Parent and Clinician Perspectives on Sustained Behavior Change after a Prenatal Obesity Program: A Qualitative Study

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Abstract

Background: Infants of obese women are at a high risk for development of obesity. Prenatal interventions targeting gestational weight gain among obese women have not demonstrated consistent benefits for infant growth trajectories.

Methods: To better understand why such programs may not influence infant growth, qualitative semi-structured interviews were conducted with 19 mothers who participated in a prenatal nutrition intervention for women with BMI 30 kg/m² or greater, and with 19 clinicians (13 pediatric, 6 obstetrical). Interviews were transcribed and coded with themes emerging inductively from the data, using a grounded theory approach.

Results: Mothers were interviewed a mean of 18 months postpartum and reported successful postnatal maintenance of behaviors that were relevant to the family food environment (Theme 1). Ambivalence around the importance of postnatal behavior maintenance (Theme 2) and enhanced postnatal healthcare (Theme 3) emerged as explanations for the failure of prenatal interventions to influence child growth. Mothers acknowledged their importance as role models for their children's behavior, but they often believed that body habitus was beyond their control. Though mothers attributed prenatal behavior change, in part, to additional support during pregnancy, clinicians had hesitations about providing children of obese parents with additional services postnatally. Both mothers and clinicians perceived a lack of interest or concern about infant growth during pediatric visits (Theme 4).

Conclusions: Prenatal interventions may better influence childhood growth if paired with improved communication regarding long-term modifiable risks for children. The healthcare community should clarify a package of enhanced preventive services for children with increased risk of developing obesity.

Keywords: health behavior; health disparities; obesity; prevention

Introduction

Infants of obese women are at a high risk for developing obesity, and prenatal obesity prevention efforts are theoretically promising.^{1–3} A 2009 Institute of Medicine (IOM) guideline on appropriate gestational weight gain prompted obstetrical practice changes to limit gestational weight gain among obese women. Evaluations of interventions addressing appropriate gestational weight gain suggest that even when behavioral or weight goals are met, there is no influence on infant growth.^{4–7}

Physiologically, maternal prepregnancy weight may be a more important predictor of appropriate birth weight than gestational weight gain.⁸ However behavioral mechanisms should, theoretically, influence pediatric outcomes. Mothers who participate in programs to limit gestational weight gain may acquire new knowledge or habits, both of which are important constructs in health behavior theories. These, in turn, may influence the family food environment and child weight status.⁹

This study explored behavioral explanations for the failure of prenatal interventions to influence offspring

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growth. Using a grounded theory approach, we described experiences of low-income, obese women who participated in an enhanced model of prenatal care at one urban center in the United States. This model addressed gestational weight gain through increased visits and nutritional counseling. Consistent with other studies, an outcome evaluation suggested some benefits to gestational weight gain and infant birth weight, but it found no influence on subsequent infant growth trajectories.⁷ Prior qualitative work describing the experience of obese women who received enhanced prenatal care in other countries found that these programs addressed perceived gaps in care and were highly acceptable.^{10,11} This is the first study to address the dynamics of behavior changes across pregnancy and the postpartum period among obese women who participated in a prenatal obesity intervention in the United States.

Methods

Setting and theoretical approach

The Nutrition in Pregnancy clinic (NIP) was established in 2011 at the Johns Hopkins Hospital, an urban tertiary referral center. NIP offers prenatal care to women with Medicaid insurance and a BMI of 30 kg/m² or greater who initiate prenatal care before 18 weeks of gestation. BMI was calculated from measured height and prepregnancy weight reported at the first prenatal visit. Women with pre-existing diabetes, cardiac disease, or other systemic diseases are excluded from NIP and followed in the traditional high-risk obstetrics clinic.

NIP offers visits every other week until 36 weeks of gestation and then weekly until delivery. Each visit includes nutritional counseling. NIP is staffed primarily by one physician, one nurse practitioner, one social worker, and one nutritionist. NIP messages focus on healthy diet and increased exercise. As of July 2016, ~250 women, with a mean BMI near 40 kg/m², have delivered babies through NIP.

