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Dutch Midwives' Behavior and Determinants in Promoting Healthy Gestational Weight Gain, Phase 2: A Quantitative Approach

Astrid Merkx, Marlein Ausems, Luc Budé, Raymond de Vries, and Marianne J. Nieuwenhuijze

BACKGROUND: Unhealthy gestational weight gain (GWG) contributes to long-term obesity in women and their offspring. The aim of this study is to quantify midwives' behavior in promoting healthy GWG and to identify the most important determinants related to this behavior.

METHODS: A survey based on the attitude–social influence–self-efficacy (ASE) model and prior qualitative research was conducted among 112 Dutch practicing midwives.

RESULTS: Midwives were moderately active in monitoring GWG and diet education and less active in physical activity education. Regression analysis showed that efforts to promote healthy GWG were associated with several determinants, including attitudes, self-efficacy, social influence, the involvement of other health workers, health promotion, and barriers.

PRACTICE IMPLICATIONS: The identified behavioral determinants provide insight into ways to stimulate midwives to promote healthy GWG.

KEYWORDS: prenatal care; gestational weight gain; ASE model; healthy weight; midwives

INTRODUCTION

High gestational weight gain (GWG; i.e., weight gain above the Institute of Medicine [IOM] guidelines) is associated with obesity in the long term for both mothers and their offspring (Koletzko, Brands, Poston, Godfrey, & Demmelmair, 2012; McClure, Catov, Ness, & Bodnar, 2013; Rasmussen & Yaktine, 2009; Rode, Kjaergaard, Ottesen, Damm, & Hegaard, 2012). Healthy GWG yields better obstetric outcomes compared with too high or too low GWG (Rasmussen & Yaktine, 2009). The percentage of women in high-income countries who gain weight within the IOM guidelines varies from 21.6% to 48.7% (Hunt, Alanis, Johnson, Mayorga, & Korte, 2013; Rauh et al., 2013). The incidence of women in the Netherlands who gain weight below (19%), within (44%), and above (38%) the IOM guidelines (Althuisen, van Poppel, Seidell, & van Mechelen, 2009) also demonstrates

a clear need to focus on healthy GWG to improve the health prospects of mothers and babies. Interventions using GWG monitoring, diet education, and education about physical activity (PA) can influence women's GWG (Muktabhant, Lumbiganon, Ngamjarus, & Dowswell, 2012; Thangaratinam et al., 2012). Prenatal care providers are in a position to provide these interventions. The problem of too high GWG has not yet been effectively addressed, however (Althuisen et al., 2009; Daemers, Wijnen, van Limbeek, Budé, & de Vries, 2013). Exploration of how to develop successful interventions for promoting GWG is necessary. One of the routes to increasing the number of women who gain a healthy amount of weight during pregnancy is to stimulate and facilitate care providers to promote healthy GWG during prenatal care. The question arises how prenatal care providers, who have limited time, can be facilitated to direct their attention in an effective way to promoting healthy GWG.



To influence prenatal care providers' behavior, it is crucial that the intervention be tailored to their practices (Bartholomew, Parcel, Kok, & Gottlieb, 2006). It is necessary, therefore, to have a clear view of what their current behavior regarding promoting healthy GWG is and what determinants encourage or discourage their behavior.

Midwives working in primary care are the main prenatal care providers in the Netherlands. Close to 85% of all pregnant women begin their prenatal care with a midwife (Perinatale Registratie Nederland [PRN], 2014). Fifty-four percent of all pregnant women continue to receive prenatal care from a midwife at the end of pregnancy (PRN, 2014). The Dutch midwifery system is described elsewhere (Merkx, Ausems, Budé, de Vries, & Nieuwenhuijze, 2015). Qualitative studies of midwives (Heslehurst et al., 2013; Merkx et al., 2015) have examined their educational needs and explored determinants related to their behavior in promoting healthy GWG. Midwives revealed their need for training and education by acknowledging a lack of relevant skills and knowledge. Moreover, midwives had varying attitudes toward promoting healthy GWG, and their engagement in health promotion in general seemed to influence their daily practice in promoting healthy GWG.

The aim of this article is to quantify midwives' behavior in promoting GWG and to identify the most important determinants related to this behavior. By doing so, we provide information that can be used for developing an evidence-based intervention to effectively promote healthy GWG, tailored to the practice of prenatal care providers.

METHODS AND MATERIALS

Model

Drawing on previous intervention studies on promoting healthy GWG, we divided the general behavior "promoting healthy GWG" into three sub-behaviors, including "monitoring GWG," "diet education," and "PA education." We used the attitude–social influence–self-efficacy (ASE) model as a basis (De Vries, Mudde, & Dijkstra, 2000). We used qualitative studies to adapt the general ASE model to build our hypothesized model (Heslehurst et al., 2013; Merkx et al., 2015). Attitude, social influence, self-efficacy, and barriers are related to a specific behavior (gray boxes in Figure 1). The attitudes related to diet education (such as "I believe diet education is important"), for example, can differ from attitudes toward monitoring GWG ("I believe monitoring GWG is important"; see Figure 1).

