increases by 3%.

Over half of all reproductive aged women are either overweight or obese.[53]

Postpartum Weight Retention

Postpartum weight retention leads to greater risk of excessive weight gain with subsequent pregnancies and predisposes women to obesity later in life.[54] Excessive gestational weight gain is a key modifiable risk factor for postpartum weight retention.[55,56]

A women's average postpartum weight retention is about 3.5 pounds at 6 months to a year.[57] Researchers have suggested that women who retain 6 pounds or more by 6 months postpartum experience major long-term weight gain, but there is no consensus as to how much postpartum weight retention is too much.[58] In particular, obese women with gestational diabetes have a very difficult time losing weight postpartum, possibly due to insulin resistance.

In addition to poor health outcomes for infants born to overweight and obese mothers, excessive gestational weight gain and postpartum obesity can lead to lower self-esteem, body image dissatisfaction, and symptoms of depression and anxiety among the mothers.[59,60,61]

Effects of Being Underweight Before and During Pregnancy:

Although women who are under their ideal weight prior to pregnancy are far less common in the U.S., being underweight during pregnancy poses risks to the mother and her developing fetus. Underweight women have increased risks of maternal iron-deficiency anemia, as well as risks for pre-term birth and giving birth to an infant with low birth weight. In turn, low birth weight is associated with childhood obesity and increased risks for heart disease, stroke, and hypertension later in life.[62]

Contributing Factors

Many factors contribute to increased overweight and obesity in pregnant and postpartum women and the related health outcomes for both mother and child. In particular, for women and their children who experience health disparities related to race/ethnicity and low-income, additional factors exist that should be examined and addressed during assessment and intervention.

Physical

Sleep. Survey data suggest that 26% of healthy pregnant women, on average, report sleeping less than 7 hours per night, and the odds of getting too little sleep were almost four times higher among working than non-working pregnant women.[63] For pregnant women, adequate sleep is essential not only for restoring physical and mental agility but also for fetal growth and development.[64] However, sleep disturbances during pregnancy are particularly common due to pregnancy-related physical discomforts such as nausea, back pain, and leg cramps as well as psychosocial factors, including increased stress and anxiety and inadequate social support.[65,66,67]

Short sleep duration (nighttime sleep of less than 7 hours) has been found to increase maternal glucose intolerance, which is associated with gestational diabetes, especially in overweight women.[68,69] Additionally, sleep-deprived women (less than 5 to 6 hours of sleep) are at a higher risk of pre-term birth.[70,71]

Obstructive sleep apnea predisposes pregnant women to increased risks of low birth weight, pre-term birth, small-for-gestational-age infants, C-section, and preeclampsia.[72] Finally, sleep deprivation is associated with increased weight retention postpartum.[73]

Psychological

Stress. Psychosocial stress occurs when there is an imbalance between demands placed on an individual and their ability to manage them. Psychosocial stress can be either acute, such as when a stressful life event occurs, or chronic, for example, ongoing stressful situations like poverty.

Pregnancy itself is a monumental life event and a significant stressor for a large segment of the U.S. population. Psychosocial stress during pregnancy (whether acute, chronic, or both) can lead to negative pregnancy outcomes, such as:

- Shorter gestations and lower birth weights;[74]
- Pregnancy induced hypertension, which restricts nutrient availability to the fetus;[75]
- Poor prenatal nutrition, which can lead to poor cognitive outcomes for children;[76]
- Impaired neurocognitive development;[77,78]
- Obesity and metabolic dysfunction in children;[79]
- Emotional and cognitive difficulties that persist into adolescence;[80,81]
- Behavioral disturbances such as ADHD and anxiety disorders;[82]
- Psychotic and depressive disorders.[83,84]

LINK: Tobacco Use in Pregnancy and Postpartum

Tobacco use has critical, adverse consequences for women and their developing babies before, during, and after pregnancy. For detailed information on this topic, see DIMENSIONS: Tobacco Free Toolkit Supplement for Pregnant and Postpartum Women.

Sociocultural

Race/Ethnicity

Racial and ethnic differences in risk factors for obesity persist throughout pregnancy, postpartum, and early childhood, leading to increased risk for childhood obesity. In particular, research shows that both Black and Hispanic women are more likely than White women to:

- Begin their pregnancies already overweight or obese;[85]
- Begin prenatal care in the third trimester of pregnancy, or obtain no prenatal care at all.[86]

As compared to White children, Black and Hispanic children are more likely to:[87]

- Be introduced to solid foods before four months of age;
- Experience rapid weight gain during infancy.

As compared to White children, Black and Hispanic children are less likely to:[88]

- Be exclusively breastfed;
- Sleep for at least 12 hours per day during infancy.

A Healthy Start...

Racial and ethnic disparities in women's health during the reproductive years have negative consequences that persist into future generations.

State Snapshot: Indicators of Reproductive Health[93]

Among a sample of Colorado women who gave birth in 2011, the following figures represent the percentage of women experiencing various indicators of poor health and well-being:

- High blood pressure during pregnancy – 10%
- Gestational diabetes – 6%
- Exercising fewer than 3 days per week – 44%
- Pre-pregnancy depression – 12%
- Financial stress – 50%
- Emotional stress – 27%
- Partner-related stress – 26%
- Black women – 33%
- Hispanic women – 20%

Socioeconomic Status

Socioeconomic status, a combination of income level, educational attainment, and occupation, also plays a role in risk factors for overweight and obesity.

- Women with less than a high school education or who have income less than 130% of the poverty threshold have twice the obesity rates as women of higher socioeconomic status.[89]
- Between 2001 and 2008, the rate of unintended pregnancies in the U.S. increased by 10%, with 51% of pregnancies being unintended in 2008.[90] The unintended pregnancy rate for poor women was five times that of women in the highest income category.
- Socioeconomic status (SES) has been associated with obesity, yet evidence indicates that differences in SES do not primarily explain racial/ethnic disparities in prenatal and early childhood obesity risk factors.[91,92]

Special Topic: Chronic Stress Related to Race/Ethnicity and Low Socioeconomic Status

Black and Hispanic women as well as socioeconomically disadvantaged women disproportionately experience chronic stress related to social disadvantages. This burden of chronic stress may contribute to disparities in reproductive health, such as increased obesity and other adverse birth outcomes.[94]

Chronic stress exposure related to race, ethnicity, and SES could be caused by lower education, job stress, discrimination, single parenthood, lack of social support, living in crowded conditions, and poverty. Chronic stress negatively impacts reproductive health by disrupting the hypo-thalamic-pituitary-adrenal axis system (HPA), which influences eating behaviors, metabolism, and stress reactivity.[95]

Racial, ethnic, and income disparities in childhood obesity start at the earliest stages of life.

