Lactation Complicated by Overweight and Obesity: Supporting the Mother and Newborn
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Disclosures

Abstract and Introduction

Abstract
Research shows that mothers who are obese (with a BMI > 30) are less likely to initiate lactation, have delayed lactogenesis II, and are prone to early cessation of breastfeeding. Black women, with the highest rates of American obesity, have the lowest rates and shortest duration of breastfeeding compared to Hispanic and white women. Women who are overweight and obese have lowered prolactin responses to suckling. Women who are obese are at risk for prolonged labors, excessive labor stress, and cesarean birth, all of which delay lactogenesis II. Lactation has a small but significant role in preventing future obesity in the mother and child. Midwifery management of obesity-related lactation problems begins with education about optimal prenatal weight gain and regular weight assessment to avoid excessive gain. Support of physiologic birth processes to avoid stress, prolonged labor, and surgical birth and limit maternal-newborn separation enhances the onset of lactogenesis II. Massage or pumping may soften and extend the obese nipple for easier latch. Infants of lactating women with prior bariatric surgery are at risk for B12 deficiency and require regular nutrition and growth assessment. Five hundred calorie per day restriction paired with aerobic exercise for intentional postpartum weight loss does not affect milk quality or infant growth.

Introduction
Obesity related perinatal morbidity does not end with birth but continues to affect the maternal-infant dyad. Mothers who are obese are less likely to initiate lactation, have delayed lactogenesis II, and are prone to early cessation of breastfeeding. Obesity rates are highest among black women (49.6%), who have the lowest rate of breastfeeding initiation (45.3%) and breastfeeding continuation to 3 months (33.7%). White women and Mexican Hispanic women have lower rates of obesity (31% and 38.9%, respectively), have higher rates of breastfeeding initiation (68.7% and 76%), and are more likely to be breastfeeding at 3 months postpartum (48.7% and 54.3%).[1] However, a survey of lactation counseling practices for mothers who are obese showed that only 29% of 80 clinicians believed that women who are obese were less successful with breastfeeding than mothers.
who are normal weight. In a second survey of 31 lactation consultants, 23% asked for a definition of obesity.

This article reviews the prevalence of lactation problems related to overweight and obesity (as defined in a 1990 Institute of Medicine [IOM] report on nutrition in pregnancy) and excess prenatal weight gain. Current understandings of obesity related hormones and their effect on lactation, and the relationship of lactation to future maternal and infant obesity are also discussed. Finally, this article describes evidence-based techniques for clinicians to reduce the lactational impact of overweight, obesity, and excessive weight gain during the prenatal and intrapartum periods, as well as methods for supporting lactation in women who are obese.

Review of the Literature

Initiation of Lactation in Overweight and Obesity

Studies performed since 1995 have demonstrated reduced initiation of lactation by mothers who are obese. An Australian National Health Survey compared 1184 women with pregravid body mass index (BMI) measurements between 20 and 25 to 254 women with BMIs > 30, and found that 89.2% (95% confidence interval [CI], 87.4-91.0) of women who are normal weight initiated breastfeeding, compared with 82.3% (95% CI, 77.6-87.0) of women who are obese. These differences remained significant after adjustments for smoking, maternal age, and other sociodemographic factors.

A study of 1109 mother-infant dyads examined the relationship between maternal overweight and obesity and successful initiation of breastfeeding before hospital discharge. Multiple logistic regression adjusted for parity, length of gestation, mother’s age and education, economic background, cesarean birth, gestational diabetes (GDM), maternal smoking, and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Women who are obese had higher rates of GDM, higher birth weights and longer gestations, and increased cesarean births compared to women of normal weight. Women who are overweight and obese attempted breastfeeding at the same rate as women of normal weights (ORs = 1.2 and 1.1, respectively); however, significantly fewer women who are overweight and obese breastfed at hospital discharge (ORs = 2.54 and 3.56, respectively). This cohort was 99% white, eliminating racial/ethnic variations in obesity as a confounding variable. In a similar study of 587 Hispanic women and 640 black women, researchers found that obesity was associated with reduced initiation and duration of breastfeeding in Hispanic women but not in black women. These results for black women conflict with the national data cited above; the authors did not offer reasons for this discrepancy.
Another 124,151 mothers, who were participants in the Pregnancy and Pediatric Nutrition Surveillance System, were categorized using pregravid BMIs and the IOM’s 1990 guidelines for prenatal weight gain (Table 1). Less than half (47%) had normal pregravid weights, and 43% gained more weight in pregnancy than recommended by the IOM. Although 46% initiated breastfeeding, women who are obese, regardless of prenatal weight gain, were significantly less likely to initiate breast feeding than women of normal prepregnancy BMI who gained the recommended weight ($P < .01$).

