Provider Advice About Pregnancy Weight Gain and Adequacy of Weight Gain

Renée M. Ferrari and
Cecil G. Sheps Center for Health Services Research, The University of North Carolina at Chapel Hill, 725 Martin Luther King, Jr. Blvd., Campus Box 7590, Chapel Hill, NC 27599-7590, USA

Anna Maria Siega-Riz
Departments of Nutrition and Epidemiology, The University of North Carolina at Chapel Hill, 2105-A McGavran Greenberg, Campus Box 7435, Chapel Hill, NC 27599-7435, USA

Renée M. Ferrari: rferrari@unc.edu

Abstract

To explore the association between health care provider advice about weight gain and gestational weight gain. Using data from a prospective cohort study, we explored the association between provider advice about weight gain in pregnancy with weight gain adequacy among 1,454 pregnant women. Provider advice was measured by maternal self-report at 27–30 weeks' gestation. Linear and Poisson regression were used to explore associations. Seventy-eight percent of the women gained outside current recommendations. Fifty-one percent reported receiving weight gain advice from a health care provider. Adjusted Generalized Linear Model (GLM) estimates showed weak effect of provider advice on inadequate or excessive gain (Relative Risk (RR) 0.96, 95% CI 0.74, 1.26 for inadequate gain and RR 1.01, 95% CI 0.97, 1.06 for excessive gain). There is a need for more women to hear about their targeted weight gains during pregnancy and the present advice that exists does little to influence actual gains. Further studies are warranted to find better strategies for providers to motivate their patients to gain weight within the appropriate ranges.

Keywords

Pregnancy; Gestational weight gain; Provider advice

Introduction

The Institute of Medicine (IOM) weight gain guidelines [1] have been widely published and adopted by the American College of Obstetrics and Gynecology and the American Academy of Pediatrics [2]. In spite of this, the majority of pregnant women continue to gain weight outside recommendations [3–5] and these numbers have increased over time [6]. Results from a systematic review demonstrate strong evidence that gaining outside recommended ranges increases the risk of preterm delivery and low birth weight for women with

Correspondence to: Renée M. Ferrari, rferrari@unc.edu.

inadequate gain, and high birth weight, macrosomia, cesarean section, and postpartum weight retention among those with excessive gain [7].

Remarkably little is known about why pregnant women gain weight outside the IOM recommendations. Researchers have found that pregnant women who reported being advised about the appropriate amount of weight to gain during pregnancy were more likely to gain within the recommended range than women who did not report receiving such advice [8–11]. However, this association is based on a handful of studies, most of which were conducted prior to or soon after the 1990 IOM guidelines were made public. In 2006, the IOM reported that "despite the availability of the IOM recommendations and an effort to publicize their availability, their use and compliance are not well-understood" [6]. The committee called for future research on the role of provider advice in helping women achieve targeted pregnancy weight gain goals, [6] a recommendation echoed in the systematic evidence-based review on maternal weight gain [7].

The purpose of this study was to determine the proportion of women reporting having received provider advice about weight gain and to examine the association between reported advice and risk for excessive or inadequate pregnancy weight gain.

Methods

Study Design and Sample

Data for this study came from the Pregnancy, Infection, and Nutrition Study 3 (PIN), a longitudinal cohort study of risk factors for preterm birth conducted at the University of North Carolina (UNC) Hospitals in central North Carolina. PIN staff recruited women from prenatal care clinics at their second prenatal visit. Eligible women were English-speaking women less than or equal to 20 weeks' gestation who were at least 16 years old, had a singleton fetus, planned to continue care at the clinic, and had access to a telephone for interviews. Data on sociodemographics, medical history, current pregnancy, and health behaviors were collected via clinic visits, in-depth phone interviews, and self-administered questionnaires. Between January 2001 and June 2005, a total of 2,006 women were recruited. The Institutional Review Board of the University of North Carolina at Chapel Hill approved all study protocols.

Exposure Measurement: Provider Advice About Pregnancy Weight Gain

Maternal self-report of provider advice about pregnancy weight gain was obtained from a telephone interview administered by a trained interviewer at 27–30 weeks' gestation. Women were asked to answer yes or no to the following question: "At any time during this pregnancy, has a doctor, nurse, or other health professional given you advice about how much weight you should gain during pregnancy?" Women were also asked to identify the source of provider advice (doctor, nurse, other health professional) and to indicate whether they followed the advice (yes/no).