Pregnant women with stressful life events or pregnancy complications have higher cortisol levels and greater HPA dysfunction, which promotes an increase in central fat distribution.[96,97] In recent research, chronic stress was associated with decreased birth weight overall and associated with the racial and ethnic disparities in birth weight – particularly for Black women.[98] Maternal SES has also recently been shown to affect cortisol levels during pregnancy, which in turn affects infant cortisol reactivity and HPA functioning soon after birth.[99] Changes in HPA functioning established early in life can negatively impact growth and cardiovascular, immune, reproductive, and cognitive systems.[100,101]

Assessment and Interventions

Talking with women about weight loss or weight management can be a challenge. Many overweight and obese women experience stigma related to their weight and likely have made several unsuccessful attempts at weight loss. Pregnant women may feel additional pressure related to the effect her weight and health can have on her developing fetus. Therefore, it is important that the conversation focus on the positive benefits of good nutrition and weight management for her health as well as that of her child.

The Role of the Healthcare Provider

To address overweight and obesity with pregnant women, strategies should focus on:

1. Achieving a healthy weight before becoming pregnant;
2. Well body education and interventions during pregnancy;
3. Maintaining a well body postpartum for both mother and child.

Tips for Talking with Pregnant & Postpartum Women About Health & Wellness

Start the Conversation: Since women may not bring up their concerns about their weight on their own, it is important for the healthcare provider to initiate the conversation. Focus on the positive benefits of a healthy weight on the short- and long-term health of the mother and child.

"Being at a healthy weight can improve pregnancy outcomes, can we spend a few minutes to talk about healthy weight and weight gain during pregnancy?"

"Pregnancy is a good time to practice healthy behaviors. Do you have any behaviors you consider unhealthy that you would like to change?"

"Do you have any concerns about your weight, eating, or physical activity?"

"Would you be willing to make some changes to your daily diet or activity?"

"All of us have ways we can improve our overall health. Are there any specific areas you would like to work on?"

Click here for access to the complete DIMENSIONS: Well Body Toolkit for Healthcare Providers

Take a Non-Judgmental Approach: Given the stigma overweight and obese women experience, it is important to talk from a non-judgmental stance. Be aware that this conversation can be an emotional one for many women who may already judge themselves negatively for being overweight or obese.

> Review the Assessment and Planning for Change section of the DIMENSIONS: Well Body Toolkit for Healthcare Providers for additional information and strategies to support change.

Be Sensitive to Cultural Differences: Educate yourself about different cultural perspectives on healthy weight. In particular, many cultures view pregnancy as a time to "eat for two" and gain more weight than is recommended. Be sure to adjust your message to address cultural norms. At the same time, educate the individual about healthy weight and weight gain during pregnancy, debunking any inaccurate myths.

The 5A's: The best way for providers to discuss health promotion and wellness is to use the "5A's" model. Although the 5A's model has not been specifically adapted for use with pregnant and postpartum women, it is a model familiar to many providers and can help to facilitate the conversation.

- Start by ASKing about their interest in maintaining a healthy weight or other well body goals
- ADVISE the individual to commit to making positive change in their health behaviors
- ASSIST by providing health education and information
- ASSESS their readiness and potential barriers to change
- ARRANGE follow-up as needed, including access to resources

Continue the Conversation: Whether a woman seems open to talking about her weight or health behaviors, be sure to continue to bring up the subject. Each time you talk about the importance of healthy weight, nutrition, and physical activity during pregnancy, there is an opportunity for change. It also acts as a reminder for the individual about the importance of maintaining a well body during pregnancy and beyond.

MOTIVATIONAL INTERVIEWING

Motivational interviewing is a collaborative conversation style for strengthening a person's own motivation and commitment to change.[102] Applying principles of motivational interviewing to everyday patient interactions has the potential to elicit behavior change that contributes to positive health outcomes. These changes could have an important impact on managing or preventing chronic diseases among women and their children. In addition, the principle of effective listening improves communication between patients and healthcare providers and increases patient satisfaction. Although the groundwork for eliciting behavior change can be set during a brief encounter, follow-up is helpful and often necessary to aid in the achievement of long-term, often incremental, results.[103]

For additional information on using motivational interviewing in the context of weight management, please review the Assessment and Planning for Change section of the DIMENSIONS: Well Body Toolkit for Healthcare Providers.

Well Body Recommendations During Pregnancy

Healthy Weight Gain

In 2009, the Institute of Medicine (IOM) published revised gestational weight gain guidelines that are based on pre-pregnancy BMI. These recommendations are independent of age, smoking history, and ethnic background. Healthcare providers who work with pregnant women should determine a woman's BMI at their initial prenatal visit. They should also offer education about the benefits of appropriate weight gain, nutrition, and exercise as well as the importance of limiting excessive weight gain to achieve the best pregnancy outcomes.[104]

Weight gain should occur gradually over the course of the pregnancy, with 1-4 pounds gained in the first trimester followed by approximately 1 pound per week during the second and third trimesters for normal weight women. The following guidelines are intended to be used in concert with good clinical judgment.

IOM Weight Gain Recommendations for Pregnancy[105]		
Pre-Pregnancy Weight Category	Body Mass Index*	Total Weight Gain Range (lbs)
Underweight	Less than 18.5	28 – 40
Normal Weight	18.5 – 24.9	25 – 35
Overweight	25 – 29.9	15 – 25
Obese (includes all classes)	30 and greater	11 – 20
*BMI is calculated as weight in kilograms divided by height in meters squared or as weight in pounds multiplied by 703 divided by height in inches.		

Well Body Recommendations During Pregnancy

Healthy Nutrition

There is an overwhelming body of evidence to demonstrate that nutritional influences encountered during early life have a lasting impact upon health and well-being. The potential impact of these findings is profoundly significant for public health because pregnancy and early infancy represent windows of opportunity during which parents are most willing to adopt lifestyle changes that could have health implications across multiple generations. The basic principles of healthy eating remain the same during pregnancy but with an emphasis on certain essential nutrients. These include:[106]

Click here for access to the complete DIMENSIONS: Well Body Toolkit for Healthcare Providers

Well Body Recommendations During Pregnancy

Healthy Physical Activity

In the absence of obstetric complications, pregnant women should exercise for 30 minutes or more at a moderate level on most, if not all, days.[107] The U.S. Department of Health and Human Services similarly recommends at least 150 minutes per week of moderate intensity aerobic activity.[108] For most healthy adults, a moderate level of exercise is equivalent to brisk waking at 3-4 miles per hour.[109] Despite these recommendations, only 23% of pregnant women surveyed between 1999 and 2006 met the DHHS exercise recommendations.[110] Healthcare providers should monitor participation in exercise programs during pregnancy to ensure there are no obstetric complications that would introduce risks associated with physical activity.

