

Published in final edited form as:

Matern Child Health J. 2009 May ; 13(3): 364–375. doi:10.1007/s10995-008-0359-8.

Perceived Barriers to Physical Activity among Pregnant Women

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Abstract

Objective—Physical activity generally declines during pregnancy, but barriers to activity during this time period are not well understood. The objective was to examine barriers to physical activity in a large cohort of pregnant women and to explore these barriers in more depth with qualitative data derived from a separate focus group study using a socioecologic framework.

Method—A total of 1535 pregnant women (27–30 weeks' gestation) enrolled in the Pregnancy, Infection, and Nutrition Study were asked an open-ended question about their primary barrier to physical activity; responses were coded into categories according to the socioecologic framework. To further elucidate, 13 focus groups of a total of 58 pregnant women (20–37 weeks' gestation) were conducted among Hispanic, African American, and White participants.

Results—Among the 1535 pregnant women participating in the survey, 85% reported an intrapersonal barrier to physical activity, of which almost two-thirds were health related. Only 2% of the women reported their main barrier to physical activity as interpersonal and 3% reported a neighborhood or environmental barrier. These results were supported by the focus group data, overall and by race/ethnicity and body mass index. Although women discussed barriers to physical activity at a variety of levels, the intrapersonal level was the most frequently cited and discussed factor in both studies.

Conclusions—Since pregnancy may trigger the development of obesity and since physical activity is recommended for healthy pregnant women, it is imperative to promote physical activity in a more relevant way. These quantitative and qualitative studies revealed many barriers to physical activity among pregnant women and some suggestions for interventions.

Keywords

pregnancy; physical activity; qualitative; exercise

Introduction

Regular physical activity enhances maintenance of a healthy weight and has health benefits beyond those directly linked to achieving a healthy weight.¹ Yet in the United States in the year 2000, 34% of pregnant women representing the span of pregnancy, reported not engaging in any moderate or vigorous intensity leisure activities in the past month.² Some studies indicate that during pregnancy physical activity declines^{3, 4} and may remain low well into the postpartum period.⁵ It has been hypothesized that the pregnancy state may trigger the development of obesity through the retention of gestational weight gain,^{6, 7} since the majority of pregnant women gain more weight than what is recommended.^{8–10} The 2002 American College of Obstetrics and Gynecology (ACOG) guidelines for exercise during pregnancy¹¹ indicate that 30 minutes or more of moderate activity on most, if not all, days of the week is recommended as long as the pregnant woman does not have any medical or obstetric complications. A 1999 consensus panel on physical activity in the prevention and treatment of obesity concluded that in pregnant women the development of physical activity interventions represented a viable avenue for the prevention of overweight and obesity in women.¹² To date, however, few studies have addressed the reasons why women reduce their physical activity during pregnancy.^{13, 14} In addition to the limited quantitative studies, we are aware of only three qualitative studies exploring the issues regarding physical activity during pregnancy,^{5, 15, 16} and two were conducted in Detroit, Michigan among Hispanic women.^{5, 16} We sought to expand the information currently available by conducting analyses of two studies in central North Carolina.

The purpose of this study was to identify the barriers to physical activity among pregnant women from diverse ethnic backgrounds using a combined qualitative and quantitative approach. We used a socioecologic framework to explore the broad range of potential factors that were perceived as barriers by pregnant women. This model proposes that health behaviors are influenced through multiple levels, including (1) intrapersonal, (2) interpersonal, (3) neighborhood or environmental, and (4) organizational and policy factors.^{17–19} We explored multiple levels to understand their effect on physical activity behavior during pregnancy with the intention of informing interventions.

Methods

Data used in this analysis came from two separate studies of pregnant women: a cohort study and a qualitative study utilizing focus groups. The procedures for these studies were in accordance with the ethical standards of and approved by the Institutional Review Board of the University of North Carolina - Chapel Hill.