Outcome Measurement: Adequacy of Pregnancy Weight Gain

Adequacy of gestational weight gain was defined as gaining within predetermined ranges of the 1990 IOM guidelines [12]. We used the older version of the guidelines since they were in use at the time of the study. These guidelines delineate recommended pregnancy weight gain based on a woman's prepregnancy body mass index (BMI). Self-reported prepregnancy weight and height measurements were collected at the time of recruitment and used to calculate prepregnancy BMI. Women were categorized into BMI categories based on the 1990 IOM cut points: BMI <19.8 kg/m^2 (underweight); BMI 19.8–26.0 kg/m^2 (normal weight); BMI 26.1–29.0 kg/m^2 (overweight); BMI >29.0 kg/m^2 (obese) [12]. After delivery, gestational weights at each prenatal visit were abstracted from the medical chart and used to determine total gestational weight gain based on gestational age, using a formula described elsewhere [3].

The outcome was explored in three different ways: (1) as a continuous variable of total pregnancy weight gain in kilograms, calculated by subtracting the prepregnancy weight from the last prenatal visit before delivery; (2) as a ratio of observed to expected weight gain, calculated by dividing the total weight gain in kilograms by the expected weight gain for a specific gestational age in kilograms (based on IOM recommendations as described above), such that a value >1 indicates greater than expected gain and a value <1 indicates less than expected gain; and (3) as a categorical variable of inadequate, adequate, or excessive weight gain. For the categorical variable, adequacy was defined based on the expected rate of weight gain (from the IOM pre-pregnancy specific weight gain recommendations) and the 1990 IOM recommended total pregnancy weight gain ranges. We expressed adequacy as the ratio of observed weight gain/ expected weight gain and then multiplied by 100 to get a percentage. Inadequate gain was defined as gain below the lowest percent, adequate was within the percentage range, and excessive was gain above the percentage range. The IOM recommendations did not indicate an upper weight gain limit for obese women; thus to categorize obese women into adequacy categories we used the same upper percentage range as for overweight women. Details of the adequacy measure and calculations are described elsewhere [13].

Covariates

Potential confounders included maternal race (African American, Caucasian), age (in years), education level (less than high school, completed high school, and greater than high school), parity (0, 1, 2, and 3 or more children), and poverty level (185% of the Federal Poverty Level (FPL), >185% FPL). We also evaluated pregnancy and maternal health status indicators. These variables were measured using prenatal records, which indicated the presence or absence of gestational diabetes, pregnancy-induced hypertension, preterm labor, vaginal bleeding, pre-existing diabetes, and smoking during pregnancy. Health behaviors included weight cycling, dieting history, and restrictive eating behaviors which were assessed at 27–30 weeks' gestation using the Revised Restraint Scale [14, 15]. Maternal attitude toward pregnancy weight gain was assessed at 27–30 weeks' gestation using the Pregnancy Weight Gain Attitude Scale [16].

Potential mediators included diet and physical activity. Dietary values of carbohydrate, protein, fat, and total caloric intake were estimated from a modified version of the Block Food Frequency Questionnaire designed to assess diet during the previous 3 months [17]. Women completed this questionnaire between 24 and 29 weeks' gestation. In the analysis we used both the continuous forms of the dietary values as well as categorical forms divided into tertiles. Physical activity was assessed at 27–30 weeks' gestation via a validated questionnaire in which women reported their physical activity in the week prior to the telephone interview [18].

Participants rated their activities that caused at least some increase in heart rate as fairly light, somewhat hard, or hard/very hard, and indicated the length of time they spent engaged in each activity. The length of time and frequency of participation in each activity were multiplied and summed for the week for each of the three intensity levels. Total activity was calculated by adding up the time per week spent in fairly light, somewhat hard, and hard/ very hard activities for all activities. Recreational activity was calculated in the same manner but limited to time spent in recreational activities, such as walking (not as a means of transportation), running, swimming, tennis, yoga, etc.