NIP is a growing program that has engaged women who often experience significant barriers to healthcare access.¹² Interviews were initially designed to inform expansion of services for these families, and for similar families in our system. Successful prenatal behavior change was a major theme in initial interviews, and mothers discussed behaviors that were relevant to infant feeding. This led to modifications to better explore why these behaviors did not lead to changes in infant growth, as demonstrated in a prior outcome evaluation.⁷ Study participants provided written informed consent and were offered a \$50 gift card to defray costs of child care and transportation and as an incentive for participation. This study was approved by the Johns Hopkins School of Medicine Institutional Review Board.

Interview guide and interviewer training

We developed an interview guide with input from NIP staff. The guide explored women's (1) experiences with NIP (*e.g.*, Tell me about your experiences with the NIP clinic), (2) postnatal healthcare (*e.g.*, What has your doctor/nurse

recommended to you about how you can stay healthy?), and (3) suggestions for improved care (*e.g.*, What do you think you would need to be healthier?). Pilot interviews with two NIP participants referred by NIP staff described a variety of behavior changes, leading to modifications to better probe why and how changes occurred (*e.g.*, Had you ever tried to change this before? What was different this time?).¹³

The interview guide for clinicians was developed after completion and coding of approximately half of maternal interviews. This guide focused on clinicians' (1) experiences of caring for obese women and their infants (*e.g.*, Tell me about any experience of taking care of a child of overweight parents), (2) desired programs for this population (*e.g.*, What kinds of services do you wish you had to help families with obesity prevention?), and (3) responses to positive participant quotes about NIP. Responses to quotations were intended to inform and verify our interpretation of the data and to encourage clinicians to think broadly about how to generate positive patient experiences in their clinical settings. Grounded theory informed the iterative approach to interview guide development and efforts to gain verification of early themes from participants.

Six individuals conducted interviews for this project (range per interviewer: 2–12). Five were graduate students or postdoctoral fellows in health-related disciplines. All had prior experience with qualitative research or conducting interviews with the Hopkins clinical population. The number of interviewers was higher than intended and, as such, efforts were made to ensure consistency through training. Training lasted ~2 hours, including a didactic session, review of the interview guide, and mock interviews with feedback. New interviewers also reviewed existing transcripts before conducting interviews.

Interviews

All interviews were conducted in person on the hospital campus. We conducted semi-structured interviews with 19 women who participated in NIP and with 19 clinicians from three sites (13 pediatric, 6 obstetric). We obtained demographic data on NIP participants. Clinicians were considered key informants (*i.e.*, providing information based on their professional training and experience). We collected work location and specialty for clinicians.

After pilot interviews (included in analysis), recruitment proceeded from a list of NIP participants who had delivered by April 1, 2014 (6 months before the start of recruitment). This list was sorted randomly, and participants were selected for recruitment in batches of 10. Purposeful sampling balanced batches based on age of infant (younger than 1 year vs. older than 1 year) and achievement of IOM guidelines for gestational weight gain. We conducted theoretical sampling, recognizing that participants were likely skewed toward those who felt positively toward NIP and were logistically able to return to our site, that is, those who were the most likely to participate in ongoing programming. In sampling clinicians, we sought an interdisciplinary perspective.

We attempted to contact 124 NIP participants. Reasons for not completing interviews included nonworking phone number ($n=71$), moved out of the area ($n=3$), not interested ($n=10$), interested but no interview scheduled ($n=6$), and interview scheduled but never conducted ($n=15$). Analysis was conducted in tandem with interviews. Recruitment stopped when coding demonstrated thematic saturation.

We recruited clinicians from NIP and the two pediatric primary care clinics where most NIP offspring receive care. Of note, there is no pediatric component to NIP and most pediatric clinicians had not heard of the program prior to study participation. Medical directors at each site generated recruitment lists that included a total of 24 physicians, nurses, social workers, and nutritionists. Recruitment proceeded by email. Reasons for not completing an interview included no response to email outreach ($n=5$).

No interviewers were previously known to participants. Interviews lasted a mean of 33 minutes (range 19–72). Two mothers were pregnant and again attending the NIP clinic at the time of interviews.