Benefits of Exercise

- May help prevent gestational diabetes, particularly in morbidly obese women (BMI >33);[111]
- Reduces risk of pre-term delivery, especially among women with BMI >24;[112]
- Reduces backaches, constipation, bloating, and swelling;
- Increases energy and mood;
- Promotes muscle tone, strength, and endurance, which may improve women's ability to cope with labor and reduce recovery time;
- Helps improve sleep.

Safe Physical Activities During Pregnancy

- Walking
- Swimming
- Cycling
- Aerobics
- Running (with some modification, and only if women were runners prior to pregnancy)

Activities to Avoid During Pregnancy

- Any activity in which there is a high risk of falling, such as gymnastics, water skiing, downhill snow skiing, and horseback riding. Changes in balance during pregnancy increase the chances of falling during these activities.
- Contact sports, such as hockey, basketball, and soccer
- Scuba diving, which can put a fetus at risk of decompression sickness – a serious illness that results from changes in the pressure surrounding the body.

Special Topic: Breastfeeding

As women begin breastfeeding, healthcare providers should discuss how to meet the nutritional demands breastfeeding requires. On average, women should consume an additional 450-500 calories per day. The American Academy of Pediatrics (AAP) recommends that women breastfeed exclusively for the first 6 months, and continue to breastfeed in addition to introducing solid foods for another 6 months. Women should be mindful of decreasing their caloric intake as they start to reduce the amount they are breastfeeding. This can be met through a modest decrease in a varied diet.

Healthcare providers should encourage women to breastfeed as it has been associated with improved infant and maternal health outcomes.[113]

In infants and children, breastfeeding is associated with reduction in:

- Ear, respiratory tract, and gastrointestinal infections
- Asthma and allergic diseases
- Celiac disease
- Inflammatory bowel disease
- Childhood leukemia and lymphoma
- Risk of sudden infant death syndrome
- Risk of childhood obesity and type 2 diabetes
- Negative neurodevelopmental outcomes

Among mothers, breastfeeding is associated with reduced:

- Blood loss after childbirth
- Risk for breast and ovarian cancers
- Risk of type 2 diabetes (though this benefit has not been observed for women with gestational diabetes)
- Risk for hypertension and cardiovascular disease
- Risk for postpartum depression and rates of child abuse and neglect

While there are many benefits to breastfeeding for mothers and infants, there are reasons why breastfeeding may not be feasible. These include single parenthood, multiple young children at home, multiple jobs, overcrowded housing, and lack of social support, among others. For these women, it is important for providers to support their decision not to breastfeed, particularly if it is the best decision for their family based upon the available resources.

Treatment

The most effective well body interventions are ones that match a woman's readiness to change and address her unique needs. Through a caring, supportive, and collaborative relationship, providers can effectively help women achieve a healthy weight as well as improve their overall health. It is important to shape a woman's well body goals based on health concerns that are most relevant to each individual. However, in order to ensure a low risk pregnancy and a healthy baby, addressing overweight and obesity prior to pregnancy is recommended.

Key qualities for well body treatment for pregnant and postpartum populations include:

Assess Motivation – Explore a woman's readiness to change her health behaviors. Identify her unique motivations to change as well as any ambivalence to change. Examine potential benefits for achieving a healthy weight as well as improved overall health behaviors. Discuss short- and long-term benefits for both the mother and baby. Be aware of and sensitive to different familial and cultural beliefs and practices. Depending upon a woman's readiness to change, it may take multiple discussions to shift her motivation to change her health behaviors.

Address Medical Concerns – Before conception, all known medical problems should be well controlled and women should be encouraged to undergo a weight reduction program to minimize risks associated with pre-pregnancy obesity. Since some pregnancies are unplanned, this may not always be achievable, but it is a good practice when possible.

Educate – Be sure not to assume any basic level of knowledge about healthy eating, physical activity, and other health behaviors. Some individuals, particularly those who experience health disparities, may not have had prior exposure to this information. Share specific information about the risks of obesity in pregnancy and postpartum. Optimally, this education would occur before a woman becomes pregnant so education about the risks of obesity for all women of reproductive age is beneficial. Provide this information through different means whether it may be handouts on display in the reception area, one-on-one conversations, or access to online resources, including videos.

Offer Counseling – Nutrition consultation should be offered to all overweight or obese women to optimize healthy food choices. Encourage participation in regular physical activity or an exercise program. Additionally, support women to participate in counseling focused on health behavior change and skills building. This can assist women to build the skills they need to make healthy decisions before, during, and after pregnancy. Some of these skills may include strategies for stress management and self-care, including good nutrition, sleep, physical activity, boundary setting, among others.

Track BMI – At the initial prenatal visit, height and weight should be recorded for all women to allow calculation of BMI, and recommendations for appropriate weight gain (using IOM guidelines) should be reviewed both at the initial visit and periodically throughout pregnancy. For an obese patient, it is reasonable to recommend a weight gain goal that is less than that of a healthy weight patient.

Resources

The following charts outline some key resources and programs targeted at pregnant women, women who want to become pregnant, and postpartum women who want to improve health outcomes for themselves and their children.

National Resources for Pregnant and Postpartum Women

Program	Description and Resources
Physical Activity	
Centers for Disease Control and Prevention	TThe CDC provides physical activity guidelines for healthy pregnant or postpartum women. http://www.cdc.gov/physicalactivity/everyone/guidelines/pregnancy.html
Mayo Clinic	The Mayo Clinic provides resources for women who want to educate themselves on pregnancy, including how and when to exercise. http://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy-and-exercise/art-20046896 They also provide instructions for safe exercises for pregnant women: http://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/multimedia/pregnancy-exercises/sls-20076779
Diet and Nutrition	
ChooseMyPlate.gov	The Pregnancy & Breastfeeding section of the USDA website provides advice to address the special nutritional needs of pregnant and breastfeeding women and includes a daily food plan with foods and amounts that are specific to each woman as well as a food tracker so women can see how their food choices compare to what they need. http://www.choosemyplate.gov/pregnancy-breastfeeding.html
American College of Obstetricians and Gynecologists (ACOG)	ACOG's frequently asked questions page provides advice on how to eat healthy during pregnancy. http://www.acog.org/Patients/FAQs/Nutrition-During-Pregnancy ACOG also provides a frequently asked questions page regarding gestational diabetes. http://www.acog.org/Patients/FAQs/Gestational-Diabetes
Fit for Two: Tips for Pregnancy	From the National Institute of Diabetes and Digestive and Kidney Disease, this brochure includes guidelines for how to stay active and how to maintain a healthy weight and diet during and after pregnancy. http://www.niddk.nih.gov/health-information/health-topics/weight-control/tips-for-two-pregnancy/Documents/fitfortwo.pdf

