

Where Do Women Get Advice About Weight, Eating, and Physical Activity During Pregnancy?

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Abstract

Background: Most women report not receiving information about gestational weight gain (GWG) from prenatal providers, but less is known about other sources of information and their potential impacts on GWG. The purpose of this study was to investigate sources of information about diet, physical activity, and weight control during pregnancy, and the impact of information sources on maternal GWG.

Materials and Methods: Participants were 183 women with normal weight and 172 women with overweight/obesity who had enrolled in a prenatal lifestyle intervention trial. At 6 weeks postpartum, women were asked whether they had received information about “diet, physical activity, or weight control” from 12 sources uninvolved in the trial (*e.g.*, physician, Internet, and friend) and, if received, the extent to which they followed the advice. Information sources were examined in relation to odds of exceeding Institute of Medicine (IOM) GWG guidelines based on measured weights.

Results: Most women reported receiving information from a book (60.6%) or the Internet (58.3%). Advice from physicians, dietitians, or nurses was reported in 55.6%, 48.2%, and 33.9% of women, respectively. Reported receipt of information from physicians was associated with reduced Odds Ratio ([95% Confidence Interval]= 0.55 [0.35–0.88]; $p=0.01$) of exceeding IOM GWG guidelines. Reported receipt of information from other sources was not related to GWG.

Conclusions: Books and the Internet were the most prevalent information sources reported for prenatal diet, physical activity, and weight control. However, of all sources, only physician provision of information was associated with reduced odds of excessive GWG.

Keywords: prenatal advice, gestational weight gain, IOM recommendations, practitioner advice

Introduction

GESTATIONAL WEIGHT GAIN (GWG) in excess of the Institute of Medicine (IOM) recommendations increases risk of several adverse maternal and neonatal outcomes, including high maternal postpartum weight retention, weight gain, and development of obesity in mothers and children.^{1–4} The IOM recommends pregnancy weight gains of 25–35 pounds, 15–25 pounds, and 11–20 pounds for women whose prepregnancy body mass index (BMI) is normal, overweight, and obese, respectively. Although the IOM and other public health and scientific communities have widely disseminated

these recommendations, about 55% of women with normal weight and 65% of women with overweight/obesity continue to gain in excess of these guidelines.^{5–7}

In standard prenatal care, most women (30%–75%) self-report not having received advice from providers on diet, activity, and weight gain.^{5,6,8–11} We previously reported that only 47% of participants in a prenatal study received GWG information from their provider early in pregnancy and, among women receiving GWG advice, a significant subset received advice that was inconsistent with the IOM recommendations.⁵ In other research,⁹ pregnant women who reported receiving correct advice from a provider about GWG

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guidelines were more likely to gain within recommendations, but GWG was based on self-report. Clinical trial research has shown that interventionists delivering lifestyle interventions during pregnancy can effectively reduce excessive GWG.^{12,13} However, it remains unclear whether physician provision of information about diet, activity, or weight during regular clinical care impacts maternal GWG. Also, the role of different types of practitioners and other potential sources of information (e.g., Internet, books, and family members) in modifying GWG remains unexplored. The purpose of this study was to investigate sources of information about diet, physical activity, and weight during pregnancy, and the impact of information source(s) on maternal GWG, assessed using measured weights.

Materials and Methods

Study setting, patients, and design

Participants were enrolled in the “Fit for Delivery” study (Clinical Trials No. 01117961). The design, methods, baseline characteristics, and main findings of the Fit for Delivery study have been published.^{5,10,11} In brief, Fit for Delivery was a randomized controlled trial conducted in Rhode Island to evaluate whether a prenatal lifestyle intervention (vs. standard care) could reduce excessive GWG in normal weight and overweight/obese women. Approximately half the sample ($n=203$) was normal weight and half ($n=198$) was overweight/obese before pregnancy. Eligibility criteria included nonsmoking, adults (age >18 years), fluency in English, ≥ 5 th grade education, access to telephone, gestational age between 10 and 16 weeks, singleton pregnancy, no current or history of eating disorders, without major psychiatric illness (i.e., schizophrenia, bipolar disorder, and panic/anxiety disorder), or major medical problems, including diabetes, stroke, and cancer.