### Duration of Lactation in Overweight and Obesity

Along with reduced initiation, mothers who are overweight and obese stop breastfeeding earlier than women of normal weights. In one study, the average duration of breastfeeding for mothers who are obese was about 2 weeks less than mothers of normal pregravid weights (average duration 14 wks) even after adjusting for infant birth weight, young maternal age, low maternal education, poverty, unmarried status, and smoking. In a second study, mothers who are overweight were more likely to terminate breastfeeding early (relative risk [RR], 1.42; $P < .04$), as were women who are obese (RR, 1.43; $P < .02$). There were significant drops in the rates of exclusive breastfeeding over the first 30 days postpartum. A later study of 114 lactating women who received daily phone follow-up for the first 5 days postpartum found that mothers who are obese intended to breastfeed for 3 fewer months than did mothers who are normal weight or overweight.

Prenatal weight gain, independent of pregravid BMI, affects lactation. Exceeding IOM prenatal weight gain recommendations (Table 1) in any BMI category reduces the odds of successfully initiating or sustaining lactation in all weight categories, but most significantly for women who are obese ($P < .01$).

### Studies on Lactation and Obesity in Animal Models

Dairy science literature from the 1970s describes delayed lactogenesis, milk fever, ketosis, and mastitis in overfat cows. Overfeeding prepubertal heifers reduces the volume of mammary gland epithelial cells and increases the number of adipocytes. Overfed rats had reduced mammary duct side branching and alveolar development with increased mammary adipose tissue during pregnancy. This impaired development reduced expression of $\beta$-casein and whey acid protein in the milk of obese rats on day one postpartum that normalized over 10 days, but $\alpha$-lactalbumin production remained decreased. If these effects occur in humans, the potential impairment of breast formation and development has implications for the 18% of American girls who are overweight and at risk for adult obesity.
Milk produced by obese rats has higher than normal fat concentrations, but volume is substantially reduced. Rats fed a high-fat diet before lactation have difficulty initiating lactation; during lactation, they exhibit low milk production associated with poor pup growth and high pup mortality rates. Litters from rats with low fat, unrestricted intake diets had significantly higher growth than the litters of rats fed either high fat or restricted, low fat diets. This demonstrates that a low fat diet can mitigate the negative effects of obesity and high fat feeding on lactation and pup growth.

Plasma insulin levels rose after 18 days of pregnancy and dropped by 3 days of lactation in lean but not in obese rats. Plasma prolactin levels also rose from 18 days of pregnancy through 3 days of lactation in lean but not obese rats. The importance of insulin and prolactin in sufficient glucose availability during milk synthesis suggests there may be important hormonal variables in the failure of lactogenesis in mothers who are obese.

**Delayed Human Lactogenesis**

Preparation for human lactation is divided into two stages. Lactogenesis I includes prenatal physical changes that prepare breast tissue for milk synthesis through colostrum production. Lactogenesis II, copious milk production, is stimulated by prolactin and begins approximately 2 days after birth. Progesterone inhibits lactogenesis II; therefore, in humans, lactogenesis II cannot start until the placenta, the main source of prenatal progesterone, is expelled.

The precipitous fall in progesterone levels following placental delivery triggers copious milk production in many mammals. Progesterone produced by retained placental fragments is known to prevent milk production. Adipose tissue concentrates and stores progesterone, leading to higher serum progesterone levels in women who are obese. Researchers tested the hypothesis that progesterone stored in excess human adipose tissue might prevent a rapid drop in progesterone after placental delivery from triggering lactogenesis II. In a study of 40 lactating mothers with term newborns, there were no differences in serum progesterone levels between 48 hours and 7 days postpartum when comparing mothers who are normal weight, overweight, or obese, thus casting doubt on adipose-stored progesterone as a lactation inhibitor.