National Resources for Pregnant and Postpartum Women

Program	Description and Resources
Diet and Nutrition	
Mayo Clinic	The Mayo Clinic provides a week-by-week breakdown focused on the essential nutrients pregnant women should include in their diet. http://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy-nutrition/art-20045082
Sleep	
National Sleep Foundation	The National Sleep Foundation provides recommendations for optimum sleep health during pregnancy. http://sleepfoundation.org/sleep-topics/pregnancy-and-sleep
Breastfeeding	
WomensHealth.gov	The Department of Health and Human Services, Office on Women's Health provides an extensive list of breastfeeding resources available online. http://www.womenshealth.gov/breastfeeding/breastfeeding-resources.html

National Resources for Healthcare Providers

Program	Description and Resources
Association of Reproductive Health Professionals (ARHP)	ARHP brings together healthcare professionals across disciplines and specialties for evidence-based training and network building. Their website includes publications and resources on a variety of reproductive health topics. http://www.arhp.org/
Before Pregnancy Care	
Pre-Conception and Health Care Resource Center	Provided by the Centers for Disease Control and Prevention, the Resource Center is a comprehensive web directory of hyperlinks to tools and resources designed to advance the health of men and women of reproductive age. http://www.cdc.gov/preconception/freematerials.html
Association of Maternal and Child Health Programs (AMCHP)	AMCHP coordinates the Women's Health Information Series, consisting of quarterly webinars that showcase promising and evidence-based practices in women's and perinatal health, highlight federal and national initiatives and resources, and allow discussion of related policy and research. http://www.amchp.org/Calendar/Webinars/Womens-Health-Info-Series/Pages/default.aspx

National Resources for Healthcare Providers

Program	Description and Resources
Before Pregnancy Care	
Before, Between, and Beyond Pregnancy	The National Preconception Curriculum and Resources Guide for Clinicians is an interactive online toolkit. The toolkit is designed to help healthcare providers meet patient needs based on the response to "vital sign" question, "Are you hoping to become pregnant in the next year?" http://beforeandbeyond.org/toolkit/
Diet and Nutrition	
A Quick Reference Guide for Clinicians: Fish Consumption	The Association of Reproductive Health Professionals created a guide to help clinicians understand the health risks of certain fish consumption and recommendations for promoting good consumption of fish during pregnancy. https://www.arhp.org/uploadDocs/QRGfishandhealth.pdf
Obesity and Weight Gain	
American College of Obstetricians and Gynecologists (ACOG)	ACOG published a Committee Opinion on "Obesity in Pregnancy" outlining the complications that can occur during pregnancy for obese women. http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Obstetric-Practice/Obesity-in-Pregnancy ACOG's Committee Opinion on "Weight Gain During Pregnancy" offers advice for clinicians on following gestational weight gain guidelines. http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Obstetric-Practice/Weight-Gain-During-Pregnancy
Institute of Medicine (IOM)	The Institute of Medicine brief, "Weight Gain During Pregnancy: Reexamining the Guidelines" offers new recommendation for total weight gain and for rate of weight gain during pregnancy. https://www.iom.edu/Reports/2009/Weight-Gain-During-Pregnancy-Reexamining-the-Guidelines.aspx
Breastfeeding	
The CDC Guide to Strategies to Support Breastfeeding Mothers and Babies	The CDC Guide builds on research and evidence demonstrating effective intervention strategies to help promote breastfeeding practices with new mothers. http://www.cdc.gov/breastfeeding/resources/guide.htm

National Resources for Healthcare Providers

Program	Description and Resources
Postpartum Care	
A Quick Reference Guide for Clinicians: Postpartum Counseling	The Association of Reproductive Health Professionals created a guide for clinicians to help them administer postpartum care, including guidance on talking about diet, nutrition, and exercise as well as postpartum mental health and sexuality. https://www.arhp.org/uploadDocs/QRGpostpartum.pdf
The Edinburgh Postnatal Depression Scale	The Edinburgh Postnatal Depression Scale (EPDS) is a depression screening tool clinicians can use to evaluate their clients mental health during or after pregnancy. http://www.fresno.ucsf.edu/pediatrics/downloads/edinburghscale.pdf

Colorado-Specific Resources for Pregnant and Postpartum Women

Program	Description and Resources
Colorado WIC	The Supplemental Nutrition Program for Women, Infants, and Children is operated out of local public health agencies. The program provides nutrition information, breastfeeding support, healthy food, and other services to pregnant and breastfeeding women and children under age 5. https://www.colorado.gov/pacific/cdphe/wic-families
Nurse Family Partnership	A maternal health program that allows nurses to deliver the support first-time moms need to have a healthy pregnancy, become knowledgeable and responsible parents, and provide their babies with the best possible start in life. Services include health education, family planning, guidance on child development, prenatal care, and preparation for healthy delivery. http://www.nursefamilypartnership.org/
Child Health Plan Plus (CHP+)	A special healthcare program that is available to pregnant women with qualifying incomes. https://www.colorado.gov/pacific/hcpf/child-health-plan-plus
Prenatal Plus Program	A special program for pregnant women on Colorado Medicaid who qualify. The program provides a team of healthcare workers who assist in lowering the chances of having a baby with low birth weight. https://www.colorado.gov/pacific/hcpf/prenatal-plus

End Notes

[1] Robbins, C. L., Zapata, L. B., Farr, S. L., Kroelinger, C. D., Morrow, B., Ahluwalia, I., ... & Barfield, W. D. (2014). Core state preconception health indicators—Pregnancy Risk Assessment Monitoring System and Behavioral Risk Factor Surveillance System, 2009. *MMWR Surveillance Summaries, 63(*3), 1-62.

[2] Rasmussen, K. M., & Yaktine, A. L. (2009). *Weight Gain During Pregnancy: Reexamining the Guidelines.* Institute of Medicine, National Research Council, Committee to Reexamine IOM Pregnancy Weight Guidelines.Washington, DC: The National Academies Press.

[3] Poston, L., Harthoorn, L. F., & van der Beek, E. M. (2011). Obesity in pregnancy: Implications for the mother and lifelong health of the child. A consensus statement. *Pediatric Research, 69*(2), 175-180.

[4] Frost, J., Finer, L., & Tapales, L. (2008). The impact of publicly funded family planning clinic services on unintended pregnancies and government cost savings. *Journal of Health Care for the Poor and Underserved, 19,* 778-796.

[5] Phelan, S. (2010). Pregnancy: A "teachable moment" for weight control and obesity prevention. *American Journal Of Obstetrics and Gynecology, 202*(2), 135-e1.

[6] Robbins, C. L., Zapata, L. B., Farr, S. L., Kroelinger, C. D., Morrow, B., Ahluwalia, I., ... & Barfield, W. D. (2014). Core state preconception health indicators—Pregnancy Risk Assessment Monitoring System and Behavioral Risk Factor Surveillance System, 2009. *MMWR Surveillance Summaries, 63*(3), 1-62.

