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Labor and Delivery Experiences of Mothers with Suspected Large Babies

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Abstract

Objective—To characterize the prevalence of and factors associated with clinicians' prenatal suspicion of a large baby; and to determine whether communicating fetal size concerns to patients was associated with labor and delivery interventions and outcomes.

Methods—We examined data from women without a prior cesarean who responded to *Listening to Mothers III*, a nationally representative survey of women who had given birth between July 2011 and June 2012 (n=1,960). We estimated the effect of having a suspected large baby (SLB) on the odds of six labor and delivery outcomes.

Results—Nearly one-third (31.2%) of women were told by their maternity care providers that their babies might be getting "quite large"; however, only 9.9% delivered a baby weighing ≥4,000 grams (19.7% among mothers with SLBs, 5.5% without). Women with SLBs had increased adjusted odds of medically-induced labor (AOR 1.9; 95% CI: 1.4–2.6), attempted self-induced labor (AOR 1.9; 95% CI: 1.4–2.7), and use of epidural analgesics (AOR 2.0; 95% CI: 1.4–2.9). No differences were noted for overall cesarean rates, although women with SLBs were more likely to ask for (AOR 4.6; 95% CI: 2.8–7.6) and have planned (AOR 1.8; 95% CI: 1.0–4.5) cesarean deliveries. These associations were not affected by adjustment for gestational age and birthweight.

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Conclusion—Only one in five US women who were told that their babies might be getting quite large actually delivered infants weighing ≥4,000 grams. However, the suspicion of a large baby was associated with an increase in perinatal interventions, regardless of actual fetal size.

Keywords

Suspected Macrosomia; Mode of Delivery; Labor Induction

INTRODUCTION

Fetal macrosomia (birthweight ≥4,000 grams or 8 pounds, 13 ounces) is a common condition that occurs in 7.9% of births in the United States.(1) Documented maternal risk factors for fetal macrosomia include obesity, multi-parity, older age, white race, and diabetes.(2) Fetal macrosomia, in turn, is associated with increased risks of newborn complications, such as shoulder dystocia, respiratory distress syndrome, hyperbilirubinemia, metabolic disorders, and neonatal hospitalization.(2–4) Studies have also reported higher rates of labor and delivery complications in cases of fetal macrosomia, including prolonged duration of delivery, cesarean delivery, perineal tears, and postpartum hemorrhage.(2, 3, 5)

These potential dangers to women and their neonates may justify early recognition of fetal macrosomia and intervention (e.g., cesarean section when the mother reaches certain criteria) to prevent its complications. However the use of medical interventions in this population has been debated, not only because of the relative inaccuracy of detecting fetal macrosomia prenatally, but also due to a lack of evidence of improved outcomes.(6–8) A recent review of commonly used formulas for detecting fetal macrosomia found that none reached acceptable detection and false positive rates that could lead to clinical recommendation.(9) Moreover, the American Congress of Obstetricians and Gynecologists (ACOG) rejects suspected fetal macrosomia as an indication for induction of labor or cesarean delivery, except in cases where estimated birthweights are greater than 5,000 grams (7, 10) (11 pounds, 1 ounce, which occurs in 0.12% of all term births annually).(1) Yet while macrosomia rates among singleton births have slightly declined in recent years,(8) the percentage of cesarean deliveries among macrosomic infants increased between 1989–2002 (11) and providers continue to intervene when macrosomia is suspected.(12–14)

Currently, there is limited information regarding the influence of patient or provider suspicion of macrosomia on the decision to use certain delivery procedures (e.g., pain management, induction, elective cesarean). Because of the potential for use of non-medically indicated interventions, it is important to know both the accuracy of such suspicions and whether they are influential to clinical decision-making. Previous studies have found a “suspected large baby” to be associated with interventions such as induction of labor and cesarean delivery.(8, 15–21) These studies were conducted in clinic-based or non-US samples, which may preclude the generalizability of findings to the US population as a whole. Therefore, we characterized the prevalence of and factors associated with clinicians’ prenatal suspicion of a large baby and determined whether communicating fetal size concerns to patients was associated with select labor and delivery interventions and outcomes using a nationally representative sample of US women. We hypothesized that the

prenatal suspicion of having a large baby would lead to a greater likelihood of certain interventions that are currently not indicated for fetal macrosomia (e.g., labor induction, cesarean delivery), and that this relation would operate independently of the infant's actual birthweight.