Prolactin and cortisol are cofactors in milk production initiation, leading researchers to postulate that obesity blunts prolactin and cortisol production, further limiting lactogenesis II. Maternal serum prolactin, progesterone, insulin, glucose, estradiol, and leptin levels were measured in the previously cited 40 mothers at 48 hours and 7 days postpartum, both before and 30 minutes after the beginning of suckling. Progesterone, insulin, glucose, and estradiol levels did not differ significantly between women who are normal weight and obese. The prolactin response to suckling was significantly lower \((P<.05)\) in the
overweight/obese group than in the normal weight control group at 48 hours, but not at 7 days. Prolactin baseline levels decreased significantly from 48 hours to 7 days postpartum in both the normal and overweight/obese groups. Reduced prolactin in the first two days postpartum can lower colostrum production, which affects the hydration and energy intake of newborns.\[1\]

Another group\[19\] provided maternal blood samples to measure oxytocin, prolactin, and cortisol at the second morning breastfeed on day 2 postpartum at 20 and 30 minutes after sucking started. All women were healthy nonsmokers. Infants born vaginally averaged 75 minutes of age and infants born by cesarean section averaged 240 minutes before the first breastfeed. Women who had emergency cesarean surgeries lacked a significant rise in prolactin at 20 to 30 minutes after the onset of breastfeeding and had fewer pulses of oxytocin on day 2 postpartum than women who had given birth vaginally. Mode of birth and the first time the infant suckled were the most important influences on oxytocin levels in this study. However, other variables with potential influence included incomplete stage 2 hormonal progression, delayed initiation of breastfeeding, reduced skin-to-skin contact with the newborn, and increased use of pain relieving medications.

Leptin is an appetite-suppressing hormone produced by adipose tissue and the placenta. It functions as a growth hormone in pregnancy, with maternal levels dropping at birth. Women who are obese are hyperleptinemic and possibly leptin resistant. Leptin levels measured during lactation were significantly higher in obese women at 48 hours and 7 days.\[18\] Leptin inhibits oxytocin-induced contractions of the myometrium in vitro.\[20\] Because the milk ejection reflex is triggered by oxytocin, high leptin levels in obesity might inhibit lactogenesis by diminishing milk ejection.

In a qualitative study of 114 lactating women, increasing BMI was significantly associated with maternal perceptions of delayed onset of lactogenesis II.\[8\] For each single unit increase over a BMI of 20, there was a 0.5 hour delay in the perceived onset of lactogenesis II. For women with BMIs $\geq 40$, this would be a 10-hour delay. This delay is clinically important, because lactogenesis II may not occur before postpartum discharge. Once discharged, if women do not perceive the breast fullness characteristic of lactogenesis II, they may lack confidence in their ability to produce milk and switch to formula. Even a 5-hour delay in lactogenesis II could affect energy and hydration levels in newborns, particularly macrosomic infants.

Researchers prospectively followed 280 women, finding a significant association with a maternal BMI $> 27$, delayed onset of milk production (RR, 2.01; 95% CI, 1.45-3.64) and suboptimal infant breastfeeding behavior on day 7 postpartum (RR, 2.58; 95% CI, 1.07-5.22).\[21\] Although it was not clear how parity was considered in the analysis, delayed onset
of lactogenesis II was associated with a stage II labor of more than 1 hour (RR, 2.26; 95% CI, 1.24-3.57) and cesarean delivery (RR, 2.0; 95% CI, 1.00-3.31). Infants of women with BMIs > 27 were three times more likely to exhibit suboptimal breastfeeding behavior than infants of women who are normal weight. Obesity, long labor, primiparity, stress to the mother and fetus during labor, and cesarean birth have been independently associated with delayed onset of lactation in several studies.\(^{[5,21-23]}\)

### The Effect of Lactation in Preventing Future Obesity in the Infant

The reported associations between breastfeeding and the reduced risk of childhood obesity are compelling reasons to help mothers who are obese overcome lactation difficulties. However, studies of breastfeeding and childhood obesity are fraught with confounding variables, including mixed feeding methods, maternal recall bias, and analysis at different ages, and do not give clear correlations between breastfeeding and normal childhood weight. Owen et al.\(^{[24]}\) performed a meta-analysis of 61 studies reporting the relationship of infant feeding to the risk of later obesity. Comparisons summarized 28 published studies with 298,900 subjects and supported breastfeeding's risk reduction effect for future obesity. In the same year, Owen et al.\(^{[25]}\) analyzed 70 studies (60 published, 10 unpublished; 414,750 subjects total), concluding that, "Mean BMI is smaller among breastfed subjects. However, the difference is small and is likely to be strongly influenced by publication bias and confounding factors." Nonetheless, the United States Breastfeeding Committee supports exclusive breastfeeding for the first 6 months of life because it "may exert a small but positive influence in reducing the risk for obesity in childhood and later life..."\(^{[26]}\) Data from the National Health and Nutrition Examination Survey III\(^{[27]}\) indicates that current maternal weight is the strongest predictor of children's weight regardless of duration of breastfeeding.