Statistical Analysis

From the 2,006 women who were recruited into PIN, we excluded 233 (11.6%) without sufficient prenatal weight gain data and 213 (10.6%) who did not complete the second phone interview (in which the provider advice question was asked). Of the remaining 1,560 women, we excluded 23 (1.5%) with fetal or infant deaths and 83 (5.3%) who had more than one pregnancy in the cohort, the second (and, in 3 cases, the third) of which was dropped to remove issues of dependency, resulting in a final analysis file of 1,454 women.

Analysis included descriptive statistics. Chi square and t test statistics were used to identify any differences in population characteristics by provider advice and by weight gain adequacy, with statistical significance set at $p < 0.05$. We hypothesized that dietary intake and physical activity operated as mediators in the causal pathway between advice and pregnancy weight gain. We tested for mediation using both Baron and Kenny's criteria [19] and the Sobel test for mediation [20], exploring the mediating variables in their continuous and categorical forms and the outcome as total, observed/expected, and adequacy of weight gain.

Maternal race and prepregnancy BMI were identified from the literature [8–10] as potential effect measure modifiers and were tested prior to assessing confounding by comparing the odds ratios for inadequate or excessive gain among women who reported receiving provider advice versus women who reported receiving no provider advice. Effect measure modification was considered present if the Mantel Hanzel test for homogeneity detected a difference in odds ratios between groups ($p < 0.1$). Race was limited to African American and Caucasian; other races were excluded due to low numbers in the population ($n = 132$, 9.1%). Prepregnancy BMI was categorized into two groups (underweight/normal weight and overweight/ obese) following a sensitivity analysis that found no significant differences when collapsing the four groups into two (results not shown). The socio-demographic, health status, health behavior, and attitude variables were assessed as potential confounders

using a backward elimination method; those that did not change the beta coefficient or the relative risk by 10% or more were dropped from the final model.

We used linear regression to examine the outcome in its continuous forms; for the categorical form of the variable, we performed a multivariable analysis using a generalized linear model to estimate the adjusted risk of inadequate or excessive gain associated with provider advice. Inadequate and excessive gains were modeled separately, with adequate gain as the referent variable in each model. Inter-cooled STATA 9.0 was employed for all statistical analyses.

Results

Table 1 provides descriptive characteristics of the study population, the majority of which was White and over the age of 25 with a greater than high school education level. The sample was comparable to the population served by the hospital at which the births occurred [21]. Less than 25% of the population gained weight within IOM recommendations, while 10% gained less and two-thirds gained more than recommended. When asked at 27–30 weeks' gestation, 51.8% of the population reported having received provider advice about pregnancy weight gain. When compared to women who reported no advice, those who reported advice were more often of a higher education level and income, nulliparous, to have a history of dieting, and to have a lesser amount of physical activity in the first trimester (p <0.05). Age, race, marital status, and prepregnancy BMI were not associated with provider advice (Table 1).

Adequacy of Weight Gain

Average total pregnancy weight gain among women who delivered term was 15.0 kg (33.0 lb.) (SD) 6.0 kg (13.2 lb.). The majority gained in excess of the recommendations (Table 1). Adequate gain was lower with higher prepregnancy BMI, while excessive gain tended to be higher with higher BMI (Fig. 1).

Total Weight Gain and the Weight Gain Adequacy Ratio (Observed/Expected Gain)

In the linear regression analysis, a change from no advice to receiving advice resulted in a 0.46 kg (1.01 lb.) lower total pregnancy weight gain (adjusting for maternal race, parity, age, and restrained eating, 95% CI –1.22, 0.30) and a 0.003 lower weight gain adequacy ratio compared to women not reporting having received advice (adjusting for the confounders of maternal race, prepregnancy BMI, age, education level, gestational diabetes, restrained eating, and total and recreational physical activity in the first trimester, 95% CI –0.10, 0.10). Neither result was statistically significant at the p <0.05 level. Following provider advice showed no association with either total weight gain or the adequacy ratio in the bivariate analysis.