Analysis

Interviews were recorded and transcribed verbatim by a professional transcription service. References to ages, names, and identifiable locations were removed before coding. Following a grounded theory approach, coding was inductive and started with all authors reviewing at least two interviews from NIP participants and two interviews from clinicians. Subsequent discussion produced a preliminary codebook. Initial codes roughly mapped onto interview guide topics. Each interview was coded by two study team members, using ATLAS.ti 10.15.¹⁴ Coders reviewed coding to ensure that codes were applied consistently and represented distinct ideas, leading to iterative changes in the codebook as analysis progressed. When necessary, discrepancies in coding were adjudicated via study team consensus.¹⁵

Results

Participants and major themes

Nineteen NIP participants reported a mean age of 30 years (Table 1). All identified as African American or black race (we use African American, because it was used most commonly by participants). Most had completed high school. Only one was married. Purposive sampling achieved balance on achievement of IOM weight gain guidelines.

Of 19 clinicians, six worked in the NIP clinic (Table 2). Clinicians included seven physicians (trained in Obstetrics, Pediatrics, or Medicine and Pediatrics), three nurses, four nutritionists, and five social workers or mental health professionals.

We first describe reported behavior changes and the timing of these changes with regard to pregnancy. Understanding participant experiences with behavior change provides a context for the subsequent themes.

Themes of ambivalence within the clinician–parent relationship emerged to explain why behaviors initiated pre-

Table 1. Characteristics of Interviewed Mothers

	N = 19 No. or Mean (SD)
Age (years)	30 (4) Range: 24–38
Time since first NIP pregnancy (months)	18 (7) Range: 8–30
Educational attainment	
Some high school	6
Completed high school	4
Some college or trade school	8
No response	1
Resides in Baltimore	18
African American race	19
Latino ethnicity	1
Married	1
Report at least one other adult helps with child care ≥ 1 x/week	15
Number of children at home	2.4 (1.2)
Weight gain during pregnancy	
<IOM recommendations	5
Within IOM recommendations	7
>IOM recommendations	7

IOM, Institute of Medicine; NIP, Nutrition in Pregnancy clinic.

natally might not influence infant growth. On one side of this ambivalence, both parents and clinicians recognized that parental obesity is associated with infant risks. Mothers recognized their roles as behavioral models for their children, and they believed that the support they received during

Table 2. Characteristics of Clinician Participants

	N = 19 No.
Location of work	
Nutrition in pregnancy clinic	6
Pediatric clinic	13
Credential	
Physician	7
Nurse (NP/RN)	3
Nutritionist	4
Social work/mental health	5

pregnancy allowed positive behavior changes. All these factors suggest parent and clinician motivation to capitalize on prenatal behavior change to influence infant growth. However, these factors are in conflict with other beliefs, described more fully later, such as clinician belief that counseling around weight-related factors should be the same for all families, regardless of parental weight status. Finally, mothers and clinicians mutually perceived a lack of interest or concern about infant growth from the other party.

We focus on factors that could be influenced at the level of the individual or within the healthcare system. However, it is important to note that themes did emerge describing social and environmental barriers to maintained behavior change. Participants discussed limited concrete resources, such as one mother who described living in a shelter where she could not access a kitchen to prepare food and several who discussed the high cost of fresh produce or gym membership. Mothers also described community norms with regard to family food preferences and lack of peer support for desired behavior changes.

Theme 1: Behavior change

NIP participants reported many weight-relevant behavior changes initiated during pregnancy (Theme 1, Table 3). Though we asked about maternal behaviors, many discussed behaviors with relevance to infant growth—for example, limiting sugar sweetened beverages. Some reported maintaining behaviors beyond pregnancy (Theme 1a), and some did not (Theme 1b). Maintained behaviors were often modified postnatally. For example, one participant noted, “I stick with some of their ideas to this day. Like my fruit drinks, I drink them but I don’t drink as much.” Some participants reported no changes (Theme 1c) and described annoyance

with recommendations from the nutritionist in particular. However, even in these situations, participants tended to reflect positively on the nutritionist’s motivation. For example, one participant said, “Telling me I’m supposed to eat a children size meal, no. That wasn’t gonna work. I just told her I didn’t like her... She laughed. And came back the next time I came back... even when I didn’t want to see her. She wanted to see me because my health was her concern.”

Theme 2: The importance of postnatal maternal behaviors

Some NIP participants believed that their behaviors would influence their children’s behaviors and health (Theme 2a; Table 4). One participant explained, “I just motivate them. They mimic what adults do, so if they see me eating healthy, they say, ‘Mommy’s eating healthy. Why can’t I? If Mommy is doing that, why can’t I?’” Another participant reflected on her motivation to change her daughter’s behaviors by stating, “I’m only doing this because look at me, I don’t want you to be—end up just like I am. Having to worry about her sugar or being overweight.”