### The Effect of Lactation in Preventing Future Maternal Obesity

Lactation has higher energy requirements than pregnancy, utilizing approximately 500 calories daily. Most lactating mothers should lose body weight and subcutaneous fat during the postpartum period. Undernourished mothers or those with high levels of physical activity would have higher losses.\(^{[28]}\) Mothers who are overweight and obese who do not breastfeed, who breastfeed for short periods, and who have reduced physical activity, may not return to their pregravid weights during the first 6 months postpartum.\(^{[29]}\)

Some women intentionally increase physical exercise while lactating to augment weight loss. Researchers\(^{[30]}\) randomly assigned lactating mothers to a group that restricted intake by 500 calories a day and exercised for 45 minutes 4 days a week, or the control group, who neither restricted intake nor exercised more than once a week. After 10 weeks, the
intervention group lost four times more weight and fat mass than the control group, with no significant effect on infant growth.

Is calorie restriction with weight reduction safe for breastfed infants? Twenty-one average weight and 19 Mexican Indian women who were overweight studied for 6 months postpartum. All women lost weight over 6 months postpartum. Energy balance was not associated with milk volume, composition, nutrients, or infant growth velocity. Studies indicate that the effect of lactation on weight loss seems to end at about 6 months postpartum. Randomized interventions showed that breastfed infants of mothers who are overweight, who dieted and exercised to lose an average of 1.10 pounds per week, had normal growth.

Clinical Implications: Evidence-Based Lactation Support for Mothers Who Are Obese

Many of the midwifery support techniques described in the following sections are best practice for all lactating mothers. These techniques become especially important for obese women or those who gained weight excessively during pregnancy, as their altered hormonal milieu and physiology pose additional challenges to the initiation of lactation.

**Prenatal Preparation**

Planned midwifery support helps to assure that women who are overweight and obese are able to initiate and sustain breastfeeding. Advice on the 1990 IOM prenatal weight gain targets (Table 1) to prevent excessive weight gain must begin at the first prenatal visit for maximum effectiveness. Recommendations based on pregravid or first trimester BMI require accurate measurement of height and weight and calculation of BMI. Twenty-four to 48-hour nutrition recall can be used to identify nutrition patterns. Advice should center on the adequate caloric intake of nutritious foods with sufficient protein and iron while counseling the mother who is obese to avoid non-nutritious foods, such as soda and candy. Mothers should never be advised to lose weight during pregnancy.

Advising non-exercising mothers to "take the baby for a walk" improves their aerobic capacity for labor and prepares them for ambulation in labor and postpartum exercise. Walking 30 minutes a day can be accomplished in 10 to 15 minute increments. Mothers who are obese who have been sedentary may need to start with 10 minutes of daily walking increased gradually at weekly intervals.

Medicaid does not pay for nutrition counseling in all states. WIC nutritionists, however, can be a valuable source of educational support. Women who are obese may qualify for WIC services under medical diagnoses, such as anemia, inadequate weight gain, or excessive weight gain during pregnancy. Obesity indicates previous excess caloric intake, not
necessarily adequate nutrition. Abnormal weight gain can be followed more closely with visits at 1- to 2-week intervals using the International Classification of Diseases 9 code 646.1 (maternal obesity syndrome/excessive weight gain). Preventing excessive weight gain reduces the risk of macrosomia and cesarean birth, which further complicate lactation for mothers who are obese. Intrapartum Support

Because excessive stress during labor and surgical birth can alter the initiation of lactation and delay lactogenesis II, intrapartum midwifery techniques, such as ambulation and frequent position changes, should be used to allow the birth to be as physiologic as possible. Pain management techniques that reduce the amount of newborn sedating medication, such as hot packs and acupressure, can increase infant alertness and enhance early sucking strength and coordination. Studies of the effect of epidural analgesia and anesthesia on lactation have conflicting results. Women who are obese are at risk for surgical birth, and therefore, exposure to epidural anesthesia. When needed, epidural analgesia with low dose fentanyl or bupivacaine instead of other anesthetics may limit problems with breastfeeding initiation and duration.