Inadequate and Excessive Weight Gain

Table 2 displays the crude and adjusted relative risks and their respective 95% confidence intervals for both inadequate and excessive weight gain among women with no provider advice compared to women who reported receiving advice. We did not detect effect measure

modification by race or prepregnancy BMI and thus one estimate each is reported for total weight gain, the ratio of observed/expected gain, and for inadequate and excessive gain. The crude analysis demonstrated a weak risk for inadequate gain, which became null after accounting for restrained eating and recreational activity in the second trimester. There was a weak effect of provider advice on excessive gain.

Source of Advice and Whether Advice was Followed

Of the 52% of women reporting weight gain advice, 75% reported advice from a doctor, 8% from a nurse and 18% from 'other health professional'. Ninety-one percent of women reported following advice. After controlling for race and BMI, following advice was associated with a statistically significant lower risk of excessive weight gain (RR = 0.87, 95% CI = 0.78, 0.98). There was no association between type of provider and weight gain adequacy.

Advice and Weight Gain Mediation

Table 3 illustrates the steps undertaken to determine the presence of mediation using the Baron and Kenny criteria [19], with the outcome of total weight gain in kilograms. The potential mediators tested were caloric intake, first-trimester physical activity, and second-trimester physical activity (all self-reported, continuous measures). We also assessed mediation defining the weight gain outcome as observed/expected gain and weight gain adequacy, with mediators measured as total caloric intake in tertiles, and physical activity levels of no activity, below the median, or above the median (results not shown).

The Sobel test statistics varied according to which forms of the pregnancy weight gain and mediating variables we tested, with a total effect of the mediators ranging from –20.4 to 31.5%, none of which were statistically significant (results not shown). Thus neither diet nor physically activity proved to be mediators between provider advice and pregnancy weight gain.

Discussion

The majority of our population gained outside IOM recommendations and most gained excessively. Just over half of the women reported receiving advice from a health care professional about how much weight they should gain. We found no evidence for an association between provider advice and pregnancy weight gain. Contrary to our hypotheses, neither dietary intake nor physical activity proved to be mediators in the causal pathway between advice and weight gain. Possible inaccuracies in self-reported dietary intake and physical activity may have created measurement error and nullified an effect of one or the other variable. It is also possible that an effect exists but that neither the Sobel test nor the Baron and Kenny criteria were able to detect a difference as both approaches are known to be limited by small sample size [22]. More likely, no mediating effect was found because of the lack of main effect, i.e. the lack of association between advice and weight gain.

The proportion of women reporting provider advice about weight gain is similar to results found by Olson and Strawderman [23], higher than Phelan et al. [24]. but lower than other studies [8–10]. With one exception, [25] earlier weight gain studies comprised mainly White

women, who were more likely to report receiving advice than women of other races (though we did not find this in our population). Several of the previous studies asked women to report solely about physician advice; given that we queried women about advice from any health care provider and that women interact with multiple providers throughout the course of a pregnancy, one would expect the proportion of those reporting advice to be higher in our sample but this was not the case [24].

Of equal concern is the very low proportion of women with significant health concerns who reported advice. In our sample, only 54% of smokers and 55, 43, 53 and 63% of women with pre-existing hypertension, pre-existing diabetes, gestational hypertension, and gestational diabetes, respectively, reported advice (results derived from Table 1). Such health conditions put pregnant women at increased risk of poor birth outcomes and warrant particular attention to weight gain advice yet a high proportion of these at-risk women reported having received no weight gain advice.

In contrast to earlier studies [8–10, 25, 26], our results provide no evidence for an association between provider advice and pregnancy weight gain. It is possible that we did not detect an effect not because advice is unrelated to weight gain but because the type or quality of advice is critical to noting an effect. Brawarsky et al. [25] found that 'no physician advice' versus 'correct physician advice' had no effect on excessive gain, but that women who reported advice to gain above IOM recommendations were most likely to gain excessively. Providers may be offering advice, but ineffectively. Although providers may feel weight gain counseling is important, research suggests that many are uncomfortable with weight gain counseling, feel poorly skilled to offer it, and/or feel weight issues are intransigent and unlikely to change with intervention [27]. A possible next step then may be targeting providers for counseling and motivational interviewing skills training [28].