[7] Krukowski, R. A., Bursac, Z., McGehee, M. A., & West, D. (2013). Exploring potential health disparities in excessive gestational weight gain. *Journal of Women's Health, 22,* 494-500.

[8] Simas, T. A. M., Liao, X., Garrison, A., Sullivan, G. M. T., Howard, A. E., & Hardy, J. R. (2011). Impact of updated Institute of Medicine guidelines on pre-pregnancy body mass index categorization, gestational weight gain recommendations, and needed counseling. *Journal of Women's Health, 20,* 837-844.

[9] Klenov, V. E., & Jungheim, E. S. (2014). Obesity and reproductive function: A review of the evidence. *Current Opinion in Obstetrics and Gynecology, 26,* 455-460.

[10] Kort, D., Winget, C., Kim, S. H., & Lathi, R. B. (2014). A retrospective cohort study to evaluate the impact of meaningful weight loss on fertility outcomes in an overweight population with infertility. *Fertility and Sterility, 101,* 1400-1403.

[11] DeSisto, C. L., Kim, S. Y., & Sharma, A. J. (2014). Prevalence estimates of gestational diabetes mellitus in the United States, Pregnancy Risk Assessment Monitoring System (PRAMS), 2007-2010. *Prevention of Chronic Diseases, 11.*

[12] Gaillard, R., Durmus, B., Hofman A., Mackenbach, J. P., Steegers, E. A., & Jaddoe, V. W. (2013). Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. *Obesity, 21,* 1046-1055.

[13] Gaillard, R., Felix, J. F., Duijts, L., & Jaddoe, V. W. (2014). Childhood consequences of maternal obesity and excessive weight gain during pregnancy. *Acta Obstetrical Gynecology Scandanavia, 93,* 1085-1089.

[14] Chu, S. Y., Callaghan, W. M., Kim, S. Y., Schmid, C. H., Lau, J., England, L. J., & Dietz, P. M. (2007). Maternal obesity and risk of gestational diabetes mellitus. *Diabetes Care, 30*(8), 2070-2076.

[15] Ay, L., Kruithof, C. J., Bakker, R., Steegers, E. A., Witteman, J. C., Moll, H. A., ... & Jaddoe, V. W. V. (2009). Maternal anthropometrics are associated with fetal size in different periods of pregnancy and at birth. The Generation R Study. *BJOG, 116*(7), 953-963

[16] Crowther, C. A., Hiller, J. E., Moss, J. R., McPhee, A. J., Jeffries, W. S., & Robinson, J. S. (2005). Australian carbohydrate intolerance study in pregnant women (ACHOIS) Trial Group. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *New England Journal of Medicine, 352,* 2477-2486.

[17] Pregnancy Risk Assessment Monitoring System. (2011). *Colorado PRAMS Data: 2009-2011.* Colorado Department of Public Health and Environment. Retrieved from http://www.chd.dphe.state.co.us/topics.aspx?q=Maternal_Child_Health_Data

[18] Gaillard, R., Durmus, B., Hofman A., Mackenbach, J. P., Steegers, E. A., & Jaddoe, V. W. (2013). Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. *Obesity, 21,* 1046-1055.

[19] Dyer, J. S., & Rosenfeld, C. R. (2011). Metabolic imprinting by prenatal, perinatal, and postnatal overnutrition: A review. *Seminars in Reproductive Medicine, 29,* 266-276.

[20] Hajj, N. E., Schneider, E., Lehnen, H., & Haaf, T. (2014). Epigenetics and life-long consequences of an adverse nutritional and diabetic intrauterine environment. *Reproduction, 148,* R111-R120.

[21] Hales, C. N., & Barker, D. J. (1992). Type 2 (non-insulin-dependent) diabetes mellitus: The thrifty phenotype hypothesis. *Diabetologia, 35*(7), 595-601.

[22] Yu, Z., Han, S., Shu, J., Sun, X., Ji, C., & Guo X. (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.

[23] Tie, H. T., Xia, Y. Y., Zeng, Y. S., Zhang, Y., Dai, C. L., Guo, J. J., & Zhao, Y. (2014). Risk of childhood overweight or obesity associated with excessive weight gain during pregnancy: A meta-analysis. *Archives of Gynecology and Obstetrics, 289*(2), 247-257.

[24] Boney, C. M., Verma, A., Tucker, R., & Vohr, B. R. (2005). Metabolic syndrome in childhood: Association with birth weight, maternal obesity, and gestational diabetes mellitus. *Pediatrics, 115*(3), e290-e296.

[25] Mammaro, A., Carrara, S., Cavaliere, A., Ermito, S., Dinatale, A., Pappalardo, E. M., ... & Pedata, R. (2009). Hypertensive disorders of pregnancy. *Journal of Prenatal Medicine, 3*(1), 1-5.

[26] American Congress of Obstetricians and Gynecologists [ACOG]. (2009). ACOG technical bulletin. Clinical management guidelines for obstetrician-gynecologists – Management of stillbirth. *Obstetrics and Gynecology, 113*(3), 748-761.

[27] Gaillard, R., Felix, J. F., Duijts, L., & Jaddoe, V. W. (2014). Childhood consequences of maternal obesity and excessive weight gain during pregnancy. *Acta Obstetrical Gynecology Scandanavia, 93,* 1085-1089.

[28] O'Brien, T. E., Ray, J. G., & Chan, W. S. (2003). Maternal body mass index and the risk of preeclampsia: A systematic overview. *Epidemiology, 14,* 368-374.

[29] Bodnar, L. M., Catov, J. M., Klebanoff, M. A., Ness, R. B., & Roberts, J. M. (2007). Prepregnancy body mass index and the occurrence of severe hypertensive disorders of pregnancy. *Epidemiology, 18*(2), 234-239.

[30] Guimicheva, B., Czuprynska, J., & Arya, R. (2015). The prevention of pregnancy-related venous thromboembolism. *British Journal of Haematology, 168*(2), 163-174.

[31] Abassi, N., Balayla, J., Laporta, D., Kezouh, A., & Abenhaim, H. A. (2014). Trends, risk factors and mortality among women with venous thromboembolism during labor and delivery: A population-based study of 8 million births. *Archives of Gynecology and Obstetrics, 289*(2), 275-284.

[32] Pallasmaa, N., Ekblad, U., Gissler, M., & Alanen, A. (2015). The impact of maternal obesity, age, preeclampsia and insulin dependent diabetes on severe maternal morbidity by mode of delivery – A register-based cohort study. *Archives of Gynecology and Obstetrics, 291,* 311-318.