MATERIALS AND METHODS

Data

Data came from the Listening to Mothers III Survey (LTM3), a national survey developed through collaborative efforts of core teams from Childbirth Connection, Boston University School of Public Health, and Harris Interactive.(22) Details on the survey methodology are available elsewhere.(22) Briefly, LTM3 conducted 2,400 online interviews among English-speaking women who had given birth to a single baby from July 1, 2011 through June 30, 2012 in a US hospital and who had that child still living and were 18 to 45 years of age at the time of the survey. Mothers responded to closed and open-ended questions. The survey was administered by Harris Interactive and quality assurance procedures prevented the same respondent from participating multiple times. Complete survey results were adjusted with demographic and propensity score weightings using methodology developed and validated by Harris Interactive. The resulting survey population was representative of all US mothers aged 18 to 45 who gave birth to a single infant in a hospital in 2011–2012. The sample population was generally comparable to published national data for US birthing mothers on age, race/ethnicity, parity, birth attendant, and method of birth with tables detailing these distributions available in the published survey report.(22)

Participants were eligible for the current study if they indicated that the index birth was either a primary cesarean or vaginal delivery (e.g., that they had not had a prior cesarean delivery; n=2,059). Our sample included 1,960 of these women with complete covariate data. Women with missing data were slightly younger, less educated, and less likely to be married than those retained in our analytic sample (not shown). The Partners Human Research Committee at the Massachusetts General Hospital for Children considered this study exempt from review.

Measures

Prenatal Suspicion of a Large Baby—Prenatal suspicion of a large baby was determined from women's response to the following question: "Near the end of your pregnancy, did your maternity care provider tell you that your baby might be getting quite large?" Hereafter, we refer to women who responded "yes" to this question as having suspected large babies, or "SLB."

Labor and Delivery Interventions and Outcomes—We examined whether women indicated that they had an ultrasound near the end of their pregnancies to estimate fetal weight, as well as six labor and delivery outcomes: (1) attempted medically-induced labor ("Did your maternity care provider try to induce your labor? That is, did your provider try to cause your labor to begin by the use of drugs or some other technique?"); (2) attempted self-induced labor ("Did you yourself try to induce your labor? That is, did you do anything to

try to cause your labor to begin?"(23);[1] (3) use of epidural or spinal analgesics to relieve pain during birth; (4) vaginal versus cesarean delivery; (5) planned cesarean delivery (e.g., one that took place before labor); and (6) whether women asked for a scheduled cesarean delivery (for women who responded "yes" to "during your pregnancy, did you ask your maternity care provider to schedule a cesarean delivery before labor?").

We also assessed the reasons for medically-induced labor based on the frequency of women's responses to 11 items (mothers could check any that apply) available for the question: "why did your maternity care providers try to cause your labor to begin?", as well as infants' birthweights (grams) and gestational ages (continuous weeks), creating a flag to denote macrosomia for babies who were 4,000 grams or more at birth.

Sociodemographic, health, and healthcare characteristics—Maternal sociodemographic, health, and healthcare characteristics included: age in years (18–24; 25–29; 30–34; 35–39; or 40 or older); race/ethnicity (non-Hispanic white; non-Hispanic black; non-Hispanic other race; or Hispanic/Latina); education (high school diploma or less; some college or Associate's degree; college graduate; or graduate degree); marital status at the time of birth (married; unmarried with partner; or unmarried with no partner); parity (primiparous versus multiparous); primary payment source for maternity care (private insurance; public insurance [Medicaid, CHIP, or other government insurance programs]; or self-pay); primary prenatal care provider (obstetrician-gynecologist [OB/GYN]; family practitioner; midwife; or other), diabetic status (coded yes if Type 1, Type 2, or gestational); and prepregnancy body mass index (BMI [kilograms divided by square meters]) (<18.5 kg/m^2 [underweight]; 18.5 to 24.9 kg/m^2 [normal]; 25 to 29.9 kg/m^2 [overweight]; ≥30 kg/m^2 [obese]).

Analysis

Analyses were conducted using survey procedures from SAS v9.2 (SAS Institute, Cary, NC) to account for LTM3's sample design. All results are based on weighted counts. We generated summary statistics to describe sample characteristics and used weighted chi-square statistics and t-tests to identify factors associated with having SLBs and to test for differences in sample characteristics across suspected groups.

