
Maternal Weight Gain: A Report of an Expert Work Group

Prepared by Carol West Suitor, D.Sc., R.D.

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The opinions or conclusions expressed in this report do not necessarily reflect those of the institutions listed above.

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Maternal Weight Gain: A Report of an Expert Work Group

The Maternal and Child Health Bureau (MCHB) has a sustained commitment to enhancing perinatal health. One of the Bureau's major goals has been to assure the delivery of full-term, healthy infants of appropriate size. In 1987, MCHB provided support to the National Academy of Sciences to conduct a study of maternal nutrition to address gaps and weaknesses in the knowledge base of maternal nutrition. As a result, the Committee on Nutritional Status During Pregnancy and Lactation was formed within the Food and Nutrition Board, Institute of Medicine (IOM). A subcommittee appointed to focus on nutritional status and weight gain evaluated the scientific evidence and formulated recommendations for desirable weight gain during pregnancy. The committee released the report *Nutrition During Pregnancy* in 1990.¹

In May 1996, MCHB convened a group of experts to reexamine issues relating to maternal weight gain. The purposes of the meeting were to (1) consider research related to maternal weight gain that had been published since the 1990 IOM report *Nutrition During Pregnancy*; (2) determine whether the results of recent research provide a basis for practitioners to change guidance for maternal weight gain; and (3) recommend future directions for research, training, and/or other programmatic initiatives. This report highlights the types of research featured at the meeting, identifies areas of special concern, and summarizes the group's recommendations.

In general, the presentations by the participants addressed determinants of maternal weight gain, maternal outcomes, and infant outcomes.

Determinants of Maternal Weight Gain

Since release of the IOM report,¹ few studies have dealt with the effects of biological factors on maternal weight gain. There is a lack of consistent findings concerning relationships of birth interval, parity, prepregnancy weight or body mass index (BMI), height, and physical activity to maternal weight or weight gain. (The IOM prenatal weight gain recommendations adjust only for prepregnancy BMI.)

Weight gain by pregnant women consists of water, protein, and fat. Both Kopp² and Lederman³ indicate that water gain, which probably represents lean tissue gain, is a predictor of birthweight, but fat gain is not. Thus, measurements of maternal water gain may predict birthweight better than measurements of composite weight gain.

The total amount of weight gained, the composition of gain, and the rate of energy metabolism all differ among healthy pregnant women. The composition of gain and rate of energy metabolism may affect infant birthweight.⁴ Two new studies have correlated energy intake with weight gain in U.S. pregnant women.^{5,6} In two independent replications, the effect size of energy intake on weight gain was modest: Coefficients were in the range of $r = .1$ to $.2$, after controlling for confounding variables.⁵

A number of studies have examined sociodemographic and psychosocial characteristics in relation to prenatal weight gain.⁷⁻¹² However, interrelationships among such risk factors as age, parity, income, maternal education, race, and ethnic background complicate

interpretations of findings. Reporting on research in progress, Olson¹³ made a strong case for cross-disciplinary, integrative perspectives when conducting intervention-relevant research on both gestational weight gain and postpartum weight loss.

Maternal Outcomes

Generally, no studies were found that bear on relationships of prenatal weight gain and antepartum complications. Studies examining cesarean delivery suggest that prepregnancy BMI, net maternal weight gain, and weight gain above the IOM recommendations may increase the risk.^{14,15}

Trends among U.S. women reveal an increasing prevalence of obesity, especially among African-American women.¹⁶ These trends are concurrent with the increasing amount of weight gained by pregnant women.¹⁷ Many studies have examined some aspect of weight retention, weight gain, or both after pregnancy.^{18–40} Gestational weight gain is positively associated with postpartum weight retention, and many women with increased weight postpartum gained an amount greater than the upper limits recommended in the 1990 IOM report.^{17,41} Some researchers suggest, however, that women may gain weight postpartum, and that postpartum weight change may be due to factors unrelated to pregnancy.^{28, 29}