The lifestyle intervention was designed to promote healthy eating, physical activity, and healthy weight gain during pregnancy. The intervention took place outside of the clinical setting (in our research center) and included one face-to-face visit followed by periodic phone counseling during pregnancy from a study interventionist. After delivery, the intervention was discontinued but follow-up assessments occurred at 6 weeks, 6 months, and 12 months postpartum.

Data collection

All questionnaire measures were collected *via* scannable paper forms. The primary measure of this substudy was sources of prenatal information. Specifically, at participants’ 6-week postpartum visit, they were asked in a structured questionnaire to reference a list of 12 information sources (i.e., physician, magazine, Internet, and friend; see Table 2) that were uninvolved in the trial. They were asked the following: “please indicate for each item whether or not you received information on diet, physical activity, or weight control during pregnancy. If you have received information, please indicate the extent to which you followed the advice received,” which was rated on a seven point scale from 1 = “did not follow” to 7 = “followed extremely.” In a sensitivity analysis, we examined reported sources of information by treatment group. Women randomized to the intervention versus standard care were more likely to report receiving information from a dietitian (60.9% vs. 30.5%, $p=0.0001$),

suggesting that women in the intervention group may not have separated our research intervention visits related to the trial from nutrition/dietitian visits received as part of regular care. There were no other significant differences in reported receipt of information across study treatment arms; the treatment did not directly involve any of the other types of information sources measured.

Demographic and weight history information were also obtained at study entry. Pregravid weight was based on self-report at time of study enrollment, which was validated with measured weights.^{10,11} Anthropometric measures (weight and BMI) were conducted at study entry, 35 weeks gestation, delivery, and 6 weeks postpartum. Total GWG was computed based on pregravid weight and weight at the last clinic visit, on calibrated scales, before delivery. We used the 1990 IOM recommendations because the data were collected before the 2009 revisions were in effect.¹⁴ We classified GWG as “excessive” in normal weight women whose gains were more than 35 pounds (15.9 kg) and in overweight women whose gains were more than 25 pounds (11.4 kg). As the 1990 IOM recommendations for obese women provided only a lower limit of gain, similar to other studies, we combined overweight and obese women in our analysis and set the upper weight gain goal of 25 pounds (11.4 kg).^{8,9,15} (However, analyses using the 2009 recommendations yielded similar findings.) The procedures followed in this study were in accordance with the ethical standards of the institutional committees on human experimentation and were approved by the Institutional Review Boards at the Miriam Hospital, Providence, Rhode Island, the Women and Infants Hospital, Providence, Rhode Island, and California Polytechnic State University, San Luis Obispo, California.

Statistics

Independent *t* tests for continuous variables or chi-square tests for categorical variables were used to examine differences in women who attended or did not attend the 6-week postpartum visit. Some demographic variables were categorized, including weight status (normal vs. overweight/obese), marital status (married vs. nonmarried), education (high school or less vs. some college or more), income ($\geq \$25,000$ vs. $< \$25,000$), ethnicity (Hispanic vs. non-Hispanic), and parity (primiparous vs. nonprimiparous).¹⁰ The McNemar test was used to compare differences in proportions of participants endorsing each source of information. Differences in information sources received within each demographic characteristic were analyzed using the chi-square test. For the multiple comparisons using the McNemar and chi-square tests, a Bonferroni correction factor ($p < 0.005$) was used to reduce likelihood of type 1 error. To examine the relationships between receipt of information from each source and the odds of exceeding IOM GWG guidelines, a logistic regression analysis was used, adjusting for potential confounds that could relate to GWG, including treatment group,^{10,11} maternal age, marital status, parity, income, education, ethnicity, and prepregnancy weight status.^{16–18} Results of Hosmer–Lemeshow tests (p 's > 0.05) indicated that the regression equations were well calibrated despite the large number of covariates (data not shown). Weeks gestation at study enrollment was not included as a covariate because of its lack of relationship with GWG in prior studies of

this sample.^{10,11} However, analyses with inclusion of this variable did not alter results (data not shown). Additional analyses included the interaction term for prepregnancy weight status × receipt of information from a physician. A $p < 0.05$ was used to interpret significance of the multiple logistic regression equations.