However, both NIP participants and clinicians reported that parents believe that offspring growth is familial and perhaps beyond their control, leading to less urgency about changing behaviors (Theme 2b). For example, one mother described her response to hearing her child was overweight, saying, “I didn’t think [we needed to cut back on feeding] because I looked at it as I’m kinda heavy, her dad’s kinda heavy so she probably was gonna be heavy.” Another participant commented that although doctors compare her son with other children of his age, “I look at the effect of his parents” in determining his expected growth.

Table 3. Pregnancy Behavior Changes

Theme 1: Behavior change timing

Theme 1a: Behavior change maintained beyond pregnancy

They would tell me to walk at least for 30 minutes. It doesn’t have to be a long walk. Something like walk somewhere and walk back or something like that. Sometimes, I’ll make it an hour, a 30-minute walk up and one back. That helped me too. And now, to this day, I still will just get up and walk. *Participant 7, Mother of 1 year old*

Well, soda, I don’t drink still. I stopped drinking soda when I came to the NIP clinic, I wasn’t drinking it my entire pregnancy... I don’t drink soda anymore. *Participant 8, Mother of 2 year old*

When I’m pregnant, I don’t eat what I wanna eat. But when I’m not pregnant, I eat what I wanna eat, but I don’t eat as much [as I did before I started going to NIP]. *Participant 5, Mother of 1 year old*

I still stick to some of their ideas to this day. Like my fruit drinks, I drink them but I don’t drink as much. *Participant 14, Mother of 2 year old*

Theme 1b: Behavior change not maintained beyond pregnancy

Over the past year, I just gave up. I just gave up. I just started slacking off on doing the exercise part. *Participant 9, Mother of 2 year old*
[After pregnancy] I went right back to eating what was fast for me. *Participant 19, Mother of 1 year old*

Theme 1c: Did not make changes

[The nutritionist] harped on my food and soda... And telling me I’m supposed to eat a children size meal, no. That wasn’t gonna work... I just told her I didn’t like her. Told her to get out... She laughed. And came back the next time I came back... even when I didn’t want to see her. She wanted to see me because my health was her concern. *Participant 1, Mother of 8 month old*

Table 4. Sustaining Behavior Change in the Postnatal Period**Theme 2: Ambivalence about the importance of postnatal behaviors***Theme 2a: Mothers believe postnatal parental behavior influences offspring behavior and health (facilitator)*

I just motivate them. They mimic what adults do, so if they see me eating healthy, they say, “Mommy’s eating healthy. Why can’t I? If Mommy is doing that, why can’t I?”... If I sit down and eat junk food all day, they’re going to want to sit and eat junk food all day. If I eat healthy all day, my girls, especially the baby—she will definitely want to eat what I eat. *Participant 16, Mother of 2 year old*

Now it’s like we’re actually sitting down, having a home-cooked meal because I want him to learn to sit down and stop—because he used to walk around with food. We would take anything and just go... Now I’m trying to get them to let them know to slow down, sit down at the table and eat. We have to sit there, how was your day, how was school. So we’re getting a lot better at that. *Participant 38, Mother of 2 year old*

I tell my daughter every day like I’m only doing this because look at me, I don’t want you to be—end up just like I am. Having to worry about her sugar or being overweight or not really having motivation or energy to do anything outside of sit around and watch TV and eat. *Participant 1, Mother of 8 month old*

Theme 2b: Mothers believe that body habitus is familial and doubt need to modify behaviors (barrier)

When she was three months, they considered her obese or overweight because she was all the way up the scale and her age was at the bottom, but she always been like that... I didn’t think [we needed to cut back on feeding] because I looked at it as I’m kinda heavy, her dad’s kinda heavy so she probably was gonna be heavy, but I didn’t think we really fed her a lot. *Participant 15, Mother of 1 year old*

A lot of our patients don’t really believe in the BMI and the growth chart. I hear over and over again, you know, the doctor said that my baby’s obese; do you think my baby’s obese. I don’t think so. Like you know, I was big and you know. *Participant 22, Social Worker*