Staged multivariable logistic regression was used to estimate the association of having a SLB with the odds of medically- and self-induced labor induction, pain medication, and method of delivery. Model 1 controlled for maternal age, race/ethnicity, education, marital status, parity, diabetic status, prepregnancy BMI, health insurance, and type of prenatal care provider; model 2 added the infant's gestational age at birth and whether the infant was born macrosomic. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) comparing outcomes of women with and without SLBs were estimated from these multivariable models.

[1]The most common means have been reported as walking or exercise, sexual intercourse and nipple stimulation; with the leading reason for trying to self-induce being a mother's desire to "get the pregnancy over with" and to "avoid a medical induction."

We also reran the analyses among women who delivered term infants (gestational ages between 37 and 42 completed weeks, n=1,709) in an attempt to account for obstetrical complications not assessed as part of LTM3.

RESULTS

Sample Characteristics

In our nationally-representative sample of women who recently gave birth to a live singleton infant via a primary cesarean or vaginal delivery and had complete data on covariates used in the analyses, nearly one-third of respondents (31.2%) were told near the end of their pregnancies that their babies might be getting quite large (Table 1). Slightly fewer than 10% of women actually delivered an infant weighing 4,000 grams or more. The majority of participants (66.5%) indicated that they had an ultrasound near the end of their pregnancies to estimate fetal weight.

Factors Associated with Having a Suspected Large Baby (SLB)

Mothers who reported having an ultrasound to estimate fetal weight were twice as likely (38% versus 19%, p<.001) to have SLBs but not more likely to have macrosomic infants than mothers who did not have an ultrasound (Table 1). Non-Hispanic black, non-Hispanic other race, and Hispanic/Latina women were more likely to have SLBs than non-Hispanic white women (34.7%, 35.6%, 38.1% and 26.9% respectively, p=0.01, Table 1). There were also differences in SLBs by maternal prepregnancy BMI and self-reported insurance type, with the highest percentages of SLBs found among women who were obese (41.8%) or reported they primarily self-paid for maternity care costs (45.8%). SLBs were more common among diabetic women than non-diabetic women (65.2% versus 23.7%, p<.001). Women with and without SLBs did not differ by age, education, marital status, parity, or prenatal care provider type.

Actual fetal macrosomia was most likely to occur among multiparous (12.5%) and diabetic (14.8%) women (Table 1).

Labor and Delivery Outcomes Associated with Having a Suspected Large Baby (SLB)

The incidence of actual macrosomia among women with SLBs (positive predictive value) was 20%, compared to 5% of women in the non-SLB group (Table 2). Among women who had babies weighing 4,000 grams or more, 62% were told prenatally by their providers that their babies might be getting quite large (sensitivity).

Women with SLBs were more likely to report perinatal interventions than women without SLBs, including labor inductions (70.1% versus 51.1%, p<.001) and using pain medications during delivery (71.8% versus 61.5%, p<.001) (Table 2). Among women who reported labor inductions, both medically- (59.6% versus 39.4%, p<.001) and self-induced (43.0% versus 24.7%, p<.001) inductions were more common in the SLB group. Women who experienced medically-induced labors were asked why their maternity care provider attempted induction. Among all women, the most commonly endorsed reason was being “close to my due date,” cited by 42.6% of women with SLBs and 47.1% of women without SLBs (p=0.35).

However, for women with SLBs, 31.9% noted provider concern about the baby's size as a reason their care provider attempted labor induction (versus 4.1% in the non-SLB group); this was the second most commonly endorsed reason among these mothers. "I wanted to get the pregnancy over with" was the second most frequently endorsed reason among mothers without SLBs (not shown).

Overall cesarean rates did not differ between the groups. However, women with SLBs were more likely to ask for scheduled (32.5% versus 6.8%, p<.001) and have planned (12.6% versus 6.0%, p<.001) cesarean deliveries than women without SLBs; 41.2% of women who asked for a scheduled cesarean delivered via cesarean (not shown). Mean infant birthweight was higher among women with SLBs than those without (3,478 grams versus 3,195 grams, p<.001), although more than 500g below the clinical threshold for macrosomia.