Results

Participant characteristics

For this substudy, all women ($n = 355/401$) who completed the sources of information questionnaire at the 6-week postpartum visit were included in analysis. Women who did versus those who did not complete the 6-week visit did not significantly differ by treatment group, age, BMI, GWG, or other demographic factors. Characteristics of substudy participants are displayed in Table 1. In full, 51.5% ($n = 183$) of participants were classified as normal weight and 48.5% ($n = 172$) as overweight/obese. As shown in Table 1, the majority of the sample was non-Hispanic white, married, and educated more than the high school level.

Sources of information

Most women reported receiving information about diet, physical activity, and weight control from a book (60.6%) or the Internet (58.3%) (Table 2). Advice from physicians, dietitians, or nurses was reported in 55.6%, 48.2%, and 33.9% of women, respectively. Fewer participants reported receiving

TABLE 2. PERCENTAGES OF PARTICIPANTS RECEIVING PRENATAL INFORMATION FROM DIFFERENT SOURCES AND EXTENT TO WHICH ADVICE FOLLOWED

	Received information %	Extent followed (1 = did not follow; 7 = followed extremely)
Book	60.6 ^a	4.5
Internet	58.3 ^a	4.1
Physician	55.6 ^{a,b}	5.5
Magazine	52.0 ^{b,c}	3.9
Female family	51.1 ^{b,c}	4.4
Female friend	51.0 ^{b,c}	4.3
Dietitian	48.2 ^c	5.0
Nurse	33.9 ^d	5.2
Television	28.5 ^d	3.6
WIC	23.4 ^{d,e}	4.5
Male family	19.2 ^e	4.1
Male friend	7.6 ^e	3.6

^{a-e}Percentages with different superscript letters indicate that significant ($p < 0.05$) differences were observed in the McNemar test. Tests were not conducted for the values for “extent followed advice” because of differences in sample sizes for each source of information endorsed.

WIC, Women, Infants, and Children Supplemental Nutrition Program.

information from television; the Women, Infants, and Children (WIC) Supplemental Nutrition Program; male family members; and/or male friends. On average, women reported being most likely to follow advice if received from a physician, nurse, or dietitian and least likely to follow advice if received from television, magazine, or a male friend.

Examining sources of information across sociodemographic groups, women who were non-Hispanic white, married, with higher annual household incomes, and had more education reported receipt of information from more sources (than their counterparts), including from books, the Internet, and magazines (Table 3). By contrast, women with younger age, lower income, Hispanic ethnicity and/or less education more frequently reported receiving information from the WIC program (Table 4) and from male friends and male family members (Table 3), although the latter source was less prevalent overall. First time mothers (vs. mothers who had previous pregnancies) and women who were normal weight (vs. overweight/obese) before pregnancy reported more frequently accessing information from female friends and/or family members (Table 3).

Relationships with excessive GWG

In logistic regression analyses, receipt of information from a physician was associated with reduced odds (odds ratio [OR]=0.55; 95% confidence interval [CI] 0.35–0.88; $p = 0.01$) of exceeding IOM GWG guidelines. The prevalence of exceeding guidelines among women who had reported *not* receiving information from a physician was 62.9%; by contrast, the prevalence of exceeding guidelines among women who had reported receiving information from a physician was 48%. Prepregnancy weight status did not significantly interact with receipt of information from a physician in relating to the odds of exceeding IOM guidelines (OR=1.08; 95% CI 0.42–2.8; $p = 0.87$). No other significant relationships or interaction effects were observed.

TABLE 1. PARTICIPANT CHARACTERISTICS (N=355)

Age, years (SD)	28.8 (5.2)
Weight status, %	
Normal weight	51.5
Overweight/obese	48.5
Relationship status, %	
Never married	25.3
Married	70.7
Divorced/separated	4.0
Education, %	
High school or less	13.9
Some college	25.8
College/university degree	33.0
Graduate degree	27.3
Annual household income, %	
<\$24,999	16.1
\$25,000–34,999	23.6
\$35,000–49,999	33.0
\$50,000–74,999	27.3
Ethnicity, %	
Hispanic	16.9
Non-Hispanic	83.1
Race, %	
Asian	2.0
Caucasian	69.0
African American	9.3
Other	19.2
Do not know	0.5
Multiparity, %	22.3
Gestation at enrollment, weeks (SD)	13.5 (1.8)
GWG, kg (SD)	15.1 (6.0)

GWG, gestational weight gain; SD, standard deviation.