A lack of effect may also mean that women are receiving advice but not following it. Results from focus groups we conducted of 58 White, African American, and Hispanic pregnant women of varying body sizes suggest that women do not follow advice that they view as conflicting and generalized, desiring instead specific, clear, tailored advice (results not yet published). These results suggest that simply being advised to gain within a specific range is not enough to effect behavior change. At least one intervention study which provided education and support to participants provides evidence of this assertion: low-income women in the intervention group gained significantly less weight during pregnancy and retained less weight at 1-year postpartum compared to controls [29].

Our results suggest that provider advice, as provided in routine prenatal care, is not sufficient to help women gain within recommended ranges during pregnancy. In contrast, results from studies of comprehensive weight gain interventions in pregnancy have been somewhat promising [29–32]. In those interventions, women received intensive, individualized counseling about diet and physical activity over a period of time. Intervention results lead us to believe that women would benefit from advice beyond what providers currently offer.

Some practical guidance for providers on how to counsel women has been detailed in earlier publications and includes suggestions for nutrition, physical activity, and weight gain tools and counseling spanning the preconception, prenatal, and postpartum periods [33–35]. It is equally important to recognize that individual providers cannot address pregnancy weight gain alone. Rather, they must be a part of a team effort and "share the care", involving other staff and making referrals when necessary, for example to nutritionists or WIC counselors [35]. Systems-level issues need also be addressed and could include tools such as electronic medical record prompts to remind providers to inquire about weight gain.

This study has both notable strengths and caveats. The study's prospective nature limited recall bias and enabled us to capture women's experiences with advice while pregnant. The richness of the data also allowed us to examine a multitude of covariates, such as diet, physical activity, restrained eating, and general health indicators of pre-existing diabetes and hypertension that are largely nonexistent in other studies of advice and weight gain. Importantly, this study was unique in exploring potential mediators in the pathway to gestational weight gain.

As in others, our study was limited to maternal self-report of advice. We have neither provider input nor an objective record of whether advice was provided, what it was, or how it was offered. This limits our ability to identify links between the nature of advice and whether it is recalled, but does not undermine the important result that, whether provided or not, women did not hear the advice. The evidence that half of women report receiving no weight gain advice is in and of itself cause for concern.

Another limitation is the self-reported prepregnancy weight and height, leading to potential misclassification of BMI. As is common with pregnancy cohorts, measuring height and weight prior to pregnancy was not feasible in this study. Prior studies show reasonable accuracy of self-reported weight in similar populations [36]. In our study, some of the misclassification risk is reduced as a result of combining underweight/normal weight together and overweight/obese together, creating a measure less sensitive to slight under or over-reporting. Of potential concern would be the overweight women being misclassified as normal weight [37].

The collective findings of earlier research [8–11] suggest that advice is an important influence on women's behavior. Future research on weight gain advice would benefit from qualitative study which is well-suited to in-depth examination of personal experiences. It could provide greater insight into what women think of weight-related issues in pregnancy, how they feel about the advice they receive, and why they do or do not follow it. Given limited research on the provider's perspective, qualitative investigation could aid in the development of a questionnaire for a large sample of providers, one that could assess their current practices as well as counseling needs and comfort level. Such inquiry could prove important as exploratory research with the ultimate aim of informing effective interventions to aid women in achieving healthy pregnancy weight gain.

Acknowledgments

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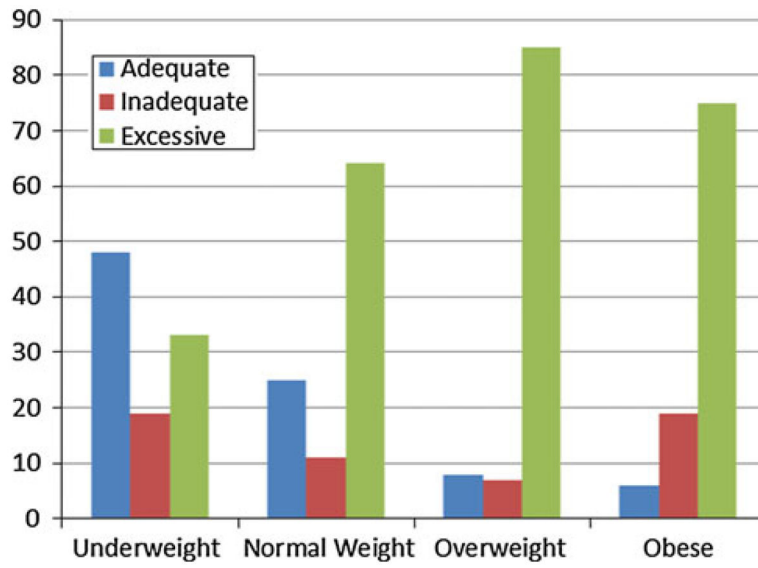
Fig. 1.
Weight gain adequacy by prepregnancy BMI