Prospective Cohort Study Data Collection and Analysis

Data for this analysis came from the Pregnancy, Infection, and Nutrition (PIN) Study of women recruited from prenatal clinics (private and resident) serving the University of North Carolina Hospitals in central North Carolina. The PIN Study was originally assembled to study risk factors for preterm birth. Potential participants were identified by study staff through a review of all medical charts of new prenatal patients. Women were recruited at their second prenatal visit before 20 weeks of gestation, provided informed consent, and were at least 16 years of age, English speaking, not carrying multiple gestations, and planning on continuing care at the selected clinic. More information on the PIN Study protocols and questionnaires can be found at the website <http://www.cpc.unc.edu/pin>.

Data collection methods for this PIN Study included two phone interviews, for which women were paid \$5 for each interview. At the second telephone interview conducted at 27 to 30 weeks of gestation (March 2001 through September 2005) women were asked, "What is the one main

reason that keeps you from being more active while you are pregnant, either during work or nonworking time?" The interviewer recorded the open-ended response verbatim if the answer was not one of the response options in the database. These participant responses were analyzed using content analysis, a method for the objective and systematic description of qualitative data.^{20, 21} Categories of responses were created by one reviewer, with a second reviewer checking each decision and disagreements resolved together through discussion. The same two reviewers coded all responses; this helped ensure accuracy and reliability of decision rules, as well as consistent categorization and coding of the data. Following this, we grouped responses according to levels comprising the socioecologic framework and by broad types of barriers to physical activity.

The PIN Study enrolled 2006 women. We first excluded those enrolled into the study more than once, with a second or third pregnancy (n=131), then those who did not participate in the second phone interview or did not answer the question or both (n=314), and then those 16 or 17 years of age (n=26), leaving 1535 PIN participants for the analysis of this study. During the first telephone interview, women were also asked about their general health, marital status, education, and employment. Self-reported height and prepregnancy weight were collected at the first prenatal visit or at the time of recruitment and were used to calculate prepregnancy body mass index (BMI). The prepregnancy BMI was also grouped according to the Institute of Medicine's recommendations: underweight with a BMI <19.8 kg/m², normal weight with a BMI between 19.8–26.0 kg/m², overweight with a BMI between 26.1–29.0 kg/m², and obese with a BMI >29.0 kg/m².²² We used SAS (version 9.1.3, Cary, NC) for the analysis of the quantitative data.

Focus Group Data Collection and Analysis

In a separate study, we conducted 13 focus groups of pregnant women to collect qualitative information on physical activity, healthy eating, and weight gain from March 2003 to September 2004 in central North Carolina. We conducted these focus groups to better understand the quantitative results generated from the PIN Study with regards to these topics. Pregnant participants were recruited based on their race/ethnicity and self-reported prepregnancy BMI. Eligibility required that participants provide informed consent and self-identify as Hispanic, Nonhispanic African American, or Nonhispanic White, spoke either English or Spanish, were between 18 to 35 years old, and between 20 to 37 weeks of gestation. Participants were recruited through prenatal clinics, newspaper advertisements, and posted flyers. We determined to hold focus groups specific to race/ethnicity (Hispanic, Nonhispanic African American, or Nonhispanic White) and prepregnancy body weight status as self-reported by participants at the time of recruitment (BMI < 26 kg/m², termed as "low BMI") or ≥ 26 kg/m² (termed as "high BMI"). Two focus groups were conducted per race/ethnicity and BMI category, with the exception of the three focus groups that were held with women in the African American/high BMI category. We included an additional focus group for these women to increase the absolute number of women in the African American/high BMI category.

The focus groups ranged in size from two to eight participants, with an average of four participants per session for African American and White groups and 6 participants in the Hispanic groups. Hispanic focus groups were conducted in Spanish. The focus groups lasted approximately 75–90 minutes. Trained moderators were the same race/ethnicity as the participants. Participants received \$35 for their attendance. The focus group guide included questions on physical activity, with probes to address the different dimensions from a socioecologic framework. The complete focus group guide is available at http://www.cpc.unc.edu/projects/pin/docs_postpart/index.html.

Participants completed a brief questionnaire prior to the start of the focus group discussion to capture basic sociodemographic information on general health, marital status, education, and

employment. Hispanic participants were asked additional questions regarding acculturation. English language acculturation was assessed using a 4-item language scale developed for Hispanics.²³ The total score ranged from 4 (least acculturated, greater use of Spanish language) to 20 (most acculturated, greater use of English language). Other proxy measures of acculturation included place of birth and length of residence in the U.S.