TABLE 3. THE PROPORTION OF PARTICIPANTS (N=355) IN EACH DEMOGRAPHIC CATEGORY WHO ENDORSED RECEIPT OF INFORMATION ABOUT PRENATAL DIET, PHYSICAL ACTIVITY, OR WEIGHT CONTROL FROM VARIOUS SOURCES

Percentage "yes" received information Demographic category, %	Information source						
	Book	Internet	Magazine	Female friend	Female family	Male friend	Male family
Age, %							
<24 years	55.0	50.3	48.3	47.7	56.4	11.4	20.9
≥24 years	66.5	64.2	56.8	55.1	47.2	3.4 ^a	16.5
Marital status, %							
Married	67.1	62.7	56.1	52.6	50.4	4.4	15.9
Nonmarried	47.4 ^a	46.4 ^a	45.4	49.5	53.6	13.4	24.7
Education, %							
>High school	64.5	61.3	55.9	52.3	50.5	5.4	5.4
≤High school	41.3 ^a	37.0 ^a	34.8 ^a	47.8	56.5	17.4 ^a	17.4 ^a
Income, %							
≥\$25,000	66.5	43.5	55.4	51.8	50.2	4.4	4.4
<\$25,000	44.9 ^a	62.2 ^a	47.8	50.7	52.2	15.9 ^a	15.9 ^a
Race/ethnicity, %							
Non-Hispanic white	69.7	63.3	57.0	48.1	51.6	4.5	4.5
Other race/ethnicity	43.3 ^a	46.2 ^a	44.2	53.4	51.0	12.5	12.5
Parity, %							
Primiparous	69.8	62.7	55.2	60.7	57.9	8.3	20.2
Multiparous	31.5 ^a	41.1 ^a	45.2	20.5 ^a	28.8 ^a	2.7	12.5
Weight status, %							
NW	68.6	60.4	55.6	60.4	58.0	8.9	23.7
OW/OB	53.2	55.1	50.0	42.3 ^a	44.2	5.1	12.9

^aSignificant difference of receipt of information within a source and by the demographic category based on Bonferroni adjusted ($p < 0.005$) chi-square tests.

NW, women with normal weight; OW/OB, women with overweight or obesity.

Discussion

This study examined women's reported receipt and use of information about diet, physical activity, and weight control during pregnancy from a variety of potential sources. The most common sources of information were books and the Internet, which is consistent with other studies.^{19,20} Just more than half of women reported receiving information about eating, activity, and weight control from their physician. Reported receipt of information from a physician was associated with a reduction by half in the odds of excessive GWG, independent of a range of potential confounders. These findings underscore the potential powerful role a physician can play in reducing GWG.

A low percentage (55%) of women reported receiving advice from their physician about prenatal diet, physical activity, and weight control. Other research has similarly found low levels of receipt of prenatal information overall.^{5,21,22} According to the American Congress of Obstetricians and Gynecologists, all prenatal patients should receive counseling about weight gain, diet, and exercise.²³ The reasons behind low levels of receipt of prenatal information remain unclear. A qualitative study of prenatal care providers identified many barriers to providing weight gain, diet, and exercise counseling during pregnancy, including sensitivity around broaching the topic of obesity, cultural discordance between providers and patients, and reduced provider confidence in weight control counseling.²⁴ Other research has highlighted lack of insurance coverage and

limited physician time as additional barriers to providing lifestyle advice.^{5,21,24} Future research is needed to understand how to increase involvement of practitioners in counseling of diet, physical activity, and weight control. Innovative methods are needed to increase provider time and insurance coverage for prenatal lifestyle counseling. Also, studies are needed for testing the effects of greater practitioner training or patient assertiveness training in broaching topics related to prenatal diet, physical activity, and weight control. Of note, although the prevalence of exceeding GWG guidelines was lower in women who had reported receiving versus not receiving advice from their physician (48% vs. 62.9%, respectively), nearly half of the women who reported receiving the physician advice still gained excessively. This underscores the need for future research to both test ways to engage physicians and test additional methods to prevent excessive GWG in more women.