The panel called attention to the direct association between parity and body weight,⁴² to the difference in postpartum obesity between black women and white women, and to a different pattern (slower initial weight loss) but comparable total postpartum weight loss among women who breastfeed compared with those who do not.⁴³ Although physical activity is important for health and fitness, several studies indicate that postpartum physical activity does not necessarily foster weight loss unless accompanied by caloric restriction.^{19,27,43–46}

Infant Outcomes

When maternal weight gain is within the IOM-recommended range, the incidence of small-for-gestational-age and/or low birthweight births is reduced.^{20,29} Recent studies examined the relationship between rate of weight gain⁶ together with other factors^{47–51} and small-for-gestational-age and/or preterm birth. The evidence concerning the effect of maternal weight gain on gestational duration is inconsistent.⁵² If maternal weight gain does affect gestational duration, the effect is small—there has been no temporal decline in the incidence of preterm delivery, despite an impressive trend of higher weight gains over this interval.¹⁷

Several recent studies on the pattern of gestational weight gain, especially late pregnancy weight gain, suggest associations with infant outcome. Johnston and Kandel⁵³ and Abrams and colleagues¹⁵ have described positive relationships between second trimester or third trimester weight gains and birthweight: Increased rates of gain were associated with larger fetal size, and lower rates of gain with smaller size. Other investigators have noted that risk of preterm birth is approximately doubled when third trimester rate of gain is low or inadequate.^{6,54}

A group of studies suggests an inverse relationship between both infant weight and proportional size at birth and the risk of long-term adverse health outcomes such as hypertension, obesity, glucose intolerance, and cardiovascular disease.⁵⁵ Initial results are intriguing and may warrant further investigation.

Special Concerns

Weight Gain by Pregnant Adolescents

Studies concerning maternal nutrition of adolescents have reported that adolescents generally gain more weight during pregnancy than adults, and gain more weight in producing infants of optimal size.^{5,7,11,34,35,53,56} The larger pregnancy weight gains and the associated increases in body fat during adolescence have been attributed primarily to previous incomplete growth.^{5,57,58} Adolescents may be underweight by adult standards or may have limited fat stores without necessarily being underweight or underfat for their age or maturation status. At present, no prospective method or biomarker is able to identify pregnant adolescents who are still growing. Although gestational weight gain should be encouraged to improve outcome for the infant,^{5,56,59,60} there is a concern that gestational weight gain may contribute to overweight and obesity in young mothers.^{5,34,35} Panel members expressed differing views concerning the value of the IOM recommendation to encourage weight gain at the upper end of the BMI weight gain range for young adolescents.

It was suggested that, until more is known, adolescents less than two years postmenarche should be advised to stay within the IOM-recommended BMI-specific weight range—without either restricting weight gain or encouraging weight gain at the upper end of the range.

Weight Gain by Racial and Ethnic Minorities

Despite the rapid increase in the proportion of births to women who belong to racial or ethnic minority groups, relatively little research has focused on the maternal nutrition of these women. One study⁹ reported on biosocial predictors of maternal weight near term in African-American and Hispanic women, and Siega-Riz and colleagues⁶ examined IOM weight gain recommendations and pregnancy outcomes among Hispanic women. Data from body image studies suggest that many African-American women perceive a larger body image as desirable.⁶¹ Definitional issues related to race and ethnicity and their limitations were emphasized.^{62–64}

Study findings since the publication of the IOM report indicate that, compared with Caucasian women, African-American women have an increased incidence of low prenatal weight gain in each BMI category but a decreased tendency to gain more than recommended.^{10,17,41,65,66} Preliminary data from a study of 384 African-American women indicate that, irrespective of BMI, no significant differences in birthweight are seen for those women whose weight gains were in the lower half of the IOM-recommended BMI-specific range, compared with those whose weight gains were in the upper half of the range.⁶⁷ Postdelivery, African-American women show greater weight retention than white women for the same gestational weight gain.^{29,36,65}

Much discussion centered on the IOM recommendation that African-American women should strive for gains at the upper end of the BMI-specific weight gain range: Does this recommendation lead to small increases in the birthweight of the infants? Does it contribute to postpartum weight retention? Some group members indicated that current data do not support the IOM's recommendation; others indicated that the evidence is not sufficient to either support or change the recommendation.