Procedure

We conducted a survey among primary care midwives who were recruited in June and July 2012. We sent an e-mail to 164 midwifery practices affiliated with our institute and placed two general announcements in the digitally distributed newsletter sent to all members of the Dutch Royal College of Midwives (98% of all primary care midwives). Midwives were invited to participate and a link to the online survey was provided in the invitation. The study was entered into the Dutch trial register under number TC 3543. Because of the

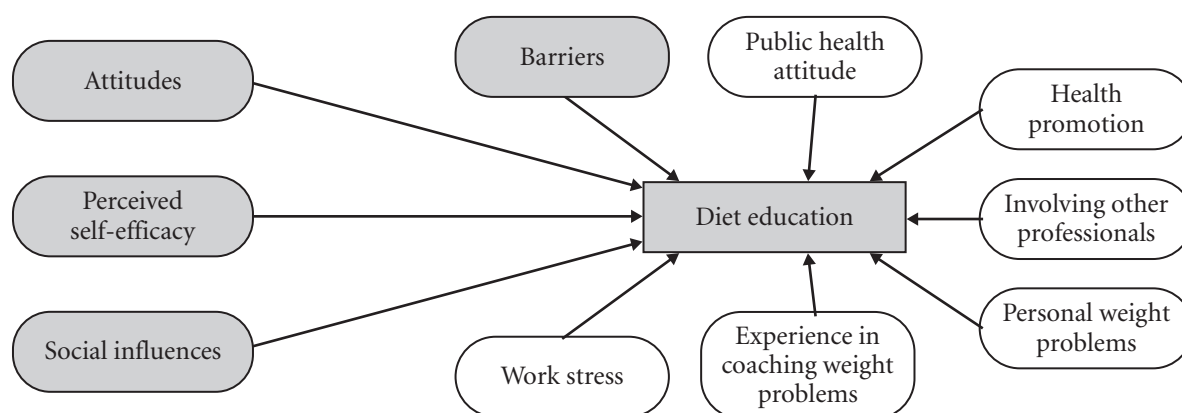


FIGURE 1 Hypothesized model for diet education used for the regression models. Gray boxes are specific for a given behavior; here for example, the behavior is diet education. The boxes containing attitudes, perceived self-efficacy, social influences, and barriers are related to diet education. Where the behavior is "monitoring GWG," the gray boxes are also related to weight gain. The white boxes remain the same for all behaviors.

noninvasive character of the study, the research ethics committee of Atrium-Orbis-Zuyd confirmed that ethical approval was not necessary.

The Questionnaire

The questionnaire included 156 items divided into six categories:

1. Midwife characteristics (4 items): age (in years), education (3 years midwifery education, 4 years midwifery education, university level), work experience (in years), and workload (number of cases per year)
2. Practice characteristics (16 items): working environment (solo practice, own practice in group practice, or as an employee), specific aspects of care (time spent on intake, number of postpartum care visits, etc.), presence and tasks of a practice assistant
3. Monitoring GWG (64 items): We asked midwives about weighing in four separate groups (average body type, appearing too thin, appearing too heavy, and women with a history of weight problems). We posed these items for the first visit and for subsequent visits. We asked two questions about discussing GWG. We also asked how body mass index (BMI) was defined (self-reported or measured weight and length).

We asked participants how often they actually engaged in a specific behavior when they “discussed GWG.” To construct these items, we used literature on behavioral change techniques, goal setting, education, and motivational interviewing (Noordman, van der Weijden, & van Dulmen, 2012). See Box 1.

We also inquired about monitoring GWG-related attitudes (e.g., “For me, discussing GWG is important.”), social influences (e.g., “My clients expect me to discuss

GWG with them.”), perceived self-efficacy (e.g., “I am good at discussing GWG with my clients.”), barriers (e.g., “I lack guidelines.”), knowledge, and time spent on discussing GWG.

4. Diet education (24 items): Items included performed behavior (advice to follow a healthy diet, discussing diet, discussing resistance to conversations about diet), related attitudes (importance and effectiveness of behavior), social influence (“My clients expect me to discuss their diet.”), perceived self-efficacy of the behavior, and barriers (e.g., “I lack guidelines to promote healthy eating.”).
5. PA education (27 items): Items included performed behavior (advice on the norms for healthy PA, discussing complaints of overexertion), related attitudes (importance and effectiveness of behavior), social influence, perceived self-efficacy of the behavior, and barriers (e.g., “I lack time to inform women about healthy PA.”).
6. Additional determinants (21 items): We asked about the involvement of various health professionals for achieving a healthy GWG (including general practitioner, obstetrician, dietitian, physiotherapist, nonregular therapist, psychologist, and special pregnancy course), attitude toward public health (one item), work-related stress (three items), personal experience with weight problems (one item), and experience in coaching others about weight issues (one item). In addition, we developed a scale about regular behavior with respect to general health promotion, derived from the World Health Organization definition of health and health promotion (World Health Organization [WHO], 1986) as shown in Box 2.

Twelve items were open-ended, 23 were multiple-choice, and the remaining (121) could be answered on a 7-point Likert scale, ranging from 1 (*totally disagree/never*) to 7 (*totally agree/always*). The questionnaire was pretested among seven practicing midwives and seven midwifery lecturers using cognitive interviewing

BOX 1 Behavioral Components of Discussing Gestational Weight Gain

When I discuss GWG . . .

- I provide information about healthy GWG for this particular woman.
- I try to find the causes of an unhealthy GWG.
- I discuss the health implications of too high and too low GWG.
- I regularly discuss the GWG of the woman.
- I motivate the woman to stay within the guidelines of healthy BMI.
- I ask the woman about her weight gain goals.
- I set a weight gain goal together with the woman.

BOX 2 Components of Determinant “Health Promotion”

- I ask my client about her physical well-being.
- I ask my clients about their emotional coping.
- I ask my clients about their social support.
- I ask my clients about their sleep.
- I confront my clients with their unhealthy lifestyle.
- I stimulate my clients to have a healthy lifestyle.

for clarity, phrasing, and sequence (Padilla, Benítez, & Castillo, 2013). This iterative process was repeated until content validity seemed to be reached. The questionnaire was subsequently pilot tested among 10 final-year midwifery students, who were asked for their feedback afterwards. This led to minor adjustments in wording.