Postpartum Support

**Early Feeding.** Every effort should be made to keep the mother and newborn together including during postcesarean recovery periods. Newborns should be put to the mother's breast as soon as possible to facilitate early and frequent suckling. This triggers prolactin and oxytocin production, potentially negating the obesity-related blunting of the prolactin response. Oxytocin released during nipple stimulation also reduces the increased risk of postpartum hemorrhage in women who are obese, by causing uterine contractions that constrict endometrial arteries.

Skin-to-skin positioning maintains close proximity to the breasts for early, frequent feedings, which are critical to the prevention of hypoglycemia in macrosomic newborns. Skin-to-skin contact also assists with the stabilization of respirations, heart rate, thermoregulation, and the conservation of energy. Mothers who are overweight, obese, or those with excessive prenatal weight gains should breastfeed on demand, approximately 10 to 12 times in 24 hours, until the onset of lactogenesis II.

**Nipple/Latch Techniques.** In addition to having larger breasts, excess periareolar adipose tissue may flatten the areola and nipple in women who are overweight and obese, making the nipple more difficult for the newborn to grasp (Figure 1). The mother who is obese with flat nipples may utilize a sandwich technique to insert her breast into the baby's mouth and elicit sucking. In the sandwich technique, the mother grasps her breast by making a "C"
with a thumb and index finger. The thumb stabilizes the top of the breast while the other four fingers support the breast from below. Sandwiching the breast in this manner allows it to be lifted to the newborn's mouth. A mother with flat or inverted nipples may benefit from pumping to make the nipple more erect before offering the breast to the newborn. In time, most women respond to pumping and infant sucking with increased nipple protractility. The use of a nipple shield to achieve latch may be an alternative, but this requires close follow-up to ensure adequate milk transfer. No studies have examined the use of nipple shields to assist latch on the obese breast.

Figure 1.

Breast stabilization with towel roll. Use of a towel roll to stabilize the breast during feeding and reduce traction on Cooper's suspensory ligaments. Note the enlarged, flattened areola.

An effective latch assures that the nipple receives adequate stimulation and that the infant transfers milk effectively. The midwife may be able to evaluate latch during postpartum exams. In some settings, latch evaluation and ongoing lactation support may be provided by a lactation consultant or postpartum nurse. The critical attributes of an effective latch have been identified as positioning, latch, sucking, and milk transfer.

Assisting the mother to achieve a comfortable position is an essential first step in effective breastfeeding. A mother who is overweight or obese will need back support and sufficient space to move the infant during positioning. Large beds and wide chairs may be needed for comfortable movement and positioning. The weight of large and heavy breasts should not rest on the infant's chest. Walker suggests placing a towel roll under large breasts to assist with stabilization (Figure 1). A correctly positioned infant is held facing the mother level with the breast, has a wide open mouth, flared lips, and chin touching the breast. An effective latch is asymmetric, with more areola visible above the baby's mouth.

If engorgement of the areola is present, then reverse pressure softening (gentle inward pressure around the areola) can be utilized to soften the areola and enable the infant to achieve an effective latch. Reverse pressure softening may also stimulate the milk ejection reflex. It can be performed by a healthcare provider, the mother, or a significant other, and should be done before latching or pump use to alleviate areolar engorgement and assist with the removal of milk.
If an infant latches but does not suckle, alternate massage can be used to assist with transfer of milk. Alternate massage is done by applying pressure to the breast to assist with transfer of milk and breast emptying during pauses in infant suckling. This technique can provide encouragement for the infant to maintain an effective suckling pattern while maximizing milk transfer.

Typical breastfed infant stools and wet diapers should be reviewed with mothers so that they have appropriate output expectations. They should expect that once lactogenesis II starts, the number of stools will increase and the infant will wet at least six to eight diapers a day.

If the infant is not able to latch and feed effectively, then colostrum should be given to the infant in a manner that least compromises the transition to breastfeeding. Methods include spoon, cup, or finger feeding, and the infant should be held upright to feed with any of these methods. An amount of 0.5 mL can be easily swallowed by the infant. Providing the infant an initial snack of colostrum may boost energy so that the infant achieves a latch and initiates sucking. Hand expression of colostrum can be more effective than pumping and allows for easier collection.