After adjusting for covariates (Table 3), women with SLBs were significantly more likely to report that their labors were medically-induced (AOR 1.9; 95% CI: 1.4–2.6) or that they attempted to self-induce their labors (AOR 1.9; 95% CI: 1.4–2.7) than women without SLBs. SLBs were also associated with increased odds of epidural analgesics (AOR 2.0; 95% CI: 1.4–2.9) and asking for scheduled cesarean deliveries (AOR 4.6; 95% CI: 2.8–7.6). Accounting for the infant's gestational age and macrosomic status (Model 2) did not affect these associations.

In separate analyses, limiting the sample to women with term pregnancies resulted in SLBs being significantly associated with planned cesarean delivery (AOR 2.1; 95% CI: 1.1–4.1; not shown).

DISCUSSION

Communication between patients and providers is an increasingly important quality measure of hospital care. The Joint Commission advises clinicians to provide their patients with the most complete and accurate information available;(24) pressure to discuss possible complications can come from mothers as well. In the 2005 *Listening to Mothers* survey, when mothers were asked how well informed they should be about possible complications associated with widely used interventions (induction, cesareans, or epidurals) virtually all mothers stated it was necessary that they know "every" (81%) or "most" (17%) complications associated with cesarean sections.(25) Under such circumstances, it is understandable that clinicians who suspect that a baby might be very large would inform the mother. The present study suggests that conveying that concern to mothers might influence women's perceptions about the pregnancy moving forward and could be independently associated with the use of some perinatal medical interventions.

In this nationally-representative sample of women without prior cesareans, one in three women were told near the end of their pregnancies that their babies might be getting quite large, a figure that varied by sociodemographic, health, and healthcare characteristics. In contrast, one in ten babies overall – and one in five among those who were suspected to be large – were actually born macrosomic. The average birthweight of SLB babies was 3,478

grams, or about 7 pounds, 11 ounces. Non-SLB babies had an average birthweight of 3,195 grams (7 pounds, 1 ounce), for a 283 gram (10 ounce) difference between groups.

The relatively low level of association between actual macrosomia and clinicians' suspicion of a large fetus in this study coincides with previous reports (9) and underscores the challenge of determining fetal size prenatally. Similar to other findings, (20) two-thirds of mothers (66%) reported having late-pregnancy ultrasounds to estimate fetal weight – a notable increase from 50% who responded positively to the same question in 2005.(25) This may have contributed to the large number of SLBs since mothers reporting an ultrasound for weight were twice as likely to be told their babies might be large. There is no consensus about the efficacy of routine ultrasound screening for low-risk pregnancies and targeted, not routine, screening is recommended.(26) The number of ultrasounds reported here suggests that providers may be screening pregnancies without evidence-based indications. The implication is that limiting ultrasound ascertainment of fetal weight in the absence of valid medical reasons could reduce unnecessary perinatal interventions associated SLBs.

In addition to ultrasound estimation, women's health and sociodemographic characteristics may have contributed to clinicians' perceptions of fetal size. While some factors associated with SLBs in this study (e.g., greater BMI and maternal diabetes) are linked to fetal macrosomia,(2, 27) the determinants of fetal macrosomia are largely equivocal and ACOG states that genetic, racial, and ethnic factors do not predict fetal macrosomia well enough to be used clinically.(7) But we found high percentages of SLBs among racial/ethnic minorities and women who self-paid their maternity costs; these factors were not associated with actual macrosomia. Future research should identify the extent to which maternal demographics influence providers' perceptions of fetal size and their communication with women about such suspicions.

Women with SLBs reported higher rates of perinatal interventions than women without SLBs, suggesting that the suspicion of a large baby might influence patient-provider decisions to perform certain perinatal interventions. This hypothesis is supported by the striking finding that women with SLBs were nearly five times more likely to ask for cesarean deliveries before labor, twice as likely to try to self-induce their labors, and twice as likely to have medical inductions and planned cesarean deliveries as women without SLBs. As hypothesized, associations remained significant after accounting for actual macrosomia, suggesting that SLB may promote overuse of these interventions.