[33] Stothard, K. J., Tennant, P. W., Bell, R., Rankin, J. (2009). Maternal overweight and obesity and the risk of congenital anomalies: A systematic review and meta-analysis. *JAMA, 301*(6), 636-650.

[34] Rasmussen, S. A., Chu, S. Y., Kim, S. Y., Schmid, C. H., & Lau, J. (2008). Maternal obesity and risk of neural tube defects: A meta-analysis. *American Journal of Obstetrics and Gynecology, 198*(6), 611-619.

[35] Dashe, J. S., McIntire, D. D., & Twickler, D. M. (2009). Maternal obesity limits the ultrasound evaluation of fetal anatomy. *Journal of Ultrasound Medicine, 28,* 1025-1030.

[36] Hamilton, B. E., Martin, J. A., & Ventura, S. J. (2010). Births: Preliminary data for 2009. *National Vital Statistics Reports, 59*(3), 1-19. Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_03.pdf

[37] Institute of Medicine [IOM]. (2006). *Preterm birth: Causes, consequences, and prevention* [Report brief]. Retrieved from https://www.iom.edu/Reports/2006/Preterm-Birth-Causes-Consequences-and-Prevention.aspx

[38] Guendelman, S., Pearl, M., Kosa, J. L., Graham, S., Abrams, B., & Kharrazi, M. (2013). Association between preterm delivery and pre-pregnancy body mass (BMI), exercise and sleep during pregnancy among working women in southern California. *Maternal and Child Health Journal, 17,* 723-731.

[39] Bhutta, A. T., Cleves, M. A., Casey, P. H., Cradock, M. M., & Anand, K. J. S. (2002). Cognitive and behavioral outcomes of school-aged children who were born preterm: A meta-analysis. *JAMA, 288*(6), 728-737.

[40] Morse, S. B., Zheng, H.., Tang, Y., & Roth, J. (2009). Early school-age outcomes of late pre-term infants. *Pediatrics, 123,* e622-e629.

[41] Pregnancy Risk Assessment Monitoring System. (2011). *Colorado PRAMS Data: 2009-2011.* Colorado Department of Public Health and Environment. Retrieved from http://www.chd.dphe.state.co.us/topics.aspx?q=Maternal_Child_Health_Data

[42] Denison, F. C., Price, J., Graham, C., Wild, S., & Liston, W. A. (2008). Maternal obesity, length of gestation, risk of postdates pregnancy and spontaneous onset of labour at term. BJOG: An International *Journal of Obstetrics & Gynaecology, 115*(6), 720-725.

[43] Kristensen, J., Vestergaard, M., Wisborg, K., Kesmodel, U., & Secher, N. J. (2005). Pre-pregnancy weight and the risk of stillbirth and neonatal death. *BJOG: An International Journal of Obstetrics & Gynaecology, 112*(4), 403-408.

[44] Johansson, S., Villamor, E., Altman, M., Bonamy, A. E., Granath, F., & Cnattingius, S. (2014). Maternal overweight and obesity in early pregnancy and risk of infant mortality: A population based cohort study in Sweden. *British Medical Journal, 349,* g6572.

[45] Rasmussen, K. M., & Kjolhede, C. L. (2004). Prepregnant overweight and obesity diminish the prolactin response to suckling in the first week postpartum. *Pediatrics, 113*(5), e465-e471.

[46] Oddy, W. H., Li, J., Landsborough, L., Kendall, G. E., Henderson, S., & Downie, J. (2006). The association of maternal overweight and obesity with breastfeeding duration. *The Journal of Pediatrics, 149*(2), 185-191.

[47] Li, C., Kaur, H., Choi, W. S., Huang, T. T. K., Lee, R. E., & Ahluwalia, J. S. (2005). Additive interactions of maternal pre-pregnancy BMI and breastfeeding on childhood overweight. *Obesity Research, 13*(2), 362-371.

[48] Gaillard, R., Felix, J. F., Duijts, L., & Jaddoe, V. W. (2014). Childhood consequences of maternal obesity and excessive weight gain during pregnancy. *Acta Obstetrical Gynecology Scandanavia, 93,* 1085-1089.

[49] Fraser, A., Tilling, K., Macdonald-Wallis, C., Sattar, N., Brion, M. J., Benfield, L., ... & Lawlor, D. A. (2010). Association of maternal weight gain in pregnancy with offspring obesity and metabolic and vascular traits in childhood. *Circulation, 121*(23), 2557-2564.

[50] Dyer, J. S., & Rosenfeld, C. R. (2011). Metabolic imprinting by prenatal, perinatal, and postnatal overnutrition: A review. *Seminars in Reproductive Medicine, 29,* 266-276.

[51] Forno, E., Young, O. M., Kumar, R., Simhan, H., & Celedón, J. C. (2014). Maternal obesity in pregnancy, gestational weight gain, and risk of childhood asthma. *Pediatrics, 134*(2), e535-e546.

[52] Leermakers, E. T., Sonnenschein-van der Voort, A. M., Gaillard, R., Hofman, A., de Jongste, J. C., Jaddoe, V. W., & Duijts, L. (2013). Maternal weight, gestational weight gain and preschool wheezing. The Generation R Study. *European Respiratory Journal,* erj01482-2012.

[53] Robbins, C. L., Zapata, L. B., Farr, S. L., Kroelinger, C. D., Morrow, B., Ahluwalia, I., ... & Barfield, W. D. (2014). Core state preconception health indicators—Pregnancy Risk Assessment Monitoring System and Behavioral Risk Factor Surveillance System, 2009. *MMWR Surveillance Summaries, 63*(3), 1-62.

[54] Davis, E. M., Stange, K. C., & Horwitz, R. I. (2012). Childbearing, stress and obesity disparities in women: A public health perspective. *Maternal and Child Health Journal, 16,* 109-118.

[55] Amorim, A. R., Rossner, S., Neovius, M., Lourenco, P. M., & Linne, Y. (2007). Does excess pregnancy weight gain constitute a major risk for increasing long-term BMI? *Obesity, 15,* 1278-1286.

[56] Claesson, I. M., Sydsjö, G., Brynhildsen, J., Cedergren, M., Jeppsson, A., Nyström, F., ... & Josefsson, A. (2008). Weight gain restriction for obese pregnant women: A case–control intervention study. *BJOG: An International Journal of Obstetrics & Gynaecology, 115*(1), 44-50.

[57] Olson, C. M., Strawderman, M. S., Hinton, P. S., & Pearson, T. A. (2003). Gestational weight gain and postpartum behaviors associated with weight change from early pregnancy to 1 y postpartum. *International Journal of Obesity, 27*(1), 117-127.

[58] Rooney, B. L., & Schauberger, C. W. (2002). Excess pregnancy weight gain and long-term obesity: One decade later. *Obstetrics and Gynecology, 100,* 245-252.