I’m tall, so he’s not gonna be a little boy. He’s gonna be a big boy. He is a big boy... [The doctors are comparing him to] most of the kids his age, I guess, they’re going by that... I look at the effect of his parents. *Participant 37, Mother of 2 year old*

Theme 3: Ambivalence about the need for enhanced postnatal healthcare*Theme 3a: Clinicians and mothers believe that, for obese mothers, behavior change during pregnancy is more important than postnatal behavior change (barrier)*

But working with them around nutrition and healthier choices I think would definitely be helpful, especially during pregnancy, but always. *29, Nutritionist*

I’m not like making it hard on myself like I have to do this or I have to stop eating fast food or I have to stop drinking sodas, but when I was pregnant, it was something that I had to stop doing. *Participant 15, Mother of 1 year old*

Theme 3b: Clinicians believe that clinical obesity prevention strategies should be universal (barrier)

But I think that every kid really should be the same. There’s going to be genetic differences in people; however, they should all be doing the same thing... So if we’re assuming that the difference is education and getting them to understand and buy in to the fact that being obese is actually a detriment, then if that’s the difference, then there would need to be a different approach. But if you were just saying, what should kids do? Or like how should we feed our kids? It should all be the same. *Participant 23, Nutritionist*

At least in the population that I see, there’s just such a preponderance of obesity in both the kids and the parents that I think it’s just kind of moot; I think it’s splitting hairs. *Participant 32, Physician*

Theme 3c: Clinicians are uncomfortable while discussing parental weight as a risk factor for children (barrier)

Again, it’s a fine line, it’s like “I look at you, and I see that you’re obese, ma’am, we’re going to do this track for your child,” this is alienating. *Participant 32, Physician*

I think it’s difficult for providers to address obesity. It’s a very sensitive subject, and when you have an obese parent sitting there it’s difficult to talk to the parent about their own obesity. I feel like we should feel more comfortable doing that because we’re addressing the health of a child which, of course, the family is gonna effect directly with whatever is going on with the parents. So I wish we were more comfortable addressing that. *Participant 35, Physician*

Theme 3d: Mothers believe that additional medical and social supports promoted behavior change in the prenatal period (facilitator)

I would definitely love to work with a nutritionist again and have that close-knit family feeling where all the doctors are really geared towards finding out what works for you and what doesn’t. If something in your diet doesn’t work, then you come back and you report to them and then you try something different. *Participant 6, Mother of 1 year old*

[During my pregnancy] my kids were away more. Like, they was going with my sister more, or they was gone with their father more. Like, I would have other people watching because I was more sickly... I would take like 20 minutes to just take a walk and get some fresh air. Sometimes that would help with my sickness also. *Participant 5, Mother of 1 year old*

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Table 4. Sustaining Behavior Change in the Postnatal Period *continued***Theme 4: Perceived lack of concern about child growth***Theme 4a: Mothers perceive reassurance by pediatric clinicians (barrier)*

She's like everything as far as health wise, he's fine... He's very active for his age... There's really no chance that he's going to gain too much weight. Most of it will be more muscle than anything. Muscle is more heavy than fat. Other than that, she said just keep doing what you're doing. *Participant 14, Mother of 1 year old*

Yeah, he's healthy... She just said he's a little bit overweight, just a little bit, a tiny bit she said. That's it. *Participant 13, Mother of 1 year old*

Theme 4b: Clinicians perceive growth is not a priority for parents (barrier)

We have fifteen, tops twenty minutes to talk to families about kids' growth, their safety, their nutrition, their teething, and immunizations, and do a physical exam and whatever topics are on the parents' mind. And so sometimes nutrition and exercise isn't always high priority in the visit. *Participant 20, Physician*

I mean the family's focused, well; we're really worried about this. There's my focus, well, he's in for a physical and he's way behind on shots. Or you're worried about the rash, but I see he's repeating first grade for the second time. Ooh, that's not a good sign. I mean so it's hard. *Participant 35, Physician*

Theme 3: The need for enhanced postnatal care

NIP participants and clinicians expressed mixed perspectives on whether enhanced postnatal care was warranted. Both viewed supporting positive maternal behaviors as more important during pregnancy than afterward (Theme 3a). For example, a nutritionist stated, "Working with [obese parents] around nutrition and healthier choices I think would definitely be helpful, especially during pregnancy, but always." A NIP participant described the importance of prenatal dietary changes, saying, "I'm not like making it hard on myself like I have to do this or I have to stop eating fast food or I have to stop drinking sodas, but when I was pregnant, it was something that I had to stop doing."