This study's findings also suggest some social disparities in access to information about diet, physical activity, and weight control. Women with low education and minority status were less likely to report receiving prenatal information from books, the Internet, and magazines, which could reflect an inability to afford these sources, transportation barriers,^{25,26} or potentially lower literacy. (This study excluded participants who could not read, but women with ≥5th grade education were included.) Disadvantaged groups were more likely to receive advice from WIC, underscoring the potential role WIC plays as a primary source of information for underserved populations. Receipt of information from

TABLE 4. THE PROPORTION OF PARTICIPANTS (N=355) IN EACH DEMOGRAPHIC CATEGORY WHO ENDORSED RECEIPT OF INFORMATION ABOUT PRENATAL DIET, PHYSICAL ACTIVITY, OR WEIGHT CONTROL FROM DIFFERENT TYPES OF PRACTITIONERS

Percentage "yes" received information Demographic category, %	Practitioner type			
	Physician	Nurse	WIC counselor	Dietitian
Age, %				
<24 years	56.8	37.6	43.6	46.3
≥24 years	53.4	29.1	6.8 ^a	44.9
Marital status, %				
Married	55.7	28.5	6.1	44.7
Nonmarried	53.1	43.8	64.9	47.4
Education, %				
>High school	55.8	30.6	17.2	47.0
≤High school	50.0	47.8	63.0	45.5
Income, %				
≥\$25,000	55.8	30.6	75.4	47.0
<\$25,000	51.5	47.8	8.8 ^a	43.5
Race/ethnicity, %				
Non-Hispanic white	57.9	32.6	9.5	47.1
Other race/ethnicity	48.5	34.0	53.8 ^a	42.3
Parity, %				
Primiparous	57.8	20.8	21.4	47.2
Multiparous	45.2	36.4	31.5	39.7
Weight status, %				
NW	60.9	34.3	21.3	46.2
OW/OB	48.4	31.6	26.3	44.9

^aSignificant difference in information source receipt by the demographic category based on Bonferroni adjusted $p < 0.005$ in chi-square tests.

WIC was not associated with GWG in this study. Future research should examine ways to increase the impact of WIC in reducing odds of excessive GWG in underserved women.

Interestingly, more low income/less educated women (than counterparts) reported receiving information from male family members and friends. Also, if received, women reported following the advice provided by their male companions. Although this study did not evaluate the type, quality, or accuracy of information received, future research should examine the role of male companions in women's prenatal health and whether/how incorporating men or other family/friends into treatment impacts GWG and pregnancy health outcomes.

First time mothers compared with mothers with more than one child were more likely to report accessing information from female friends and family. Since primiparous women have been shown in other studies to gain excessively than multiparous women,^{15,27} their greater information seeking is potentially encouraging. However, accuracy of information reportedly received from female friends and family is unknown. Also, science-based public health recommendations for prenatal diet, physical activity, and weight control may change between pregnancies. Women with prior pregnancies should be encouraged to seek up to date information about prenatal recommendations.

This study is the first to examine varied sources of prenatal information in a diverse population and relationships with

GWG. However, this study has limitations. While 12 information sources were assessed, not all sources were captured, including information from mid-wives or mobile phone applications, which have become increasingly available. Data from this study were collected between 2009 and 2011, and receipt of information could have changed since that time period. Also, receipt of information was based on self-report and some women likely attributed visits with the study nutritionist as a source of information. Information from diet, physical activity, and weight control were not assessed separately but captured in one question. Also, this study did not examine accuracy, type (diet, activity, and weight), or quantity of information reportedly received from various sources. Also, participants might not have accurately distinguished provider types, limiting the validity of this assessment. Finally, this study was ancillary to a clinical trial, which could limit generalizability of the findings.

Conclusions

In conclusion, information reportedly received from a physician compared with all other sources was most likely to be reported as followed and was significantly associated with reduced odds of gaining excessively during pregnancy. Many women reported that they did not receive information about diet, physical activity, or weight control from their physician. Given the health risks associated with gaining more than recommended during pregnancy,^{15,16,28} future research should examine ways to harness physician influence in reducing excessive GWG.

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Author Disclosure Statement

No competing financial interests exist.

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