The focus group conversations were audio taped and transcribed verbatim. Sessions conducted in Spanish were simultaneously audio-translated into English. Transcripts were independently double coded by the same two persons using a common codebook with the use of *ATLAS/ti*. Discrepancies between the two coders were identified through the software and resolved through discussion. The coded data were then grouped into supercodes.²⁴ During subsequent data reconstruction quotes were reevaluated to identify whether a particular quote supported one of the identified themes within any of the main supercode groups. A master matrix containing quote identification tags according to themes was created and evaluated. By reviewing this matrix, we were able to assess the degree and domain of support for each emerging theme with regard to participant race/ethnicity and prepregnancy BMI status. This examination focused on particular domains leading to the discovery of crossover themes. As a result, a final matrix was developed for each supercode and the identification tag numbers were used to create new *ATLAS/ti* documents, each of which were supportive of an individual theme. These documents were then reviewed for more nuanced information. This process of data reduction and reconstruction allowed distinct individual and overarching themes to emerge from the focus groups.

Results

Descriptive Information of Participants

Table 1 describes the 1535 PIN survey participants and the 58 focus group participants. For the focus groups, the median age for these participants was 26 years, with a median gestational age of 29.5 weeks; for the survey participants, the median age was 30 years, with a median gestational age of 28.7 weeks at the time of the second phone interview. Because of the strategic sampling of focus group participants (i.e., approximate equal representation from three race/ethnic groups), the representation across race/ethnicity was more diverse than from the survey. Most participants in both studies reported excellent or very good general health and approximately two-thirds reported being married or partnered. Almost half (47%) of the focus group participants reported a prepregnancy BMI in the overweight or obese category, compared to 34% of the PIN survey participants. The education level of the PIN participants (80% at least some college) was higher than that of the focus group participants (52% at least some college). The PIN participants also reported working more often than the focus group participants (67% vs. 43%, respectively). Information about birth origin and acculturation was collected from the Hispanic focus group participants only. Of the 25 Hispanic women participating in focus groups overall, 20 of them were from Mexico, 1 was from Honduras, and 4 left the question blank. Among the Hispanic focus group participants, 64% spoke only Spanish, the median time in the United States was 41 months (range 9–114 months) and the median score on the acculturation scale was 4 (range 4–8, out of a potential high score of 20), indicating low acculturation.

Barriers According to the Socioecologic Framework

A summary of the main barrier to physical activity for the 1535 PIN survey participants can be found in Table 2. The barriers were grouped by the socioecologic framework (i.e., intrapersonal, interpersonal, neighborhood or environmental, organizational, and policy factors). Although the quantitative question focused only on barriers, the qualitative study probed for both barriers and enablers to physical activity, as well as suggestions for

interventions to help pregnant and postpartum women be more physically active in different settings. Intrapersonal barriers discussed by the pregnant women fell into two broad, sometimes overlapping, dimensions: either health (i.e., physical symptoms or feelings, somatic) or non-health (i.e., motivation, lack of time) related. A summary of findings for the focus group study can be found in Table 3.

Intrapersonal, Health Related—Among the PIN survey participants, the most commonly reported barrier to physical activity during pregnancy was health related (52%, Table 2). This was supported in the qualitative findings as well. Across all focus groups, pregnant women commonly discussed health related or somatic factors as barriers to physical activity. Tiredness or lower energy during pregnancy garnered the most number of quotes when discussing reduced or lack of physical activity. *“The only thing that would hold me back would be if I went upstairs, just don’t look for me no more because I’m not coming back down. I’ll holler at you tomorrow morning or something, but I’m not coming back down those stairs.”* (African American high BMI) *“I used to feel very free when I was able to walk and to run and here now with the pregnancy because in the sun I get very tired. I have to be at home.”* (Hispanic high BMI) Other women mentioned the need for more sleep. *“Something I noticed too is like before pregnancy I rarely got to take a nap during the day. That like never happened and now I am the nap queen.”* (White low BMI) Another woman described having less time in the day due to sleeping longer. *“My energy level is much less. I’m sleeping a lot more and even though I’m sleeping a lot more my energy level is still a lot lower so I just move more slowly and try to get to the critical things and don’t really get to much more than that if any more than that. I’m happy if at the end of the day the basic things have gotten done... When you sleep more there’s less time in the day so as well as less energy.”* (White low BMI)