The questionnaire is available in Dutch from the first author (AM).

Analyses

One item with more than 10% missing values was excluded. It concerned an open-ended knowledge question on how much weight a woman should gain in the first 13 weeks of pregnancy. We do not know why this question was not filled out in thirteen cases. Above that, some answers on this topic (for instance 10–14 kg) suggested that midwives interpret this question as how much weight a woman should gain during her whole pregnancy. Crude data were used for descriptive analysis. For inferential statistics, missing data on items missing less than 10% were imputed with sample means.

We had three separate outcomes: GWG monitoring, diet education, and PA education. We computed GWG monitoring by calculating the mean of (a) the two moments of weighing (first visit and subsequent visit across all four types of women) and (b) the two “discussing GWG” items. Diet education and PA education were computed by calculating the means of items measuring that specific behavior. We used Cronbach’s alpha to check the internal consistency of the items in these three composite outcome variables. Dummy variables were constructed for categorical items with more than two values (education and working environment). Pearson’s correlation coefficients were used to measure the association between each of the dependent variables (GWG monitoring, diet education, and PA education)

and the variables hypothesized as determinants of the sub-behaviors (see Figure 1). The initial models used in our regression analyses for these three dependent variables included (a) ASE determinants, (b) additional determinants (barriers, work stress, involving other professionals, health promotion, public health attitude, experience in coaching, and personal weight problems) that were significantly correlated with the behavior concerned, and (c) a limited number of covariates (age, working environment, education, workload; Field, 2009). We used a manual backward model selection strategy for our regression analyses. At each step, the weakest determinant based on p value was removed. In the final model, a two-sided $\alpha \leq .05$ was used as criterion for inclusion of variables. We present only the final models.

RESULTS

The questionnaire was completed by 118 midwives. We cannot determine the response rate because we do not know how many midwives took note of the announcement. We excluded the surveys completed by six midwives working in a secondary care capacity in hospitals. Characteristics of the remaining 112 participants and their practices are shown in Tables 1 and 2. Personal characteristics of our sample were fairly comparable to a recent study on the quality and provision of Dutch midwifery care (Spelten, Klomp, & Manniën, 2011).

Gestational Weight Gain Monitoring and Determinants

Table 3 shows that most midwives weighed and discussed healthy GWG to a moderately positive extent ($M = 5.5$, $SD = 1.3$). Nearly all midwives who weighed

TABLE 1 Characteristics of Participants ($N = 112$)

PERSONAL	CATEGORIES	PERCENTAGES	MEAN (SD)	RANGE
Education	3 years midwifery	26.8		
	4 years midwifery (Bachelor)	67.0		
	University degree (MSc or PhD)	6.3		
Age (years)			36.12 (10.0)	22–62
Working experience (years)			11.77 (9.4)	0.5–41
Workload (full cases per participant per year)			85.00 (35.0)	40–380

TABLE 2 Characteristics of Practices

PRACTICE	CATEGORIES	NUMBER (%)	MEAN (SD)	RANGE
Working environment	Own practice in group	83 (74.1)		
	Solo practice	11 (9.8)		
	Working as employee	18 (16.1)		
Five or more visits during first week postpartum		48 (42.9)		
Working with practice assistant		72 (64.3)		
Time spent on first checkup; echo and screening excluded (minutes)			41.7 (11.4) ^a	20–75
Time spent on subsequent checkups (minutes)			14.1 (3.3) ^b	10–30
Time spent on extra pregnancy information meetings (minutes)			55.7 (75.4) ^c	0–360
Number of midwives in practice (<i>n</i>)			3.87 (1.8) ^a	1–11
Women in practice coming for 6-week postpartum checkup (%)			62.95 (27.7) ^a	2–100

^a*n* = 111. ^b*n* = 110. ^c*n* = 109.**TABLE 3** Characteristics of Gestational Weight Gain Monitoring and Related Determinants

SUB-ITEMS OF VARIABLE LIKERT SCALE (1 = <i>TOTALLY DISAGREE</i> , 7 = <i>TOTALLY AGREE</i>)	MEAN (SD) OF SUB-ITEMS	COMPOSITE VARIABLE	MEAN (SD); CRONBACH'S α ; PEARSON'S CORRELATION (<i>R</i>)
During the first visit, I weigh women . . .			
with an average body type	5.7 (2.1)		
who appear too thin	$\alpha = .974$		
who appear overweight			
with weight problems in history			
During subsequent visits, I weigh women . . .			
with a healthy BMI			
who have a low BMI			
who have a high BMI	5.3 (2.2)		
with weight problems in history	$\alpha = .977$		
I help women with a healthy BMI toward a healthy GWG.	5.5 (1.4)		
I help women with a high BMI toward a healthy GWG.	5.5 (1.3)		
I believe it is important to discuss GWG with . . .			
women with a normal BMI	4.9 (1.5)		
women with a high BMI	6.5 (0.8)		
women with a low BMI	6.2 (1.1)		
women who gain too much	6.3 (1.0)		
women who gain too little	5.5 (1.4)		
I believe it is effective to discuss GWG with . . .			
women with a normal BMI	4.0 (1.5)		
women with a high BMI	4.6 (1.3)		
women with a low BMI	4.4 (1.3)		
women who gain too much	4.8 (1.3)		
women who gain too little	4.2 (1.2)		
Pregnancy is the only time a woman can gain weight. Therefore, I do not pay attention to GWG.	2.0 (1.3) ^a		
I believe education on GWG belongs in prenatal care.	6.1 (1.0) ^a		
		GWG monitoring	5.5 (1.3) $\alpha = .777$
		GWG monitoring attitude	5.3 (0.8) $\alpha = .860$ <i>r</i> with GWG monitoring = .428***