Although clinicians consistently acknowledged that infants of obese mothers are at a high risk for obesity, many desired a universal approach to obesity prevention. Clinicians justified this approach based on the prevalence of obesity in their clinical populations and the fact that recommendations for obese populations are warranted for lower-risk populations as well. One nutritionist referenced this ambivalence, saying, "I think that every kid really should be the same. There's going to be genetic differences in people; however, they should all be doing the same thing."

In addition, clinicians were reluctant to develop enhanced services for families with obese parents due to discomfort in discussing parental weight as a risk factor. One pediatrician reflected, "It's a fine line, it's like 'I look at you, and I see that you're obese, ma'am, we're going to do this track for your child,' this is alienating."

Despite these reservations from clinicians, NIP participants described additional resources from their social networks and from the healthcare system as important facilitators of prenatal behavior change (Theme 3d). For example, one participant described the importance of the enhanced obstetrical care she received, saying, "I would definitely love to work with a nutritionist again and have that close-knit family feeling where all the doctors are really geared towards finding out what works for you and what doesn't." Another participant explained that she ex-

ercised during pregnancy, because "[During my pregnancy] my kids were away more... Like, I would have other people watching because I was more sickly... I would take like 20 minutes to just take a walk and get some fresh air."

Theme 4: Perceived lack of concern about rapid child growth

NIP participants reported feeling reassured about offspring growth by pediatricians. This reassurance was linked to complacency about the need for changed behaviors at home. For example, when asked what her pediatrician had told her about her son's growth, one participant responded, "there's really no chance that he's going to gain too much weight... she said just keep doing what you're doing."

Clinicians, meanwhile, perceived that parents' priorities for limited visit time often did not include weight-related behaviors. One pediatrician explained, "We have fifteen, tops twenty minutes to talk to families about kids' growth, their safety, their nutrition, their teething, and immunizations, and do a physical exam and whatever topics are on the parents' mind. And so sometimes nutrition and exercise isn't always high priority in the visit."

Discussion

Our findings offer stakeholder ambivalence as a key explanation for why prenatal obesity interventions may not benefit offspring growth.⁴⁻⁷ To our knowledge, this is the first study to explore stakeholder perspectives on obesity-related behaviors across the pre- and postnatal periods in the United States. Though we evaluated a prenatal intervention, the explanations that emerged suggest postnatal intervention targets such as clarification of professional recommendations and improvement of parent-clinician communication regarding familial obesity risks.

Clinician ambivalence about enhanced care for children of obese parents is reflected in current guidelines, which provide no specific recommendations for this group. The 2007 AAP statement on obesity prevention recognized

children of obese parents as a high-risk group, but it explicitly recommended a universal obesity prevention strategy.¹⁶ Meanwhile, parental obesity is not a risk factor listed in the 2011 NHLBI guideline on cardiovascular risk reduction.¹⁷ Primary prevention of obesity may require professional clarification of appropriate services for at-risk groups.

Improving parent–clinician communication around the long-term risks of parental weight status and infant growth may also improve outcomes. Risk communication is an important part of primary care. However, clinicians we interviewed expressed caution about addressing long-term risks for obesity, and they described time constraints as a barrier to nuanced communication. Ongoing research seeks acceptable language to discuss weight status and to standardize obesity prevention messages in pediatric primary care without increasing time burdens.^{18–21}

Our findings are an extension of prior obesity literature. Reports from obese women who participated in prenatal weight management programs in other countries also described the increased support as beneficial.^{10,11} In addition, obese pregnant women have previously emphasized the importance of prenatal behavior change, and we find that this belief may be stable even years beyond pregnancy.²² Similar to other parents of obese children and despite specific prenatal counseling on weight-related topics, NIP participants tended to believe their children were growing in a healthy manner.^{23–26} We offer a previously unexplored reason for these parental beliefs. Namely, clinicians themselves place a greater value on behavior change during pregnancy and are uncertain about singling out some at-risk children for specific counseling or services.