Table 1

Distribution of maternal characteristics by provider advice about pregnancy weight gain

Maternal characteristic	Total sample (n = 1,454)		Provider advice about weight gain				p value
			Received advice[a] (n = 753)		Did not receive advice (n = 701)		
	n	%	n	%	n	%	
Race							0.32
Caucasian	1,049	72.2	543	72.1	506	72.3	
African American	273	18.8	149	19.8	124	17.7	
Other	131	9.1	61	8.1	70	10.0	
Education level*							0.05
<High school	95	6.5	43	5.7	52	7.4	
High school	182	12.5	82	10.9	100	14.3	
>High school	1,177	81.0	628	83.4	549	78.3	
Income status*							0.02
185% Federal poverty level	279	19.9	127	17.5	152	22.6	
>185% Federal poverty level	1,121	80.1	601	82.6	520	77.4	
Marital status							0.75
Single	282	19.4	149	19.8	133	19.0	
Married	1,122	77.2	576	76.5	546	77.9	
Separated, divorced, widowed	50	3.4	28	3.7	22	3.1	
Age							0.10
18	42	2.9	22	2.9	20	2.9	
19–24	253	17.4	119	15.8	134	19.1	
25–29	423	29.1	238	31.6	185	26.4	
30–34	495	34.0	260	34.5	235	33.5	
35+	241	16.6	114	15.1	127	18.1	
Parity (live births + stillbirths)*							0.00
0 (Nulliparous)	726	49.9	456	60.6	270	38.5	
1	479	32.9	193	25.6	286	40.8	
2	178	12.2	66	8.8	112	16.0	

Maternal characteristic	Total sample (n = 1,454)		Provider advice about weight gain					p value
			Received advice[a] (n = 753)		Did not receive advice (n = 701)			
	n	%	n	%	n	%		
3+	71	4.9	38	5.1	33	4.7		
Pre-pregnancy BMI								
Underweight	208	14.3	99	13.2	109	15.6		0.59
Normal weight	747	51.4	392	52.1	355	50.6		
Overweight	157	10.8	80	10.6	77	11.0		
Obese	342	23.5	182	24.2	160	22.8		
Diet history								
Weight cycling								
Yes	495	49.7	265	49.8	230	49.5		0.91
No	502	50.4	267	50.2	235	50.5		
Dieting*								
Yes	564	52.3	318	56.0	246	48.2		0.01
No	514	47.7	250	44.0	264	51.8		
Restrained eating								
Yes	502	50.5	279	52.5	223	48.2		0.17
No	492	49.5	252	47.5	240	51.8		
Health conditions								
Pre-existing hypertension								
Yes	100	6.9	55	7.3	45	6.4		0.51
No	1,354	93.1	698	92.7	656	93.6		
Pre-existing diabetes								
Yes	51	3.5	22	2.9	29	4.1		0.21
No	1,403	96.5	731	97.1	672	95.9		
Pregnancy-induced hypertension								
Yes	367	25.2	194	25.8	173	24.7		0.63
No	1,087	74.8	559	74.2	528	74.3		
Gestational diabetes								
Yes	62	4.3	39	5.2	23	3.3		0.07
No	1,392	95.7	714	94.8	678	96.7		

