



# Gestational weight gain and pregnancy outcomes: where does delivery timing fit in?

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Gestational weight gain is a modifiable risk factor that impacts both short and long term maternal and child health (1). In 2009, the Institute of Medicine (IOM, now the National Academy of Medicine) published guidelines, “Weight Gain in Pregnancy, Reexamining the Guidelines”, recommending pregnancy weight gain goals stratified based on prepregnancy BMI (2). Achieving these goals in the United States has been difficult: in 2012–2013, only 32.1% of parturients met the recommended gestational weight gain target (3). Nonetheless, there is evidence supporting the use of dietary and lifestyle modifications to improve both maternal weight gain and obstetric outcomes (4,5).

Many adverse outcomes have been associated with both excessive and insufficient weight gain in pregnancy. Outcomes previously associated with excessive weight gain include large for gestational age, macrosomia, cesarean section, hypertensive disorders of pregnancy, maternal weight retention, and childhood obesity; those associated with insufficient weight gain include small for gestational age, preterm birth, and stillbirth (6-13). However, the findings from many of these studies are limited by small sample size, single institution populations, and failure to account for gestational age at delivery in weight gain assessments. A recent large meta-analysis and systematic review by Goldstein *et al.* consisting of 23 studies and including 1,309,136 patients supported many of the associations demonstrated in these previous studies (14). Nevertheless, this meta-analysis did not account for gestational age at delivery. This is a significant potential

confounding factor in evaluating the association between gestational weight gain and outcomes such as preterm birth (mothers delivering at earlier gestational ages would be expected to have gained less weight than those delivering at term) (15).

In their article “Association Between Gestational Weight Gain and Perinatal Outcomes” published in the October 2018 edition of *Obstetrics and Gynecology*, Kominiarek *et al.* aim to evaluate the association between gestational weight gain and various maternal and neonatal outcomes while accounting for gestational age at delivery. This retrospective cohort study was a secondary analysis of the MFMU Assessment of Perinatal Excellence (APEX) study. Women were included if they had a recorded height, self-reported prepregnancy or first trimester weight, and a weight recorded at the time of delivery. Exclusion criteria included extreme weight gain or extreme weight loss. Comparison between the observed weight gain and the expected weight gain based on IOM BMI-stratified weekly weight gain recommendations was used to categorize patients as having achieved weight gain “below”, “within”, or “above” the IOM recommendations. The authors compared multiple maternal baseline health and demographic characteristics among the aforementioned gestational weight gain categories. Using the “within” guidelines group as a referent, unadjusted and adjusted analyses were used to calculate odds ratios of various maternal and neonatal outcomes in the “below” and “above” target weight gain groups.

In this recent publication, pregnancy outcomes of 29,861 women were investigated. Numerous demographic and health characteristic differences were noted between pregnancy weight gain groups [see table 1 in (15)]. Interestingly, gestational diabetes was more prevalent in the “below” (9.1%) and “within” (6.0%) groups than in the “above” (5.0%) group ( $P < 0.001$ ). Outcomes associated with insufficient weight gain in pregnancy in both the adjusted and unadjusted analyses included both spontaneous preterm birth and indicated preterm birth. Outcomes associated with excessive weight gain in pregnancy in both analyses included hypertensive disease of pregnancy, cesarean delivery in both multiparous and nulliparous women, indicated preterm birth, shoulder dystocia, macrosomia, and neonatal hypoglycemia requiring treatment [see tables 2 and 3 in (15)].

These findings support many of the previously documented adverse pregnancy outcomes associated with weight gain outside the 2009 IOM recommendations. In particular, by accounting for gestational age at delivery, the authors of this study lend credence to the previously documented association between preterm birth and inadequate weight gain. Nevertheless, major questions remain unaddressed. Previous studies have shown mixed results as to whether an association between pregnancy weight gain and stillbirth exists (13,16). In addition, although neonatal outcomes were considered, the relationship between gestational weight gain and severe adverse neonatal outcomes (e.g., neonatal mortality, brachial plexus injury, etc.) was not evaluated. Finally, previous studies have demonstrated an association between excessive weight gain and gestational diabetes (17,18). The decreased rate of gestational diabetes in those with excessive weight gain compared to those with insufficient and adequate weight gain in this cohort is a curious finding. As suggested by the authors, nutritional counseling and lifestyle modification may have contributed to lower weight gain among those with gestational diabetes. Nonetheless, one must wonder whether there was a high rate of undiagnosed gestational diabetes in those with excessive weight gain; if so, the adverse outcomes in the “above” group in both the unadjusted and adjusted analyses may in fact be a result of undocumented gestational diabetes rather than excessive weight gain.

In conclusion, by accounting for gestational age at delivery, this study adds to and supports the already substantial literature on the adverse outcomes associated with inappropriate weight gain in pregnancy. Nonetheless,

important questions regarding gestational weight gain and its effects require further study, including its association with severe obstetric and neonatal outcomes and the relative contribution of gestational diabetes in explaining the adverse outcomes associated with excessive weight gain in pregnancy.

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### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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