[59] Webb, J. B., Siega-Riz, A. M., & Dole, N. (2009). Psychosocial determinants of adequacy of gestational weight gain. *Obesity, 17,* 300-309.

[60] Laraia, B. A., Siega-Riz, A. M., Dole, N., & London, E. (2009). Pregravid weight is associated with prior dietary restraint and psychosocial factors during pregnancy. *Obesity, 17*(3), 550-558.

[61] Duncombe, D., Wertheim, E. H., Skouteris, H., Paxton, S. J., & Kelly, L. (2008). How well do women adapt to changes in their body size and shape across the course of pregnancy? *Journal of Health Psychology, 13,* 503-515.

[62] Curhan, G. C., Chertow, G. M., Willett, W. C., Spiegelman, D., Coditz, G. A., Manson, J. E, ... & Stampfer, M. J. (1996). Birth weight and adult hypertension and obesity in women. *Circulation, 94,* 1310-1315.

[63] Facco, F. L., Grobman, W. A., Kramer, J., Ho, K. H., & Zee, P. C. (2010). Sleep disturbances in pregnancy. *Obstetrics & Gynecology, 115,* 77-83.

[64] Chang, J. J., Pien, G. W., Duntly, S. P., & Macones, G. A. (2010). Sleep deprivation during pregnancy and maternal and fetal outcomes: Is there a relationship? *Sleep Medicine Review, 14,* 107-114.

[65] American Academy of Sleep Medicine. (2005). *International classification of sleep disorders, revised: Diagnostic and coding manual.* Chicago, IL: Author.

[66] Ko, S. H., Chang, S. C., & Chen, C. H. (2010). A comparative study of sleep quality between pregnancy and non-pregnant Taiwanese women. *Journal of Nursing Scholarship, 42,* 23-30.

[67] Swanson, L. M., Pickett, S. M., Flynn, H., & Armitage, R. (2011). Relationships among depression, anxiety, and insomnia symptoms in perinatal women seeking mental health treatment. *Journal of Women's Health, 20,* 553-558.

[68] Facco, F. L., Grobman, W. A., Kramer, J., Ho, K. H., & Zee, P. C. (2010). Sleep disturbances in pregnancy. *Obstetrics & Gynecology, 115,* 77-83.

[69] O'Keeffe, M., & St-Onge, M-P, (2013). Sleep duration and disorders in pregnancy: Implications for glucose metabolism and pregnancy outcomes. *International Journal of Obesity, 37,* 765-770.

[70] Micheli, K., Ioannis, K., Emmanouel, B., Theano, R., Antonis, K., Manolis, K., & Leda, C. (2011). Sleep patterns in late pregnancy and risk of preterm birth and fetal growth restriction. *Epidemiology, 22,* 738-744.

[71] Kajeepeta, S., Sanchez, S. E., Gelaye, B., Qiu, C., Barrios, Y. V., Enquobahrie, D. A., & Williams, M. A. (2014). Sleep duration, vital exhaustion, and odds of spontaneous preterm birth: A case-control study. *BMC Pregnancy and Childbirth, 14,* 337.

[72] Chen, Y. H., Kang, J. H., Lin, C. C., Wang, I. T., Keller, J. J., & Lin, H. C. (2012). Obstructive sleep apnea and the risk of adverse pregnancy outcomes. *American Journal of Obstetrics & Gynecology, 206,* 136e1-136e5.

[73] Xiao, R. S., Kroll-Desrosiers, A. R., Goldberg, R. J., Pagoto, S. L., Person, S. D., & Waring, M. E. (2014). The impact of sleep, stress, and depression on postpartum weight retention: A systematic review. *Journal of Psychosomatic Research, 77,* 351-358.

[74] Dunkel-Schetter, C., & Tanner, L. (2012). Anxiety, depression and stress in pregnancy: Implications for mothers, children, research, and practice. *Current Opinions in Psychiatry, 25,* 141-148.

[75] Landsbergis, P. A., & Hatch. M. C. (1996). Psychosocial work stress and pregnancy-induced hypertension. *Epidemiology, 7,* 346-351.

[76] Monk, C., Georgieff, M. K., & Osterholm, E. A. (2013). Research Review: Maternal prenatal distress and poor nutrition – mutually influencing risk factors affecting infant neurocognitive development. *The Journal of Child Psychology and Psychiatry, 54,* 115-130.

[77] Buss, C., Davis, E. P., Muftuler, L. T., Head, K., & Sandman, C. A. (2010). High pregnancy anxiety during mid-gestation is associated with decreased gray matter density in 6–9-year-old children. *Psychoneuroendocrinology, 35*(1), 141-153.

[78] Mennes, M., Stiers, P., Lagae, L., & Van Den Bergh, B. (2006). Long-term cognitive sequelae of antenatal maternal anxiety: Involvement of the orbitofrontal cortex. *Neuroscience Biobehavioral Review, 30,* 1078-1086.

[79] Entringer, S. (2013). Impact of stress and stress physiology during pregnancy on child metabolic function and obesity risk. *Current Opinion in Clinical Nutrition and Metabolic Care, 16,* 320-327.

[80] Talge, N. M., Neal, C., & Glover, V. (2007). Antenatal naternal stress and long-term effects on child neurodevelopment: How and why? *Journal of Child Psychology and Psychiatry, 48,* 245-261.

[81] Tarabulsy, G. M., Pearson, J., Vaillancourt-Morel, M. P., Bussières, E. L., Madigan, S., Lemelin, J. P., ... & Royer, F. (2014). Meta-analytic findings of the relation between maternal prenatal stress and anxiety and child cognitive outcome. *Journal of Developmental & Behavioral Pediatrics, 35*(1), 38-43.

[82] Van Den Bergh, B. R., & Marcoen, A. (2004). High antenatal maternal anxiety is related to ADHD symptoms, externalizing problems, and anxiety in 8- and 9-year olds. *Child Development, 75,* 1085-1097.

[83] Khashan, A. S., Abel, K. M., McNamee, R., Pedersen, M. G., Webb, R. T., Baker, P. N., ... & Mortensen, P. B. (2008). Higher risk of offspring schizophrenia following antenatal maternal exposure to severe adverse life events. *Archives of General Psychiatry, 65*(2), 146-152.

[84] Markham, J. A., & Koenig, J. I. (2011). Prenatal stress: role in psychotic and depressive diseases. *Psychopharmacology, 214,* 89-106.

[85] Chu, S. Y., Callaghan, W. M., Bish, C. L., & D'Angelo, D. (2009). Gestational weight gain by body mass index among US women delivering live births, 2004-2005: Fueling future obesity. *American Journal of Obstetrics and Gynecology, 200,* 271: e1-e7.

[86] Bengiamin, M. I., Capitman, J. A., & Ruwe, M. B. (2010). Disparities in initiation and adherence to prenatal care: impact of insurance, race-ethnicity and nativity. *Maternal and Child Health Journal, 14*(4), 618-624.