Maternal characteristic	Total sample (n = 1,454)		Provider advice about weight gain				p value
			Received advice[a] (n = 753)		Did not receive advice (n = 701)		
	n	%	n	%	n	%	
Pre-eclampsia/Eclampsia							
Yes	75	5.2	37	4.9	36	5.4	0.66
No	1,379	94.8	716	95.1	663	94.6	
Smoked first 6 months of pregnancy							
Yes	164	11.3	75	10.0	89	12.7	0.11
No	1,287	88.7	675	90.0	612	87.3	
Attitude toward pregnancy weight gain							
Positive	1,081	93.6	572	93.5	509	93.7	0.85
Negative	74	6.4	40	6.5	34	6.3	
Received weight gain advice							
Yes	753	51.8	–	–	–	–	–
No	701	48.2	–	–	–	–	
Source of advice							
Doctor	548	74.7	–	–	–	–	–
Nurse	57	7.8	–	–	–	–	
Other health professional	129	17.6					
Followed weight gain advice							
Yes	675	91.2	–	–	–	–	–
No	65	8.8	–	–	–	–	
Advised to change physical activity during pregnancy[*]							
Yes	339	23.3	189	25.1	150	21.4	0.15
No	1,114	76.7	563	74.9	551	78.6	
Adequacy of weight gain							
Adequate	320	22.0	167	22.2	153	21.8	0.5
Inadequate	196	13.5	109	14.5	87	12.4	
Excessive	938	64.5	477	63.4	461	65.8	
First trimester physical activity	n = 1,432		n = 744		n = 688		–
Total activity hours in last week[*]	Mean 7.9		Mean 7.2		Mean 8.6		0.02

Maternal characteristic	Total sample (*n* = 1,454)		Provider advice about weight gain				*p* value
			Received advice[a] (*n* = 753)		Did not receive advice (*n* = 701)		
	n	%	*n*	%	*n*	%	
	SD 11.4		SD 9.8		SD 12.8		
Total recreation hours in last week	Mean 1.9		Mean 1.9		Mean 1.8		0.31
	SD 2.9		SD 2.6		SD 3.1		
Second trimester physical activity	*n* = 1,413		*n* = 735		*n* = 678		
	Mean 6.6		Mean 6.3		Mean 6.8		0.20
Total activity hours in last week	SD 8.2		SD 7.6		SD 8.9		
Total recreation hours in last week [*]	Mean 1.7		Mean 1.9		Mean 1.5		0.01
	SD 2.7		SD 2.9		SD 2.3		

[*] Significant differences between those who reported advice and those who did not (χ^2 test of overall distribution *p* <0.05 for categorical variables; two-sided *t* test of sample means for continuous variables *p* <0.05)

Missings uniformly excluded; percents may not add due to rounding

Table 2

Relative risk of inadequate or excessive gain associated with reported provider advice

Weight gain	Crude		Adjusted	
	Relative risk	**(95% CI)**	**Relative risk**	**(95% CI)**
Adequate	Referent		Referent	
Inadequate[a]	1.09	(0.87, 1.36)	0.97	0.75, 1.27
Excessive[b]	0.99	(0.92, 1.05)	1.01	0.97, 1.06

[a] Adjusted for restrained eating and recreational activity in the 2nd trimester

[b] Adjusted for maternal race and pregravid BMI

Table 3

Assessment of total caloric intake and total physical activity hours in the first trimester and second trimesters as potential mediators between provider advice and pregnancy weight gain, using the Baron and Kenny criteria

Criterion	Independent variable (mediation model)	Dependent variable (mediation model)	Model results	
			Coefficient	*p* value
1. Independent variable is associated with dependent variable	Weight gain advice	Total weight gain	−0.14	0.67
2. Independent variable is associated with mediating variable	Weight gain advice	Total caloric intake	4.82	0.92
	Weight gain advice	Total physical activity, 1st trimester	−1.40	0.02
	Weight gain advice	Total physical activity, 2nd trimester	−0.56	0.20
3. The mediating variable is associated with the dependent variable	Total caloric intake	Actual weight gain	0.0004	0.05
	Total physical activity, 1st trimester	Actual weight gain	−0.008	0.58
	Total physical activity, 2nd trimester	Actual weight gain	−0.009	0.63
4. The association between the independent and dependent variables is attenuated when controlling for the mediating variable	Weight gain advice	Actual weight gain[a]	−0.11	0.75
	Weight gain advice	Actual weight gain[b]	−0.22	0.49
	Weight gain advice	Actual weight gain[c]	−0.09	0.78

[a] Controlling for total caloric intake

[b] Controlling for total perceived physical activity, 1st trimester

[c] Controlling for total perceived physical activity, 2nd trimester