TABLE 3 Characteristics of Gestational Weight Gain Monitoring and Related Determinants (*continued*)

SUB-ITEMS OF VARIABLE LIKERT SCALE (1 = <i>TOTALLY DISAGREE</i> , 7 = <i>TOTALLY AGREE</i>)	MEAN (SD) OF SUB-ITEMS	COMPOSITE VARIABLE	MEAN (SD); CRONBACH'S α ; PEARSON'S CORRELATION (R)
When I discuss GWG with women, it disrupts the bond between me and the woman.	1.9 (1.4) ^a		
Suppose I want to discuss GWG, I think it is best to do this with women who . . .			
have a normal BMI	5.9 (0.9)	GWG monitoring self-efficacy	5.5 (0.7) $\alpha = .828$ r with GWG ns monitoring = .064
have a high BMI	5.3 (1.2)		
have a low BMI	5.4 (1.2)		
gain too much	5.5 (1.0)		
gain too little	5.5 (1.1)		
I believe I know enough to help women with their GWG.	5.6 (0.9)		
I believe these persons think it is important that I help women toward a healthy GWG:			
pregnant women	5.4 (1.1)	GWG monitoring social influence	4.7 (1.1) $\alpha = .899$ r with GWG monitoring = .338***
partners of pregnant women	4.5 (1.3)		
other midwives in my practice	4.8 (1.5)		
other midwives in my neighborhood	4.2 (1.6)		
the Dutch Professional Organization of Midwives	5.2 (1.4)		
obstetricians	4.4 (1.6)		
general practitioners	4.3 (1.6)		
I believe my clients expect me to help them toward a healthy GWG.	4.8 (1.4)		
I experience the following barriers in helping women toward a healthy GWG:			
lack of time	3.7 (2.1)	GWG monitoring barriers	3.7 (1.4) $\alpha = .825$ r with GWG monitoring = -.328***
lack of good guidelines	4.3 (1.8)		
lack of materials	4.1 (1.9)		
lack of knowledge	3.3 (1.8)		
lack of skills	2.8 (1.7)		
lack of mutual agreements with other professionals	3.7 (1.8)		

Note. GWG = gestational weight gain; BMI = body mass index.

^aExcluded from GWG monitoring attitude because of low Cronbach's α .

* $p < .05$. ** $p < .01$. *** $p < .001$.

women during the first visit also weighed them during subsequent visits. Differences in weighing among the four subgroups (low, normal, high BMI, women with weight problems in history) were marginal.

Regarding the definition of "discussing GWG," the highest scores were given to "providing information about healthy GWG" and "trying to find reasons for why GWG was too high or too low" (Table 4). Lowest scores were given on "asking women about their personal goals for GWG" and "setting of GWG goals with the clients in a shared decision."

All respondents calculated the BMI of all of their clients. The mean estimated time spent on GWG over the course of prenatal care was 12.7 minutes (range 1–60) per woman. Forty-three percent of the

respondents answered the four (remaining) items on GWG knowledge correctly.

On average, attitudes toward GWG monitoring were positive. Midwives thought it was more important than effective to discuss GWG with women. Higher scores were given on importance to discussing GWG with women with a high BMI than with women with a normal BMI. Midwives' self-efficacy expectations toward GWG monitoring were high, and on average, midwives experienced positive social influences, mostly from clients and from the Dutch Organization of Midwives. The most important barrier was a lack of guidelines. Attitudes, social influence, and barriers were significantly correlated with GWG monitoring; self-efficacy was not (see Table 3).

TABLE 4 Additional Information on Monitoring Gestational Weight Gain

SUBJECT	CONTENT OF	% (N)	MEAN (SD)
Definition of discussing GWG	When I discuss GWG . . . (Likert scale 1 = <i>never</i> to 7 = <i>always</i>)		
	I provide information about healthy GWG for this woman.		5.4 (1.5)
	I try to find causes of unhealthy GWG.		5.2 (1.6)
	I discuss the implications of too high and too low GWG.		4.9 (1.6)
	I discuss the GWG of the woman regularly.		4.8 (1.6)
	I motivate the woman to stay within the guidelines of healthy BMI.		4.8 (1.7)
	I ask the woman about her weight gain goals.		1.8 (1.2)
	I set a weight gain goal together with the woman.		2.0 (1.5)
Knowledge	A healthy BMI is between 25 and 30 kg/m ² . (false)	88.4 (99)	
	A healthy GWG depends on the BMI. (true)	81.3 (91)	
	For a woman with a normal BMI, 20 kg GWG is normal. (false)	65.2 (73)	
	A healthy GWG protects against weight retention postpartum. (true)	92.0 (103)	
	<i>all answers correct</i>	42.9 (48)	
BMI	I measure BMI of all women. (yes)	100.0 (112)	
	I use for weight . . .		
	self-reported weight before pregnancy	42.9 (48)	
	weight of woman during first visit	55.4 (62)	
	self-reported last weight	1.8 (2)	
	I use for length . . .		
	self-reported length	77.7 (87)	
	length of woman measured in first visit	13.4 (15)	
Time	length in passport	8.9 (10)	
	Time spent on GWG during entire course of prenatal care (in minutes)		12.7 (11.0)
			range 1–60

Note. GWG = gestational weight gain; BMI = body mass index.

Diet Education and Determinants

The mean score for diet education was 5.2 ($SD = 1.1$; Table 5). Within the determinant diet education attitude, importance scored higher than effectiveness. On average, midwives perceived their self-efficacy with respect to diet education as sufficient and assumed that—to a certain extent—pregnant women expected the midwives to educate them about diet. The highest score among the barriers was for lack of time. All ASE determinants were significantly correlated with diet education (see Table 5).