For some pregnant women with young children, tiredness was exacerbated by child care activities. *“I think I’m more physically tired this time, maybe because I have a two-year old too. When he lays down for his nap, I’m right with him.”* (African American low BMI) Other groups discussed a similar concern. *“I don’t have as much energy because I have two kids already, a four year old and a three year old and already they would just drain all my energy and now being pregnant that’s taking even more. It’s like I don’t have enough energy to do everything I have to do because I go to school and take care of them.”* (African American high BMI) *“When I was pregnant the first time I just sat on the couch and waited for the baby to come and this time I just don’t ever get to sit down and just sit in front of the tube, so I feel like whether I like it or not, I’m physically active.”* (White low BMI)

Several women related challenges to engaging in physical activity because of shortness of breath. *“It doesn’t take much for me to be short of breath. We live in an apartment and I swear just going to that first floor from the living room and I’m like ooh - and I’ve got to take a breather before I go to each level.”* (African American high BMI) Another woman described a similar experience. *“I just can’t breathe. I don’t know why I can’t breathe. I can’t go. I’m tired. I use to walk the dogs a mile down the road and back and I can’t do that I’m physically tired.”* (White high BMI)

Several women mentioned musculoskeletal problems associated with physical activity, such as back pain or soreness, as a reason to avoid physical activity. Even so, other women who remained active described the importance of listening to your body. *“I ran before I was pregnant and weight lifted and now I’ve been able to kind of transition into the pregnancy but I do get tired faster and I try to listen more so like if I’m running and I’m in a long run and I get tired, I’ll walk.”* (White high BMI) Another woman described how she responded to early contractions. *“If I push myself too hard I get all those Braxton-Hicks and I just go nuts and I know that’s your body saying ‘slow down.’ So I think that’s a normal progression. If I slow down they will stop.”* (White low BMI) Another woman described learning from the

experiences of others to not push too hard. *"I saw a couple of people in my birthing class ... (they) were just pushing it too hard too late in the pregnancy and they started getting contractions way too early and just, you know, it had that effect so I'm sure that has led me to not want to push myself. You know just to try to listen to my body and not push, push, push, push 'cause just instinctively and by experience I've seen it's not a good idea."* (White low BMI) Interestingly, this concept of listening to one's body was primarily discussed only among the focus groups of White women.

A number of groups discussed the concern with pregnancy complications from being active. In particular, some women voiced being afraid that if they pushed themselves physically that they might harm the baby or bring on premature labor. *"I was really, really nervous just because I'd had a lot of fertility problems for a number of years and so the first trimester I was a maniac nervous, just a wreck, and ... I totally stopped going to the gym and even at work I had to do a lot of physical activity but it was really causing me a lot of stress because I was so worried about something happening with the pregnancy...."* (White low BMI) Another woman described her cessation of attending a local gym in order to avoid delivering early. *"Since I'm almost term, I'm going to deliver at the Birth Center and you have to be at least 37 weeks before they'll let you deliver there so I wanted to make sure I didn't do anything (to bring on the delivery early)."* (African American low BMI)

Women with high risk pregnancies mentioned the advice from their physician to slow down. *"My doctor was actually telling me to take it easy because I'm high risk. I've lost two babies and I was threatening to go in labor."* (African American high BMI) Another woman described the influence of her first pregnancy on her activity. *"My first pregnancy I had a miscarriage, so this one at eight weeks I had started bleeding so that made me kind of slow down a little bit."* (African American low BMI)

Intrapersonal, Not Health Related—Among the PIN survey participants, intrapersonal factors that were non-health related were cited by almost one-third of the sample (Table 2), including factors related to lack of time or busyness. Non-health related intrapersonal barriers were also frequently cited by the women participating in the focus groups, including both lack of motivation and time, which sometimes overlapped with physical feelings of tiredness. Lack of enjoyment, child care, or cost was mentioned less frequently by the focus group participants, and lack of knowledge was not overtly discussed.