We did not explore specific mechanisms underlying these relations, but patient, provider and institution-based practices and preferences associated with suspected macrosomia are likely important. For example, one study of women induced at term suggested that clinicians who anticipate fetal macrosomia diagnose labor arrest at lower thresholds, increasing cesarean delivery rates (21). We found that more than one in three mothers with SLBs noted concerns with the baby's size as the reason their maternity provider induced labor, the second-most commonly cited reason for induction among cases of medically-induced labor. These findings are important in light of ACOG guidelines (7) and empirical evidence that such interventions do not reduce neonatal morbidities for SLBs.(8, 15–21)

Women's feelings and beliefs about having a large baby may also play a role. Women with SLBs may feel uncertain, fearful, and anxious about having to deliver a macrosomic infant and seek medical interventions (e.g., cesarean deliveries or pain relief) to avoid anticipated trauma during delivery.(28) Women who are concerned about fetal size may also attempt to end their pregnancies sooner through various non-medical induction techniques. Provider and social support may help reduce unnecessary perinatal medical interventions for women who are told their babies might be getting quite large. Crisis-oriented and group-based therapies that address fears of childbirth, for example, have been shown to help women who request cesareans prepare for normal vaginal deliveries (29–31) and may be especially relevant for women with SLBs.

Decisions to pursue medical interventions are not made individually but are likely the result of shared decision making between patients and their providers. Increased patient education and involvement about decisions during pregnancy, as well as provider training regarding communication about SLBs may be appropriate. This study did not account for the relative contribution of the provider's or patient's decision-making to the higher rates of interventions in the SLB group; we are exploring this topic in a separate study.

We believe this is the first nationally-representative study in the US to investigate maternal characteristics and perinatal interventions associated with the prenatal suspicion of a large baby. Our large sample size and rich dataset allowed us to examine the experiences of recent mothers from their own perspectives and control for numerous potential confounders, facilitating a comprehensive investigation of the risks and consequences SLBs that avoids limitations of previous reports. We note several limitations. First, being warned of a potentially large baby is not equivalent to receiving a formal diagnosis or even a prediction of fetal macrosomia and the meaning of "quite large" may be interpreted differently by providers and women across different contexts. Second, SLBs were determined by maternal report, which has the potential for recall bias, especially if mothers of babies born macrosomic or who experienced difficult labors or births were more likely to recall being told their babies were large during pregnancy. Our SLB measure did not capture cases where clinicians may have suspected a large baby without telling the patient. Other factors are also subject to self-reporting biases; however maternal recall of perinatal events (e.g., birthweight) is reliable (32–34) and may be more comprehensive than medical records, especially on sensitive topics.(22) Third, we could not assess some maternal health conditions, congenital abnormalities, type of prenatal practice setting, or complications (e.g., shoulder dystocia, perineal trauma) that could have influenced our findings. We also could not determine the directionality of the relationship between having a late-pregnancy ultrasound and having a SLB. Women with SLBs may have requested ultrasounds to confirm fetal weight. Participants with missing data were slightly different from those in the sample, which may have biased our results in either direction. In particular, excluded women had more socioeconomic risk factors; if these women were more likely to experience the outcomes, our results would be biased towards the null, leading to conservative estimates. Finally, although nationally representative of LTM3's target population (mothers 18 to 45 who gave birth to a single baby in US hospitals who could participate in English and had their babies still living at the time of the survey in the final quarter of 2012) our

study sample may exclude important subgroups of women, including those without access to the internet.

In summary, we found that while only 20% of women with SLBs go on to have a baby weighing 4,000 grams or more, the suspicion of a large baby is independently associated with greater use of perinatal interventions that are currently not indicated for fetal macrosomia and may themselves confer unnecessary risks to women and their neonates. Maternity providers may not be aware of the impact of communicating fetal size concerns to patients on their perceptions about the likely course of labor and delivery and the need for certain perinatal interventions. Future studies are needed to review current policies and practices surrounding clinical management of pregnancies with suspected large babies, which will hopefully lead to the development of guidelines that ensure that women with SLBs experience care that reflects the best current evidence and standards.