Physical Activity Education and Determinants

The mean score for PA education was 4.1 ($SD = 1.3$; Table 6). On average, midwives discussed physical signs of overexertion more often than they educated pregnant women about healthy PA, and they were more positive

toward discussing physical signs of overexertion than toward education about healthy PA. In addition, midwives perceived their self-efficacy positively and did not believe that pregnant women expected much information from them about healthy PA. Concerning barriers, highest scores were on lack of guidelines, lack of time, and lack of materials. All ASE determinants were significantly correlated with PA education (see Table 6).

Associations Between Characteristics and the Three Behaviors

We found associations between midwives' behaviors and the midwives' practice characteristics (Table 7). Positive associations were seen between time spent for the first checkup with diet education and with PA education. Furthermore, percentage of women coming for 6-week postpartum checkup was positively associated with diet education (see Table 7).

TABLE 5 Characteristics of Diet Education and Related Determinants

SUB-ITEMS OF VARIABLE LIKERT SCALE (1 = TOTALLY DISAGREE, 7 = TOTALLY AGREE)	MEAN (SD)	COMPOSITE VARIABLE	MEAN (SD); CRONBACH'S α ; PEARSON'S CORRELATION (r)
I help women gain or maintain a healthy diet.	5.6 (1.1)	Diet education	5.2 (1.1) $\alpha = .681$
I discuss diet with women with a high BMI.	5.4 (1.1)		
If a woman does not want to talk about her diet, I discuss with her the reason for her resistance.	5.0 (1.4)		
I believe most people have a healthy diet.	3.9 (1.2)	Diet education attitude	5.1 (1.0) $\alpha = .649$ r with diet education = .822***
I believe I can prevent gestational diabetes by discussing women's diet.	4.8 (1.5)		
I believe helping someone toward a healthy diet is time consuming.	5.2 (1.4)		
I believe the subject of diet is so important that I want to spend extra time on it.	5.0 (1.4)		
I believe it is important to discuss the diet of a woman with a high BMI.	5.1 (1.1)		
I believe it is effective to discuss the diet of a woman with a high BMI.	4.9 (1.4)		
I believe it is important to discuss resistance with a woman who does not want to talk about her diet.	5.5 (1.2)		
I believe it is effective to discuss resistance with a woman who does not want to talk about her diet.	4.6 (1.5)		
I believe I am good in discussing the diet of a woman with a high BMI.	5.4 (1.1)	Diet education self-efficacy	5.1 (1.1) $\alpha = .778$ r with diet education = .639***
I believe I am good in discussing resistance with a woman who does not want to talk about her diet.	4.9 (1.4)		
Women expect me to talk about their diet.	5.1 (1.2)	Diet education social influence	r with diet education = .350***
I experience the following barriers in helping women toward a healthy diet:		Diet education barriers	3.6 (1.3) $\alpha = .838$ r with diet education = -.212*
lack of time	4.8 (1.8)		
lack of good guidelines	3.9 (1.8)		
lack of materials	3.6 (1.8)		
lack of knowledge	3.1 (1.6)		
lack of skills	2.8 (1.6)		
lack of mutual agreements with other professionals	3.5 (1.7)		

Note. BMI = body mass index.

* $p < .05$. *** $p < .001$.

Additional Determinants and Their Associations

Table 8 presents the results of the additional determinants of midwives' behaviors in promoting healthy GWG. On average, midwives experienced their work-related stress as neutral. Midwives hardly involved others concerning GWG; they most frequently called on dietitians and least frequently on obstetricians. Midwives had a very positive public health attitude. The mean score for health promotion, representing education behaviors in six fields related to public health, was positive. Individual items in this determinant showed that midwives were more active in discussing physical

well-being ($M = 6.1$, $SD = 1.1$) and sleep ($M = 5.5$, $SD = 1.1$) than in discussing emotional coping ($M = 4.4$, $SD = 1.6$) and social support ($M = 4.5$, $SD = 1.6$). The variables health promotion and involving other professionals showed positive correlations with the outcome variables (see Table 8).

Regression Analyses

The final models of the regression analyses for GWG monitoring, diet education, and PA education are presented in Table 9.

TABLE 6 Characteristics of Physical Activity Education and Related Determinants

SUB-ITEMS OF VARIABLE LIKERT SCALE (1 = TOTALLY DISAGREE, 7 = TOTALLY AGREE)	MEAN (SD)	COMPOSITE VARIABLE	MEAN (SD); CRONBACH'S α ; PEARSON'S CORRELATION (r)
I help women toward healthy physical activity.	4.8 (1.4)	PA education	4.1 (1.3) $\alpha = .839$
I ask women what their activity pattern is.	3.0 (1.9)		
I explain what healthy physical activity is.	3.0 (1.9)		
I explain the benefits of healthy physical activity for mother and baby.	4.2 (1.8)		
I discuss the signals of overexertion.	5.3 (1.6)	PA education attitude	4.7 (1.1) $\alpha = .891$ r with PA education = .725***
I believe it is important to ask the woman about her activity pattern.	4.3 (1.6)		
I believe it is effective to ask the woman about her activity pattern.	4.1 (1.5)		
I believe it is important to explain to women what healthy physical activity is.	4.3 (1.6)		
I believe it is effective to explain to women what healthy physical activity is.	4.0 (1.6)		
I believe it is important to explain the benefits of healthy physical activity for mother and baby.	5.1 (1.3)		
I believe it is effective to explain the benefits of healthy physical activity for mother and baby.	4.9 (1.3)		
I believe it is important to discuss signals of overexertion.	5.5 (1.3)		
I believe it is effective to discuss signals of overexertion.	5.5 (1.3)		
I believe discussing physical activity is time consuming.	4.4 (1.4)		
I believe discussing healthy physical activity is important enough to spend my time on.	4.4 (1.4)		
I believe I am good in asking the woman about her activity pattern.	5.9 (1.1)	PA education self-efficacy	5.3 (1.1) $\alpha = .842$ r with PA education = .509***
I believe I am good in explaining to women what healthy physical activity is.	5.2 (1.5)		
I believe I am good in explaining the benefits for mother and baby of healthy physical activity.	5.0 (1.5)		
I believe I am good in discussing signals of overexertion.	5.3 (1.4)		
I believe the women I work with expect me to help them toward healthy physical activity.	4.1 (1.4)	PA education social influence	r with PA education = .467***
I experience the following barriers in helping women toward healthy physical activity:		PA education barriers	4.0 (1.3) $\alpha = .858$ r with PA education = -.237*
lack of time	4.4 (1.9)		
lack of good guidelines	4.5 (1.8)		
lack of materials	4.4 (1.8)		
lack of knowledge	3.5 (1.7)		
lack of skills	3.3 (1.6)		
lack of mutual agreements with other professionals	3.9 (1.9)		