It was suggested that, until more is known, African-American women should be advised to stay within the IOM-recommended BMI-specific weight range—without either restricting weight gain or encouraging weight gain at the upper end of the range.

Weight Gain by Women Pregnant with Twins or Higher-Order Multiples

With the increase in multiple births in the United States, numerous new studies have addressed weight gain by mothers of twins,^{68–73} and one study has reported on weight gain by mothers of triplets.⁷⁴ For multiple births, both the optimal range of birthweight and the gestational age associated with the lowest morbidity is achieved earlier than for singleton births. For twins, this optimal range is estimated to be 2,500 to 2,800 grams at 36–37 weeks, and for triplets, 1,900 to 2,200 grams at 34–36 weeks.⁷⁵ Outcomes with both twins (or the average of the twin pair) weighing 2,500 grams or more have been reported for maternal weight gains of 40–45 pounds.^{70,72,73} Weight gain of 0.85 pound/week or less before 24 weeks' gestation was significantly associated with poor intrauterine growth and higher morbidity among twins, regardless of subsequent rate of gain.⁷³ Lantz and colleagues⁷⁰ reported that clinical guidelines for maternal weight gain during twin gestation should be based on maternal prepregnancy BMI. Weight gain should be encouraged throughout twin gestation in underweight women, with a target gain of 1.75 pounds/week after 20 weeks' gestation. The data support a weight gain of 1.5 pounds/week for normal-weight women during the second half of twin pregnancy.

Conclusions and Recommendations

Despite a considerable body of recent research, the group concluded that a formal revision of the 1990 IOM weight gain recommendations is not yet warranted. However, the group expressed reservations that the recommendations for African-American women, young adolescents, and women of short stature were too specific. The major recommendations of this expert work group are summarized below.

Recommendations for Practice

- Promote use of the IOM recommendations for the *rate of weight gain* as well as those for total weight gain. These recommendations are specific for the women's BMI category.
- Promote healthy eating as well as total weight gain.
- Promote strategies to help women stay within the weight gain range recommended for their prepregnancy BMI.

The IOM publication *Nutrition During Pregnancy and Lactation: An Implementation Guide*⁷⁶ was identified as a useful tool that should be more widely disseminated. Any counseling or intervention to promote weight gain should also aim to improve the quality of the diet.

Recommendations for Research

Much discussion dealt with a need for data concerning the extent to which maternal weight gain recommendations and postpartum weight management may be related to the

increasing problem of obesity among U.S. women. The research recommendations are as follows:

- Identify more completely the contribution of pregnancy weight gain to body composition, body fat distribution, and the long-term risk of maternal overweight and obesity—at least for the first year postpartum—and interventions for weight management postpartum.
 - Identify differences and similarities among various racial and ethnic groups.
 - Identify special considerations for adolescent mothers, women of short stature, and multiple births.
- Investigate the composition and pattern of maternal weight gain in relation to pregnancy outcomes, and identify favorable patterns of gain.
- Examine the extent to which adolescents transfer their weight gain to the fetus, and compare the findings to those in adults.
- Encourage researchers to use the IOM definition of young adolescents (less than two years postmenarche) to assure comparability of data.
- Ensure that weight retention and weight management studies include evaluations of perception of body image and psychosocial consequences of weight retention.
- Encourage research that accounts for the interrelationships of race and other maternal characteristics, and considers historical and lifestyle issues that can affect women.
- Encourage research on specific populations of women and adolescents, including those with obesity, or with eating disorders or other psychological problems.
- Find effective strategies for achieving and staying within weight gain recommendations.

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