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References

1. Martin JA, Hamilton BE, Ventura SJ, et al. Births: Final data for 2011. National vital statistics reports : from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. 2013; 62(1):1–69. 72.
2. Stotland NE, Caughey AB, Breed EM, et al. Risk factors and obstetric complications associated with macrosomia. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2004; 87(3):220–6.
3. Boulet SL, Alexander GR, Salihu HM, et al. Macrosomic births in the united states: Determinants, outcomes, and proposed grades of risk. American journal of obstetrics and gynecology. 2003; 188(5):1372–8. [PubMed: 12748514]
4. Rossi AC, Mullin P, Prefumo F. Prevention, management, and outcomes of macrosomia: A systematic review of literature and meta-analysis. Obstet Gynecol Surv. 2013; 68(10):702–9. [PubMed: 25101904]
5. Jolly MC, Sebire NJ, Harris JP, et al. Risk factors for macrosomia and its clinical consequences: A study of 350,311 pregnancies. European journal of obstetrics, gynecology, and reproductive biology. 2003; 111(1):9–14.
6. Rouse DJ, Owen J. Sonography, suspected macrosomia, and prophylactic cesarean: a limited partnership. Clinical obstetrics and gynecology. 2000; 43(2):326–34. [PubMed: 10863630]
7. American College of, Obstetricians and, Gynecologists. ACOG committee opinion no 22: Fetal Macrosomia. 2000.
8. Chauhan SP, Grobman WA, Gherman RA, et al. Suspicion and treatment of the macrosomic fetus: a review. American journal of obstetrics and gynecology. 2005; 193(2):332–46. [PubMed: 16098852]
9. Hoopmann M, Abele H, Wagner N, et al. Performance of 36 different weight estimation formulae in fetuses with macrosomia. Fetal diagnosis and therapy. 2010; 27(4):204–13. [PubMed: 20523027]
10. American College of, Obstetricians and, Gynecologists. ACOG committee opinion no. 561: Nonmedically indicated early-term deliveries. Obstetrics and gynecology. 2013; 121(4):911–5. [PubMed: 23635710]
11. Boulet SL, Alexander GR, Salihu HM. Secular trends in cesarean delivery rates among macrosomic deliveries in the United States, 1989 to 2002. Journal of perinatology : official journal of the California Perinatal Association. 2005; 25(9):569–76. [PubMed: 16079908]

12. Groom KM, Paterson-Brown S, Fisk NM. Temporal and geographical variation in UK obstetricians' personal preference regarding mode of delivery. European journal of obstetrics, gynecology, and reproductive biology. 2002; 100(2):185–8.
13. Gregory KD, Korst LM, Platt LD. Variation in elective primary cesarean delivery by patient and hospital factors. American journal of obstetrics and gynecology. 2001; 184(7):1521–32. discussion 32–4. [PubMed: 11408876]
14. Barber EL, Lundsberg LS, Belanger K, et al. Indications contributing to the increasing cesarean delivery rate. Obstetrics and gynecology. 2011; 118(1):29–38. [PubMed: 21646928]
15. Gonen R, Bader D, Ajami M. Effects of a policy of elective cesarean delivery in cases of suspected fetal macrosomia on the incidence of brachial plexus injury and the rate of cesarean delivery. American journal of obstetrics and gynecology. 2000; 183(5):1296–300. [PubMed: 11084580]
16. Vendittelli F, Riviere O, Breart G. Is prenatal identification of fetal macrosomia useful? European journal of obstetrics, gynecology, and reproductive biology. 2012; 161(2):170–6.
17. Weeks JW, Pitman T, Spinnato JA 2nd. Fetal macrosomia: does antenatal prediction affect delivery route and birth outcome? American journal of obstetrics and gynecology. 1995; 173(4): 1215–9. [PubMed: 7485323]
18. Melamed N, Yogev Y, Meizner I, et al. Sonographic prediction of fetal macrosomia: the consequences of false diagnosis. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2010; 29(2):225–30. [PubMed: 20103792]
19. Sadeh-Mestechkin D, Walfisch A, Shachar R, et al. Suspected macrosomia? Better not tell. Archives of gynecology and obstetrics. 2008; 278(3):225–30. [PubMed: 18299867]
20. Little SE, Edlow AG, Thomas AM, et al. Estimated fetal weight by ultrasound: a modifiable risk factor for cesarean delivery? American journal of obstetrics and gynecology. 2012; 207(4):309 e1–6. [PubMed: 22902073]
21. Blackwell SC, Refuerzo J, Chadha R, et al. Overestimation of fetal weight by ultrasound: does it influence the likelihood of cesarean delivery for labor arrest? American journal of obstetrics and gynecology. 2009; 200(3):340 e1–3. [PubMed: 19254597]
22. Declercq ER, Sakala C, Corry MP, et al. Major Survey Findings of Listening to Mothers III: New Mothers Speak Out: Report of National Surveys of Women's Childbearing Experiences Conducted October-December 2012 and January-April 2013. The Journal of perinatal education. 2014; 23(1):17–24. [PubMed: 24453464]
23. Declercq, ER.; Sakala, C.; Corry, MP., et al. Listening to Mothers II: Report of the Second National U.S. Survey of Women's Childbearing Experiences. New York: Childbirth Connection; 2006.
24. Joint Commission. Advancing effective communication, cultural competence, and patient-and family-centered care: A roadmap for hospitals. Joint Commission; 2010.
25. Declercq ER, Sakala C, Corry MP, et al. Listening to Mothers II: Report of the Second National U.S. Survey of Women's Childbearing Experiences: Conducted January-February 2006 for Childbirth Connection by Harris Interactive in partnership with Lamaze International. The Journal of perinatal education. 2007; 16(4):15–7. [PubMed: 18769522]
26. AIUM Practice Guideline for the performance of an antepartum obstetric ultrasound examination. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2003; 22(10):1116–25. [PubMed: 14606571]
27. Weiss JL, Malone FD, Emig D, et al. Obesity, obstetric complications and cesarean delivery rate--a population-based screening study. American journal of obstetrics and gynecology. 2004; 190(4): 1091–7. [PubMed: 15118648]
28. Reid EW, McNeill JA, Holmes VA, et al. Women's perceptions and experiences of fetal macrosomia. Midwifery. 2014; 30(4):456–63. [PubMed: 23786991]
29. Poikkeus P, Saisto T, Unkila-Kallio L, et al. Fear of childbirth and pregnancy-related anxiety in women conceiving with assisted reproduction. Obstetrics and gynecology. 2006; 108(1):70–6. [PubMed: 16816058]
30. Saisto T, Toivanen R, Salmela-Aro K, et al. Therapeutic group psychoeducation and relaxation in treating fear of childbirth. Acta obstetricia et gynecologica Scandinavica. 2006; 85(11):1315–9. [PubMed: 17091410]