Note. PA = physical activity.

* $p < .05$. *** $p < .001$.

The final regression model explained 34% of the variance in GWG monitoring. Increases in GWG monitoring attitude ($B = 0.594$, $p = .000$) and GWG monitoring social influence ($B = 0.212$, $p = .044$) were associated with an increase in the score on GWG monitoring. Higher scores on GWG monitoring

barriers ($B = -0.271$, $p = .001$) were associated with a decrease in GWG monitoring. Self-efficacy was not significantly associated. Working environment was a significant covariate; working in a group practice was associated with an increase in GWG monitoring as compared to working in a solo practice ($B = -0.726$,

TABLE 7 Characteristics and Their Relation to the Outcomes Gestational Weight Gain Monitoring, Diet Education, and Physical Activity Education

	PEARSON'S CORRELATION (<i>r</i>)
Time spent on first check-up; echo and screening excluded (minutes) ^a	<i>r</i> with GWGM .104 ns <i>r</i> with DE .388*** <i>r</i> with PAE .192*
Time spent on subsequent checkups (minutes) ^b	<i>r</i> with GWGM −.050 ns <i>r</i> with DE .001 ns <i>r</i> with PAE .104 ns
Time spent on extra informational meetings (minutes) ^c	<i>r</i> with GWGM −.035 ns <i>r</i> with DE −.016 ns <i>r</i> with PAE .038 ns
Number of midwives in practice (<i>n</i>) ^a	<i>r</i> with GWGM .151 ns <i>r</i> with DE −.071 ns <i>r</i> with PAE .185†
Women in practice coming for checkup 6 weeks postpartum (%) ^a	<i>r</i> with GWGM .075 ns <i>r</i> with DE .196* <i>r</i> with PAE .131 ns
Age (years)	<i>r</i> with GWGM .091 ns <i>r</i> with DE .084 ns <i>r</i> with PAE .027 ns
Work experience (years)	<i>r</i> with GWGM .174 ns <i>r</i> with DE .113 ns <i>r</i> with PAE .049 ns
Workload (full cases per year)	<i>r</i> with GWGM .020 ns <i>r</i> with DE .014 ns <i>r</i> with PAE .018 ns

Note. GWGM = GWG monitoring; DE = diet education; PAE = physical activity education; ns = not significant.

^a*n* = 111. ^b*n* = 110. ^c*n* = 109.

†*p* < .1. **p* < .05. ***p* < .01. ****p* < .001.

p = .048) and working as an employee (*B* = −0.701, *p* = .019).

The explained variance of diet education was 76%. Increases in diet education attitude (*B* = 0.644, *p* = .000), diet education self-efficacy (*B* = 0.212, *p* = .001), diet education social influence (*B* = 0.105, *p* = .024), and health promotion (*B* = 0.160, *p* = .019) were associated with an increased diet education score. Diet education barriers were not a significant determinant. Workload and education were significant covariates; a higher workload (*B* = −0.003, *p* = .028) was associated with lower and 3 years of education compared to 4 years (*B* = 0.252, *p* = .038) was associated with higher scores in diet education.

The explained variance of PA education was 68%. Increases in PA education attitudes (*B* = 0.522, *p* = .000), PA education self-efficacy (*B* = 0.238, *p* = .002), PA education social influence (*B* = 0.121,

p = .044), involving other professionals (*B* = 0.295, *p* = .000), health promotion (*B* = 0.233, *p* = .019), and a decrease in PA education barriers (*B* = −0.142, *p* = .014) were associated with an increase in PA education. Confounders were not significantly associated.

DISCUSSION AND CONCLUSIONS

Our findings give us important information for the development of an intervention to help midwives promote a healthy GWG during prenatal care.

Gestational Weight Gain Monitoring

Overall, midwives in this study were moderately active in GWG monitoring and this was more or less the same for women in all prepregnancy BMI groups. Midwives had moderately positive attitudes toward GWG monitoring, felt confident, and experienced moderate support from clients and peers. Midwives also experienced barriers such as a lack of guidelines and a lack of materials. There is room for improvement, however. All of the ASE determinants except self-efficacy were significantly correlated with GWG monitoring, meaning that when attitudes and social influence increase and barriers diminish, GWG monitoring is likely to increase. To increase the attitudes of midwives toward GWG monitoring, it seems necessary to encourage midwives to look more positively at discussing GWG with pregnant women and to convince them that pregnant women expect them to discuss GWG. Because self-efficacy is not a significant determinant, skills training would not seem necessary (Bartholomew et al., 2006). Providing guidelines with standard care norms and materials, such as growth charts, could be helpful in promoting a healthy GWG.