Numerous women discussed their lack of motivation to be active during pregnancy. For example, one woman remarked, *"My motivation has diminished. I used to like to go out a lot and now I just stay inside."* (Hispanic high BMI) One woman described how she internally motivated herself to exercise. *"I have been more tired this pregnancy. I mean just exhausted and then it takes a huge amount of personal effort to get myself to the gym. ... I have to like coax myself and I say if you just go and you just walk on the treadmill for 10 minutes and I negotiate until I get there... I never looked forward to working out. I look forward to how I feel afterwards but it's been a lot more work."* (White high BMI) Some women procrastinated the need for physical activity until the postpartum period. *"Maybe after the baby then I'll start walking because that's when I'll really be concerned about losing the extra pounds, but right now I'm not too concerned."* (African American high BMI) *"Well, my friends, my Momma too, she'll call, 'You in that bed? You need to get up go outside and do some walking or something. When you have that baby you going to be this old couch potato!' Well, I'm already that. When I have the baby, I'm going to be energized. I'm going to be out."* (African American high BMI)

When women discussed their lack of time to engage in physical activity, it often included feelings of tiredness, as described earlier. *"I definitely feel like my days are shorter now that I'm pregnant. I go to bed earlier and sleep in a little bit later. Whereas before I would get up*

early and run or walk before my toddler would wake up. I don't feel like that's an option now. Just from a time standpoint. It's also sort of with classes like why it's been so hard to go cause I feel like every hour away from my toddler is so hard to come by that there's shopping or errands to do so it's hard to squeeze exercise in. I'd definitely say from a scheduling standpoint being pregnant sort of makes me have less time so there's less time for exercising." (White low BMI) Another woman revealed a similar sentiment. *"When I'm not pregnant I have the luxury of like going to the Y(MCA) and putting my child in daycare and doing yoga or whatever, but now like my cup is full and so I feel like life is my activity."* (White low BMI) Another woman in the group continued her sentence. *"Getting through every day, like just getting out of the car, keeping the house in some state of (order)."* (White low BMI)

It is interesting to note that the women in the quantitative study never overtly indicated a lack of knowledge regarding physical activity. In the focus group conversations, the groups discussed the advice or lack thereof that they received from their health provider. Some were told to decrease their activity, especially with regards to intensity, while others were told to continue being active as if you were not pregnant. In contrast, other women discussed not receiving any advice regarding physical activity during pregnancy. *"No, no one has given me any advice. I don't know anything. I don't know anything about physical activity. I do what I feel I want to do."* (Hispanic low BMI) *"Nobody told me nothing.... They gave me some brochures and that's it."* (African American high BMI)

Interpersonal—Interpersonal barriers to physical activity were reported by only 2% of the PIN survey participants (Table 2). In the focus groups, the primary interpersonal barrier discussed was lack of social support. This was mentioned in all four of the Hispanic focus groups, but in only one of the four White groups and two of the five African American groups. Several women discussed the need for external motivation to be active, such as from another person. Other women described how their children served to motivate them to be more active. *"I have a four year old ... he can't stay in the house so we go outside to the park or something, so I guess we motivate each other."* (African American high BMI) Several women described the influence of their family members on their activity. *"I used to walk a lot with my girls. My husband doesn't let me do that any longer. I cannot bend and I cannot even turn on the lawn mower."* (Hispanic high BMI) Other women described their families as being overly protective. *"Because I have the cerclage in there, I have every risk factor. They're constantly watching me. I feel like, you know, the princess and the peas. Is it really a contraction or am I thinking this up? ... and of course my husband's paranoid. If you're gonna swim you're have to go with somebody else, you've gotta go to the Y(MCA) where there's other people cause he's afraid I'll have the baby right there at the Y(MCA)."* (White high BMI)