31. Nerum H, Halvorsen L, Sorlie T, et al. Maternal request for cesarean section due to fear of birth: can it be changed through crisis-oriented counseling? Birth. 2006; 33(3):221–8. [PubMed: 16948722]

32. Yawn BP, Suman VJ, Jacobsen SJ. Maternal recall of distant pregnancy events. Journal of clinical epidemiology. 1998; 51(5):399–405. [PubMed: 9619967]

33. Seidman DS, Slater PE, Ever-Hadani P, et al. Accuracy of mothers' recall of birthweight and gestational age. British journal of obstetrics and gynaecology. 1987; 94(8):731–5. [PubMed: 3663531]

34. Buka SL, Goldstein JM, Spartos E, et al. The retrospective measurement of prenatal and perinatal events: accuracy of maternal recall. Schizophrenia research. 2004; 71(2–3):417–26. [PubMed: 15474913]

Matern Child Health J. Author manuscript; available in PMC 2015 December 01.

Table 1

Proportions of women who were told their babies might be getting quite large and the proportions of infants with born macrosomic by selected maternal sociodemographic, health, and healthcare characteristics

	Total	Percent told baby might be getting quite large	χ^2 p-value	Percent of infants with birth weight ≥4000 grams	χ^2 p-value
Unweighted N	1,960	566		191	
Weighted %	100.0	31.2		9.9	
Infant birthweight (grams), mean (SD)	3279 (578)	3478 (624)	<.001	4267 (916)	<.001
	N (%)	**%**		**%**	
Had ultrasound to estimate fetal weight					
Yes	1299 (66.5)	37.6	<.001	10.4	0.46
No	661 (33.5)	18.6		8.9	
Maternal Characteristic					
Age, years					
18 to 24	512 (33.8)	35.4	0.10	8.0	0.14
25 to 29	547 (29.9)	31.9		10.1	
30 to 34	551 (22.8)	28.2		13.7	
35 to 39	255 (10.9)	24.3		8.7	
40 and older	95 (2.6)	25.2		5.2	
Race/Ethnicity					
Non-Hispanic White	1189 (55.3)	26.9	0.01	10.7	0.81
Non-Hispanic Black	255 (15.5)	34.7		7.8	
Non-Hispanic Other Race	151 (6.6)	35.6		9.8	
Hispanic or Latina	365 (22.6)	38.1		9.4	
Education Status					
High school or less	368 (40.5)	33.1	0.39	8.8	0.76
Some college or Associate's degree	745 (30.0)	31.6		10.9	
College graduate	616 (21.3)	29.5		10.6	
Graduate degree	231 (8.1)	25.2		9.9	
Marital Status					
Married	1300 (59.3)	32.4	0.20	11.9	0.06
Unmarried with partner	544 (33.1)	27.7		7.2	