[87] Taveras, E. M., Gillman, M. W., Kleinman, K., Rich-Edwards, J. W., & Rifas-Shiman, S. L. (2010). Racial/ethnic differences in early-life risk factors for childhood obesity. Pediatrics, 125, 686-695.

[88] Taveras, E. M., Gillman, M. W., Kleinman, K., Rich-Edwards, J. W., & Rifas-Shiman, S. L. (2010). Racial/ethnic differences in early-life risk factors for childhood obesity. *Pediatrics, 125,* 686-695.

[89] Singh, G. K., Siahpush, M., Hiatt, R. A., & Timsina, L. R. (2011). Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States, 1976–2008. *Journal of Community Health, 36*(1), 94-110.

[90] Finer, L. B., & Zolna, M. R. (2014). Shifts in intended and unintended pregnancies in the United States, 2001-2008. *American Journal of Public Health, 104*(Suppl 1), S43-S48.

[91] Taveras, E. M., Gillman, M. W., Kleinman, K., Rich-Edwards, J. W., & Rifas-Shiman, S. L. (2010). Racial/ethnic differences in early-life risk factors for childhood obesity. *Pediatrics, 125,* 686-695.

[92] Whitaker, R. C., & Orzol, S. M. (2006). Obesity among US urban preschool children: Relationships to race, ethnicity, and socioeconomic status. *Archives of Pediatric and Adolescent Medicine, 160,* 578-584.

[93] Pregnancy Risk Assessment Monitoring System. (2011). *Colorado PRAMS Data: 2009-2011.* Colorado Department of Public Health and Environment. Retrieved from http://www.chd.dphe.state.co.us/topics.aspx?q=Maternal_Child_Health_Data

[94] Giscombé, C. L., & Lobel, M. (2005). Explaining disproportionately high rates of adverse birth outcomes among African Americans: The impact of stress, racism, and related factors in pregnancy. *Psychological Bulletin, 131*(5), 662.

[95] Peters, A., Schweiger, U., Pellerin, L., Hubold, C., Oltmanns, K. M., Conrad, M., ... & Fehm, H. L. (2004). The selfish brain: Competition for energy resources. *Neuroscience & Biobehavioral Reviews, 28*(2), 143-180.

[96] Obel, C., Hedegaard, M., Henriksen, T. B., Secher, N. J., Olsen, J., & Levine, S. (2005). Stress and salivary cortisol during pregnancy. *Psychoneuroendorinology, 30,* 647-656.

[97] Epel, E. S., McEwen, B., Seeman, T., Matthews, K., Castellazzo, G., Brownell, K. D., Bell, J., & Ickovics, J. R. (2000). Stress and body shape: Stress-induced cortisol secretion is consistently greater among women with central fat. *Psychosomatic Medicine, 62,* 623-632.

[98] Strutz, K. L., Hogan, V. K., Siega-Riz, A. M., Suchindran, C. M., Tucker Halpern, C., & Hussey, J. M. (2014). Preconception stress, birth weight, and birthweight disparities among US women. *Research and Practice, 104,* e125.

[99] Thayer, Z. M., & Kuzawa, C. W. (2014). Early origins of health disparities: Material deprivation predicts maternal evening cortisol in pregnancy and offspring cortisol reactivity in the first few weeks of life. *American Journal of Human Biology, 26,* 723-730.

[100] Nepomnaschy, P., & Flinn, M. (2009). Early life influences on the ontogeny of the neuroendocrine stress response in the human child. In P. T. Ellison & P. B. Gray (Eds.), *Endocrinology of Social Relationships.* Harvard University Press.

[101] Nyberg, C. H., Leonard, W. R., Tanner, S., Mcdade, T., Huanca, T., & Godoy, R. A. (2012). Diurnal cortisol rhythms and child growth: Exploring the life history consequences of HPA activation among the Tsimane'. *American Journal of Human Biology, 24*(6), 730-738.

[102] Miller, W. R., & Rollnick, S. (2013). *Motivational Interviewing: Helping People Change* (3rd Ed.). New York, NY: The Guilford Press.

[103] American Congress of Obstetricians and Gynecologists [ACOG]. (2009). Committee Opinion no. 423: Motivational Interviewing: A Tool for Beh*avior Change. Obstetrics & Gynecology, 113,* 243-246.

[104] American Congress of Obstetricians and Gynecologists [ACOG]. (2013). Committee Opinion No. 549. Obesity in pregnancy. *Obstetrics & Gynecology, 121,* 213-217.

[105] Institute of Medicine [IOM]. (2009). *Weight Gain during Pregnancy: Reexamining the Guidelines.* Washington, DC. National Academies Press.

[106] Mayo Clinic. (2014). *Pregnancy diet: Focus on these essential nutrients.* Retrieved from http://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy-nutrition/art-20045082

[107] American Congress of Obstetricians and Gynecologists [ACOG]. (2002). Committee Opinion no. 267: Exercise during pregnancy and the postpartum period. *Obstetrics and Gynecology, 99,* 171-173.

[108] U.S. Department of Health and Human Services [USDHSS]. (2008). *2008 physical activity guidelines for Americans.* Washington, DC. Retrieved from http://www.health.gov/paguidelines/guidelines/default.aspx

[109] Artal, R., & O'Toole, M. (2003). Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. *British Journal of Sports Medicine, 37*(1), 6-12.

[110] Evenson, K., & Wen, F. (2010). National trends in self-reported physical activity and sedentary behaviors among pregnant women: NHANES 1999-2006. *Preventative Medicine, 50,* 123-128.

[111] Dye, T. D., Knox, K. L., Artal, R., Aubry, R. H., & Wojtowycz, M. A. (1997). Physical activity, obesity, and diabetes in pregnancy. *American Journal of Epidemiology, 146*(11), 961-965.

[112] Guendelman, S., Pearl, M., Kosa, J. L., Graham, S., Abrams, B., & Kharrazi, M. (2013). Association between preterm delivery and pre-pregnancy body mass (BMI), exercise and sleep during pregnancy among working women in southern California. *Maternal and Child Health Journal, 17,* 723-731.

[113] American Academy of Pediatrics [AAP]. (2012). Policy statement: Breastfeeding and the use of human milk. *Pediatrics, 129,* e827.

The Behavioral Health and Wellness Program's DIMENSIONS: Well Body Program is designed to train peers and providers to assist people to maintain a healthy lifestyle. The DIMENSIONS: Well Body Program Advanced Techniques training supports individuals to envision and achieve their Well Body goals through motivational engagement strategies, group process, community referrals, and educational activities. Contact the Behavioral Health and Wellness Program at bh.wellness@ucdenver.edu for more information.

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