Our study addresses Medicaid-insured families seen at one hospital system. Because of our local population, the interviewed NIP participants were exclusively African American. We view this clinical population as a strength of this study. Both locally and nationally, NIP participants represent a population that has experienced persistent barriers to healthcare access and high rates of adverse outcomes, including increased infant mortality and early death from cardiovascular disease.^{12,27–29} Addressing healthcare inequities requires an understanding of the perspectives and experiences of NIP patients and others like them.

Our study focuses on behavioral interventions in the prenatal period. Interestingly, many of the behaviors that mothers described are relevant to infant and toddler growth, including limiting portion sizes and sugar-sweetened beverages, and eating meals as a family. This supports the theory that prenatal programs should be able to alter the family food environment in ways that influence pediatric outcomes.

As our participants note, many factors influencing growth are beyond the control of parents. Approximately 40% of obesity is attributed to genetic causes,^{30,31} and the rapid rise of obesity over the last generation highlights the importance of environmental factors in determining weight status.^{32,33} However, in discussing barriers to sustained change, NIP participants consistently returned to factors that are modifiable, such as the loss of services that were available to

them during pregnancy, other health problems, and personal motivation. In addition to being potentially modifiable, these individual-level behaviors warrant attention in that they can positively influence cardiovascular outcomes, even in the absence of measurable changes in weight status.³⁴

This study had several limitations. We could not confirm that mothers or clinicians described beliefs or experiences that were consistent with their actual behavior in the healthcare setting or beyond, especially given that interviews were conducted up to 2 years after the intervention of interest. Participants did not discuss some topics that were relevant to weight management, such as parity, inter-pregnancy interval, and sleep. In addition, recruitment was challenging, though we did complete interviews with almost 40% of contacted NIP participants. Our sampling strategy led to overrepresentation of NIP participants who felt positively toward the program. While further limiting generalizability, this captured the perspectives of women who were the most likely to desire ongoing healthcare engagement.¹³ Finally, we did not obtain demographic information on clinicians, so we could not interpret how their demographic identity might influence their clinical practice.

Conclusions

Participation in a prenatal intervention targeting appropriate gestational weight gain led to maternal familiarity with, adoption, and in some cases maintenance of behaviors that were relevant to the family food environment. Both parents and clinicians expressed ambivalence about the need for sustained services and behavior change after pregnancy, which may explain why prenatal programs fail to influence pediatric growth. Our findings suggest a need for professional clarification of adequate preventive services for infants at risk of obesity, and new strategies for parent–clinician communication about risks related to parental weight status.