**Milk Pumping.** If mother and infant are separated, milk production should be stimulated by emptying the breasts every 2 to 3 hours using a hospital grade pump. Double pumping, using a breast pump configured to pump both breasts simultaneously, in addition to breast massage has been shown to increase prolactin levels and produce better milk output. Additionally, double pumping halves pumping time, giving new mothers more resting time. The standard 24-mm breast pump shield may not sufficiently cover an obese breast, causing rubbing and strangulation with each pull, eventually leading to nipple damage. Ensuring that the breast shields provided are large enough will make pumping more effective and avoid nipple trauma. Figure 2 shows a standard breast shield compared to a large shield, and a nipple measurement tool to assist with shield fitting, equipment that should be available on all postpartum units. Information and support should be provided regarding breast pump use, storage and transport of breast milk, and infant feeding techniques. Mothers should be aware of community resources that provide rental or loans of breast pumps.
Large and standard breast shields with sizing tool.

**Breastfeeding Post-Bariatric Surgery.** Bariatric surgery with gastric banding or bypass is increasingly available to women whose BMI exceeds 35, who have been unsuccessful with other weight loss methods, or who have obesity related infertility. There are case reports of vitamin B12 deficiency and failure to thrive in breastfed infants of mothers who had gastric bypass surgery, most likely because of the maternal lack of gastric intrinsic factor needed to absorb vitamin B12. These mothers will need multivitamin supplements with regular nutrition and infant growth surveillance, and may need parenteral vitamin B12 supplementation.

**Intertrigo.** Intertrigo, the inflammation of skinfolds caused by skin-to-skin or clothing friction, is a common problem of the obese breast. Intertrigo progresses from erythema and maceration to reddened plaques that may have fissures and exudates. Women may complain of intense itching, burning, and pain as intertrigenous areas become secondarily infected with bacteria or fungi, most commonly Candida. Although the obese breast needs a bra with firm support, care must be taken that the fit is non-constricting and that the fabric is light, non-synthetic, and porous. Mothers who are obese must clean and thoroughly dry breast skin folds daily. Protective creams may be used as skin barriers or cornstarch as a drying agent. Mothers should be taught the symptoms of candidal breast infections and to recognize the cottony white oral patches or tongue plaques of infant oral thrush. Secondary infections should be treated with the appropriate antibiotic or antifungal agent.

**Post-Discharge Lactation Support Plan.** Completing a lactation support plan (Table 2) before hospital discharge, as well as providing close follow-up, may be critical to continued breastfeeding for obese women. Discharge teaching should consist of a review of infant feeding cues, achievement of a comfortable and appropriate latch, duration and frequency of breast feedings, the identification of infant swallowing, and indicators of adequate infant intake. Giving parents a log to record daily stools and urine, breast feedings, and breast assessments may assist with the recognition of adequate output and early identification of problems. Contacts for breastfeeding assistance such as WIC offices, La Leche League, and local lactation consultants should be provided as resources upon discharge. Midwifery practices with home visit capacity are ideally organized to provide support during the first postpartum weeks when women who are obese are likely to have reduced perceptions of breast fullness and milk production. Midwives can observe lactation, assess infant hydration, and reassure the mother about infant growth and her breastfeeding capability.

Mothers who are overweight and obese should be encouraged to choose low fat foods during lactation. In the absence of chronic disease, such as heart disease or asthma, mothers may resume physical exercise gradually until they are walking at least 30 minutes
per day. Exercise may be done in 15-minute increments. Physical activity helps burn excess intake if weight stabilization or loss is desired postpartum. Mothers may restrict intake no lower than 1500 calories a day to lose weight, but should wait until lactation is well established.\(^{29-32}\)

**Conclusion**

Midwives can reduce the risk of both maternal and childhood obesity by recognizing maternal obesity and its potential affects on lactation, initiating lactation preparation during pregnancy, and optimizing maternal prenatal weight gain. Lactation support continues as midwives provide physiologic labor support that reduces labor stress and complications that might separate mother and newborn or suppress lactational hormones. Finally, midwives can plan lactation support based on maternal risk factors and provide on-going postpartum support that maximizes breastfeeding success for mother and newborn.