Some women received conflicting advice on physical activity from members of the support network. One woman described receiving recommendations from both her mother and her physician. *"I follow my mother's recommendations. Oh yes, because the doctors don't tell you exactly why. They say, 'Don't do too much movement.' But it's not concrete. I want my mother to tell me more concrete things."* (Hispanic high BMI) Another woman described the conflicting advice between her husband and others. *"I have decreased my physical activities. I don't do much of anything. My husband doesn't let me do much. He thinks that if I lay down, the baby will be fine. However, people tell me that I need to walk, move around for the baby to be fine."* (Hispanic low BMI) In particular, the following woman placed more value on her family's advice over her clinic and emphasized the cultural aspect of advice. *"They give us a lot of pamphlets and sometimes they tell us we cannot do like very sudden movements that our bodies cannot take. We just have to be careful and follow our customs. I used to do this and you used to do that and my mother recommended not to. You just have to follow your family."* (Hispanic high BMI)

Several Hispanic women described feeling isolated, due to language and transportation barriers, as well as simply not having many friends in this new place. *“I was more active in Mexico as well. Here if I go for a walk. I don’t see anyone. In Mexico if you go for a walk you see people and you talk to people. Here I feel much more enclosed.”* (Hispanic high BMI) Another woman shared a similar view. *“Here I spend my time cooped up inside my home. I only go to the market but I have to wait for someone to take me. When you don’t know how to drive, you rely on your husband to get you out of the house ... It is hard to be outside without having anyone to talk to. I just have my two kids and that’s all that I see and because I don’t know how to drive I don’t have anywhere to go. It’s like when I go to the hospital no one is available to take me only a taxi and that’s hard.”* (Hispanic high BMI)

Neighborhood or Environmental—Only 3% of the PIN survey participants mentioned neighborhood or environmental barriers to physical activity during pregnancy (Table 2). Neighborhood barriers were also infrequently mentioned across the focus groups despite our probing on this topic. Among this type of barrier, weather or season of the year was the most often cited factor. Several women mentioned turning the bad weather into a positive experience, such as dancing indoors. Few women mentioned the physical environment as a barrier to physical activity. Of those that did, outdoor places, such as parks and trails, were discussed. *“I don’t trust those paths because it’s too much trees and stuff and ... unless I’ve got six pregnant women with me, then we’ll go.”* (Hispanic high BMI)

Organizational and Policy Factors—Only 0.5% of the PIN survey participants cited organizational barriers (mainly having to do with transportation, work, or school conflicts) and 1.3% cited policy barriers (mainly having to do with cost) to physical activity during pregnancy (Table 2). These factors were not emerging themes among any of the focus groups.

Intervention Recommendations

At the end of the focus groups, women were asked about intervention ideas for pregnant and postpartum women pertaining to physical activity. Their recommendations included the need for child care, social support, and suggestions for changes to their neighborhood and worksites, but focused primarily on the postpartum period rather than during pregnancy. It is important to note that these recommendations came primarily from the African American and White focus groups, while the Hispanic focus groups provided very few suggestions.

In thinking of the postpartum period, discussion around securing affordable and trustworthy child care occurred. Several groups anticipated that participation in physical activity in the postpartum period would be linked to affordable and trustworthy child care. Ideas included baby friendly gyms and neighborhood co-ops for child care. One woman expressed the need for “guilt-free day care” reflecting on perceived judgments when she left her first child in day care for an extra hour so that she could go to the gym.

When considering the neighborhood or environment, several women, primarily from the White focus groups, described places to live that are conducive to physical activity. For example, one woman stated, *“We have a great neighborhood for exercising because it’s a pretty spread out neighborhood on a couple of gravel roads and it’s very, very pleasant place to go outside and walk and jog and even the roads just outside the neighborhood are paved but they’re not very busy so I think that helps us out.”* (White low BMI) Other women wished for neighborhoods that facilitated activity, making it more convenient and safe. For example, one woman stated, *“For me to go get exercise I have to like plan it and I have to get in the car, go to the Y(MCA) but if things were just more, I don’t know, if we could just walk or bike anywhere safely and if there were lots of nice parks you know with cool trails through them. I think that would just*

make it easier on everybody. If everybody was doing it then everybody would be doing it.” (White low BMI)