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References

- Rooney BL, Mathiason MA, Schauburger CW. Predictors of obesity in childhood, adolescence, and adulthood in a birth cohort. *Matern Child Health J* 2011;15:1166–1175.
- Johnson J, Clifton RG, Roberts JM, et al. Pregnancy outcomes with weight gain above or below the 2009 institute of medicine guidelines. *Obstet Gynecol* 2013;121:969–975.
- Gillman MW, Ludwig DS. How early should obesity prevention start? *N Engl J Med* 2013;369:2173–2175.
- Mustila T, Raitanen J, Keskinen P, et al. Pragmatic controlled trial to prevent childhood obesity in maternity and child health care clinics: Pregnancy and infant weight outcomes (the VACOPP study). *BMC Pediatr* 2013;13:80.
- Tanvig M, Vinter CA, Jørgensen JS, et al. Effects of lifestyle intervention in pregnancy and anthropometrics at birth on offspring metabolic profile at 2.8 years: Results from the lifestyle in pregnancy and offspring (LiPO) study. *J Clin Endocrinol Metab* 2014;100:175–183.
- Kong K, Campbell C, Wagner K, et al. Impact of a walking intervention during pregnancy on post-partum weight retention and infant anthropometric outcomes. *J Dev Orig Health Disease* 2014;5:259–267.
- Gregory EF, Goldshore MA, Henderson JL, et al. Infant growth following maternal participation in a gestational weight management intervention. *Child Obes* 2016;12:219–225.
- Catalano P. Maternal obesity and metabolic risk to the offspring: Why lifestyle interventions may have not achieved the desired outcomes. *Int J Obes* 2015;39:642–649.
- Montano DE, Kasprzyk D. Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. In: K. Glanz, B.K. Rimer, and K. Viswanath (eds.), *Health Behavior: Theory, research and practice*. Jossey-Bass, San Francisco, CA, 2015, pp. 67–96.
- Atkinson L, Olander EK, French DP. Acceptability of a weight management intervention for pregnant and postpartum women with BMI ≥ 30 kg/m²: A qualitative evaluation of an individualized, home-based service. *Matern Child Health J* 2016;20:88–96.
- Dencker A, Premberg Å, Olander EK, et al. Adopting a healthy lifestyle when pregnant and obese—An interview study three years after childbirth. *BMC Pregnancy Childbirth* 2016;16:201.
- Fox CE, Morford TG, Fine A, Gibbons MC. The Johns Hopkins urban health institute: A collaborative response to urban health issues. *Acad Med* 2004;79:1169–1174.
- Bryman A, Burgess B. *Analyzing Qualitative Data*. Routledge; NY, 2002.
- Markgraf F, Michels S, Winter M, Steiner M. ATLAS.ti. 2013.
- Barbour RS. Checklists for improving rigour in qualitative research: A case of the tail wagging the dog? *BMJ* 2001;322:1115.
- Barlow SE. Expert committee and treatment of child and adolescent overweight and obesity: Expert committee recommendations regarding the prevention. *Pediatrics* 2007;120:S164–192.
- Daniels S, Benuck I, Christakis D. Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents, national heart, lung, and blood institute expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: Summary report. *Pediatrics* 2011;128:S213–S256.
- Sanders LM, Perrin EM, Yin HS, et al., Greenlight Study Team; “Greenlight study”: A controlled trial of low-literacy, early childhood obesity prevention. *Pediatrics* 2014;133:e1724–e1737.
- Oettinger MD, Finkle JP, Esserman D, et al. Color-coding improves parental understanding of body mass index charting. *Acad Pediatr* 2009;9:330–338.
- Puhl RM, Peterson JL, Luedicke J. Parental perceptions of weight terminology that providers use with youth. *Pediatrics* 2011;128:e786–e793.
- Puhl RM, Heuer CA. The stigma of obesity: A review and update. *Obesity* 2009;17:941–964.
- Phelan S. Pregnancy: A “teachable moment” for weight control and obesity prevention. *Obstet Gynecol* 2010;202:135.e1–135.e8.
- Jain A, Sherman SN, Chamberlin LA, et al. Why don’t low-income mothers worry about their preschoolers being overweight? *Pediatrics* 2001;107:1138–1146.
- Eli K, Howell K, Fisher PA, Nowicka P. “A little on the heavy side”: A qualitative analysis of parents’ and grandparents’ perceptions of preschoolers’ body weights. *BMJ Open* 2014;4:e006609.
- Thompson AL, Adair L, Bentley ME. “Whatever average is.” Understanding African-American mothers’ perceptions of infant weight, growth, and health. *Curr Anthropol* 2014;55:348–355.
- Kominiarek MA, Gay F, Peacock N. Obesity in pregnancy: A qualitative approach to inform an intervention for patients and providers. *Matern Child Health J* 2015;19:1698–1712.
- Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the united states, 2011–2012. *JAMA* 2014;311:806–814.
- Centers for Disease Control and Prevention (CDC). CDC health disparities and inequalities report—United States, 2013. *Morb Mortal Weekly Rep*. 2013;62:1–186.
- Mathews TJ, MacDorman M. Infant mortality statistics from the 2010 period linked birth/infant death data set. *Natl Vital Stat Rep* 2013;62:1–26.
- Maes HH, Neale MC, Eaves LJ. Genetic and environmental factors in relative body weight and human adiposity. *Behav Genet* 1997;27:325–351.
- Yang J, Bakshi A, Zhu Z, et al. Genetic variance estimation with imputed variants finds negligible missing heritability for human height and body mass index. *Nat Genet* 2015;47:1114–1120.
- Swinburn BA, Sacks G, Hall KD, et al. The global obesity pandemic: Shaped by global drivers and local environments. *Lancet* 2011;378:804–814.
- Nau C, Ellis H, Huang H, et al. Exploring the forest instead of the trees: An innovative method for defining obesogenic and obesoprotective environments. *Health Place* 2015;35:136–146.
- Soares-Miranda L, Siscovick DS, Psaty BM, et al. Physical activity and risk of coronary heart disease and stroke in older adults: The cardiovascular health study. *Circulation* 2016;133:147–155.

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