We saw that the estimated time spent on GWG was approximately 5% of total prenatal care time, with major differences being present. In line with obesity guidelines in the Netherlands (Nederlandse Vereniging voor Obstetrie en Gynaecologie, 2009), all midwives assessed BMI. This suggests that midwives are faithful to practical guidelines concerning weight issues. Introducing guidelines for GWG monitoring, accompanied by materials and resources, could be promising in this respect. More than half of our sample lacked sufficient knowledge about GWG, which corresponds with findings from other studies

TABLE 8 Additional Determinants and Their Relation to the Outcomes Gestational Weight Gain Monitoring, Diet Education, and Physical Activity Education

SUB-ITEMS OF VARIABLE LIKERT SCALE (1 = TOTALLY DISAGREE, 7 = TOTALLY AGREE)	MEAN (SD)	VARIABLE	MEAN (SD); CRONBACH'S α ; PEARSON'S CORRELATION (r)
I experience enough fulfillment in my work (reversed in scale).	5.5 (1.3)	Work stress	4.1 (1.2) $\alpha = .602$ r with GWGM ns r with DE ns r with PAE ns
I often work under great work pressure.	4.4 (1.7)		
My work demands a lot of energy.	5.3 (1.4)		
I involve the following others in promoting a healthy GWG:		Involve other professionals	2.9 (0.8) $\alpha = .758$ r with GWGM .176 [†] r with DE ns r with PAE .437***
general practitioner	2.4 (1.7)		
obstetrician	2.0 (1.5)		
dietitian	5.8 (1.1)		
physiotherapist	2.2 (1.7)		
a nonregular therapist	2.2 (1.5)		
psychologist	2.6 (1.7)		
a special pregnancy course	2.9 (2.0)		
I ask the woman about her . . .		Health promotion	5.1 (0.9) $\alpha = .700$ r with GWGM ns r with DE .455*** r with PAE .437***
physical well-being	6.1 (1.1)		
social support	4.5 (1.6)		
emotional coping	4.4 (1.6)		
sleeping pattern	5.5 (1.1)		
ideas to change toward a healthier lifestyle	5.1 (1.3)		
I confront women with their unhealthy behavior.	5.2 (1.1)		
I think it is very important that midwives pay attention to the general health of women.		Public health attitude	6.3 (0.8) na r with GWGM .163 [†] r with DE .209* r with PAE .306**
I have experience in helping others to keep/ maintain a healthy BMI.		Experience coaching	4.0 (2.0) na r with GWGM ns r with DE .231* r with PAE ns
I experience problems with keeping/maintaining a healthy BMI myself.		Personal weight problems	3.2 (2.2) na r with GWGM ns r with DE ns r with PAE ns

Note. GWG = gestational weight gain; BMI = body mass index; PA = physical activity; GWGM = gestational weight gain monitoring; DE = diet education; PAE = physical activity education; na = not applicable; ns = not significant.

[†] $p < .1$. * $p < .05$. ** $p < .01$. *** $p < .001$.

(Althuisen et al., 2009; McDonald et al., 2011; Stotland et al., 2010; Wilkinson, Poad, & Stapleton, 2013). In the definition of discussing GWG, midwives revealed that they provided information on GWG but rarely discussed weight gain goals together with women. In a Dutch study using video recordings, it was observed that during the first visit women were weighed, but that weight gain was barely discussed (Spelten et al.,

2011). Three studies revealed that accurate goal setting and advice by health care professionals were positively correlated with pregnant women achieving a healthy GWG (Brown et al., 2012; Ferrari & Siega-Riz, 2013; Stotland et al., 2005). We would argue that midwives need to be educated about the importance of discussing weight-gain goals in a shared decision-making process.

TABLE 9 Final Models of Regression Analyses for the Outcomes Gestational Weight Gain Monitoring, Diet Education, and Physical Activity Education

GESTATIONAL WEIGHT GAIN MONITORING / $R^2 = .341$	B	SE	STANDARDIZED COEFFICIENT	p VALUE
Intercept	2.340	.942	—	.015
GWG monitoring attitude	0.594	.164	.326	.000
GWG monitoring social influence	0.212	.104	.179	.044
GWG monitoring barriers	−0.271	.080	−.276	.001
Working environment (ref own practice in cooperation)				
Solo	−0.726	.363	−.163	.048
Employee	−0.701	.294	−.194	.019
DIET EDUCATION / $R^2 = .758$	B	SE	STANDARDIZED COEFFICIENT	p VALUE
Intercept	−0.295	.406	—	.468
Diet education attitude	0.644	.073	.609	.000
Diet education self-efficacy	0.212	.064	.225	.001
Diet education social influence	0.105	.046	.118	.024
Health promotion	0.160	.067	.127	.019
Workload	−0.003	.002	−.111	.028
Midwives' education (ref 4 years)				
3 years	0.252	.120	.105	.038
University	−0.396	.218	−.090	.072
PHYSICAL ACTIVITY EDUCATION / $R^2 = .676$	B	SE	STANDARDIZED COEFFICIENT	p VALUE
Intercept	−1.610	.576		.006
PA education attitude	0.522	.085	.436	.000
PA education self-efficacy	0.238	.074	.202	.002
PA education social influence	0.121	.060	.131	.044
PA education barriers	−0.142	.057	−.143	.014
Involving other professionals	0.295	.078	.223	.000
Health promotion	0.233	.098	.148	.019

Note. The initial model also included public health attitude, midwives' education, working environment, age, and workload. GWG = gestational weight gain; PA = physical activity.