	Total	Percent told baby might be getting quite large	χ^2 p-value	Percent of infants with birth weight ≥4000 grams	χ^2 p-value
Unmarried, no partner	116 (7.5)	37.5		7.0	
Parity					
Primiparous	1070 (48.7)	31.1	0.94	7.2	0.004
Multiparous	89 (51.3)	31.4		12.5	
Prepregnancy BMI					
Underweight (less than 18.5)	148 (8.4)	29.4	0.01	10.8	0.10
Normal (18.5 to 24.9)	1033 (51.0)	27.8		7.8	
Overweight (25.0 to 29.9)	420 (22.2)	31.0		10.8	
Obese (30 or higher)	359 (18.4)	41.8		14.5	
Maternal Diabetes					
Yes	348 (18.9)	65.2	<.001	14.8	0.02
No	1627 (81.1)	23.7		8.8	
Self-reported Insurance Type					
Public	1105 (47.3)	27.2	0.01	10.7	0.41
Private	758 (47.2)	33.6		9.6	
Self Pay	97 (5.5)	45.8		5.6	
Prenatal Care Provider					
OBGYN	1528 (76.5)	30.4	0.21	9.3	0.40
Family Practitioner	169 (9.7)	37.1		13.8	
Midwife	160 (8.1)	25.4		13.0	
Other	103 (5.8)	40.3		8.4	

Note. Data are weighted percentages. Percentages may not sum to 100 due to rounding. *BMI*, body mass index; *OBGYN*, obstetrician-gynecologist.

Table 2

Labor and delivery interventions and outcomes for women who were told and who were not told their babies might be getting quite large, weighted estimates from the *Listening to Mothers III* survey (N=1,960)

		Told Baby Might Be Getting Quite Large		
	Total	**Yes**	**No**	**p-value**
Labor and Delivery Outcomes	**%**			
Macrosomic Baby	9.9	19.7	5.5	<.001
Induction of Labor	57.0	70.1	51.1	<.001
Medically Induced	45.7	59.6	39.4	<.001
Self Induced	30.4	43.0	24.7	<.001
Epidural Analgesia	65.0	72.7	61.7	<.001
Cesarean Delivery	19.0	21.5	18.3	0.26
Asked for Cesarean Delivery	14.8	32.5	6.8	<.001
Planned Cesarean Delivery	8.1	12.6	6.0	<.001
	Mean (SD)			
Birthweight, Grams	3,279 (578)	3,478 (624)	3,195 (512)	<.001
Gestational Age, Weeks	38.9 (2.3)	39.1 (2.2)	38.8 (2.2)	0.02

Note. Data are weighted percentages.

Table 3

Summary of associations between having a suspected large baby (SLB) and select labor and delivery outcomes

	Model 1 OR	95% CI	Model 2 OR	95% CI
Labor and Delivery Outcomes				
Medically Induced Labor	1.9	1.4 – 2.6	1.9	1.4 – 2.5
Self Induced Labor	1.9	1.4 – 2.7	1.9	1.3 – 2.6
Epidural Analgesia	2.0	1.4 – 2.9	2.1	1.4 – 3.0
Asked for Cesarean	4.6	2.8 – 7.6	4.4	2.6 – 7.3
Planned Cesarean	1.8	1.0 – 3.6	1.6	0.8 – 3.4

Notes. Weighted estimates. *OR*, odds ratio; *CI*, Confidence Interval.

Odds ratios compared labor and delivery interventions and outcomes of women who were told and who were not told by their prenatal care provider near the end of their pregnancies that their babies might be getting quite large.

Model 1 controlled for maternal age, race/ethnicity, education status, marital status, parity, prepregnancy body mass index, diabetic status, health insurance status, and type of prenatal care provider.

Model 2 added the infant's actual birthweight and gestational age.