Diet Education

On average, the midwives involved in this study were moderately active in diet education. Their attitudes, social influences, perceived self-efficacy, and health promotion were significantly correlated with diet education. Although the variable diet education barriers (with lack of time the important part) was not a significant determinant, workload was, however. These findings imply that midwives could give more diet education when they are convinced of its importance and effectiveness and when clients expect them to provide this education. Furthermore, midwives can be stimulated by skills training to improve their self-efficacy and by providing efficient ways to educate their clients. Midwives with higher scores on health promotion also scored higher on diet education. In this respect, convincing

midwives to pay more attention to their clients' health in general, including emotional coping and social support, would likely have its effect on diet education as well. In addition, because a high workload and less time spent on the first checkup were also significantly associated with diet education, we conclude that midwives experience a lack of time to go into diet education. Therefore, other solutions, such as involving dietitians, should be explored as well.

Midwives with 3 years instead of 4 years of education were more active in diet education. This could be explained by the history of Dutch midwifery education. The midwifery curriculum changed from 3 to 4 years in 1995 (Jamar, 2009). Therefore, the group of midwives with 4 years of education includes recently graduated midwives who have less work experience. More experienced midwives could have learned about healthy eating during their

working years. This finding may also indicate a lack in education in current Dutch midwifery programs.

Physical Activity Education

Midwives in this study paid moderate attention to PA education. Most of the attention went to dealing with complaints and not to informing women about healthy PA. This finding is comparable to that of an earlier Dutch study in which only 41% of participating midwives stated that they always discussed PA as a standard subject of prenatal care (Voorn, 2013). This is difficult to interpret because we do not know the content of what was discussed. All ASE determinants were significantly associated with PA education, as were barriers, involving other professionals, and health promotion. There is clearly room for improvement by, for instance, influencing midwives' attitudes, training them in discussing healthy PA with clients and by convincing them about their clients' needs in this respect. PA education could improve as well when midwives have higher scores on health promotion and involvement. This can be achieved by raising awareness about various aspects of health, including emotional coping and social support, and when midwives are encouraged to involve other health professionals more often. Involving other health professionals could also save time, which was an important barrier.

Reflection on the Quality of This Study

To the best of our knowledge, this study is the first quantitative study that offers insights into Dutch midwives' behaviors in promoting healthy GWG. Although our sample was quite comparable to another Dutch midwifery study, selection bias must be taken into account. Midwives working as employees were underrepresented in this study (Hingstman, van Hassel, & Kenens, 2013). Because we found that midwives working in a group practice had higher levels of GWG monitoring, the average score of 5.5 for this outcome would likely have been lower if more participants had been employees. Furthermore, midwives who agreed to participate may have been more interested in GWG, and this self-selection may have led to higher scores. Finally, we used self-reported data and did not objectively measure midwives' behaviors, which could have led to more positive scores. With these remarks in mind, we believe this study can be useful for other countries where midwives work in prenatal care. In other countries, midwives also need support in promoting healthy GWG (Ferrari & Siega-Riz, 2013; Heslehurst et al., 2013).

Especially our findings related to midwives' attitudes, self-efficacy, and social influences toward promoting healthy GWG might be useful in the understandings of their behaviors as well.

The ASE determinants, together with the additional determinants, explained a large amount of the variance in midwife behaviors related to GWG. The explained variance in the models for diet education and PA education was high. This could be the result of the high correlations between diet education and diet education attitudes, for example, and between PA education and PA education attitudes. Respondents may have interpreted the questions as asking for the same information.

Our questionnaire was developed for this project and has not yet been validated. To enhance the quality of the questionnaire, we used the adapted ASE model as the theoretical basis for the item development and we used a thorough process in developing the questionnaire, including representatives of the study population.

Conclusions

Our study revealed that midwives were fairly active in GWG monitoring in pregnant women in all prepregnancy BMI groups and that their attitudes, social influence, and barriers were related to GWG monitoring. Midwives in a group practice were more active in GWG monitoring than employed midwives. Midwives were also more active in diet education than in PA education. Attitudes, perceived self-efficacy, social influences, and health promotion were significantly related to these educational behaviors. In addition, midwives who more often involved other health professionals were also more active in PA education. Diet education was hampered by time constraints. The barriers, including time constraint and lack of guidelines, hampered PA education. Midwives who received their midwifery education longer ago were more active in Diet education than their more recently educated peers.

Practice Implications

The determinants found to be significantly associated with midwives' behaviors in promoting healthy GWG can be influenced and can therefore be used to develop an intervention for midwives. An effective intervention could help to reduce the burden caused by obesity, one of today's major health problems. Attitudes, for example, can be enhanced by convincing midwives of the importance and the benefits of monitoring GWG, Diet education and PA education, and educating them about the role midwives

can play in improving these behaviors. Social influences can be improved by educating midwives about the expectations of clients and by setting the norm within the professional organization. Self-efficacy can be improved by skills training. Barriers can be diminished by providing guidelines, resources, and by inventing ways to reduce the time constraint midwives experience. Midwives need to be encouraged to involve other health professionals. This will decrease the demand on midwives' time and allow pregnant women to benefit from the expertise of these professionals. Stimulating midwives to pay attention to all aspects of health, including emotional coping and social support, will likely have a positive effect on Diet education and PA education as well. The highly positive attitude of midwives toward the importance of their public health role can be used as a motivator.

Future research is needed to explore strategies that can be used to improve midwives' GWG monitoring, diet education, and PA education and to explore strategies for influencing the cooperation of midwives with other health professionals. The education of midwives in Diet education in current midwifery curricula should also receive attention.

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