Several groups discussed work related intervention ideas, mainly around the desire to be able to exercise while at work in order to maximize their time. The following two quotes are examples of this discussion. *“To me one of my concerns is, cause I work at lunchtime it’s my one window of the day that I can work out. I don’t feel I can leave my child in daycare a minute beyond the time I already have her in there because it’s just, the guilt would eat me alive. So the only window I have during the day is that lunch time in order to work out and after the baby comes I’ll have to make sure I can have childcare for that window if I want to get back to working out before I go back to work.”* (White high BMI) *“Or even mentally in our work day if that was part of the workday. Just like you take supposedly an hour for lunch even though nobody really does, but if you take an hour out of every day and go exercise, that’s something they should encourage I think bosses, in general, because they’ll have better workers then.”* (White low BMI) The desire to be able to exercise at work was coupled with the need for convenience and no additional time away from their children. The discussion regarding intervention strategies concluded the focus group sessions.

Discussion

This study reports on both qualitative and quantitative studies to provide a richer understanding of barriers to physical activity across a diverse sample of pregnant women. Together, this study provides some confirmation and corroboration through overlap of data sources. The quantitative data provides expanded generalizability and can demonstrate the generality of specific observations from the qualitative results.²⁴ In contrast, the qualitative data provided a depth and richness in context, while also clarifying and illustrating some of the quantitative findings.

Intrapersonal Level

We found that women participating in both the qualitative and quantitative research studies reported intrapersonal barriers, both health and non-health related, far more often than any other type of barrier to physical activity during pregnancy. When exploring the specific reason for not being physically active during pregnancy among the PIN survey participants, issues regarding lack of time or being too busy conferred the highest response, followed by reports of lack of energy or tiredness. Some women reported medical conditions, pain, or discomfort, while others voiced concern for the baby and did not want to overdo it. For some women, the concern did not appear to be founded in health recommendations. Likewise, the focus group participants described intrapersonal barriers, with feelings of tiredness and fatigue coming up most often across all groups. Given the physiologic changes that occur with pregnancy, this finding may not be surprising.

A few other studies provide some support for these predominant intrapersonal findings. A study of 57 active and inactive women living in the United Kingdom were asked at 16 to 38 weeks of gestation whether their physical activity had changed with pregnancy and why.¹⁴ Interestingly, the importance of sleep rated higher than exercising regularly during pregnancy and maternal physical health was the most common barrier. One-third of the women referred to risks or dangers associated with physical activity, including potential harm to the baby, while fewer women mentioned losing motivation as a reason for a decline in physical activity. In a study among 158 pregnant Australian women, reasons commonly cited for not being active included too tired, unwell, and that exercise was uncomfortable.²⁵ In another study of 266 Polish women pregnant in their third trimester, reasons for not being active included not knowing what to do (32%), not having enough time (32%), and medical conditions (10%).

¹³ Two other studies conducted using focus group methodology also identified physical complaints or concerns as barriers to their physical activity.^{5, 26}

Interpersonal Level

Interpersonal barriers to physical activity, such as lack of support, were infrequently cited as the primary concern of our survey participants. This was in contradiction to our original expectations, since studies of nonpregnant women often cite social support as critical.²⁷ One explanation is that the survey participants were asked to only report one main barrier, such that intrapersonal barriers may have overridden any concerns regarding social support. In contrast, our focus group participants regularly mentioned social support in their discussions. This is also supported in other qualitative studies of pregnant women.^{5, 16} In particular, Thornton et al.¹⁶ explored informational (e.g., advice, information, guidance), emotional (e.g., encouragement, criticism), and instrumental support (e.g., tangible assistance) for physical activity among pregnant and postpartum Hispanic women. They found that all three types of support were reported as being associated with woman's physical activity. Other focus groups of Hispanic women, including this study, also have identified social isolation, including fear of safety and lack of transportation, as barriers to physical activity, and this is especially true among newly immigrated women.^{5, 28} Providing ways to connect women together, such as using support systems, could help with some of these concerns. In the aforementioned study of pregnant women of Hispanic ethnicity, the primary intervention proposed by the Hispanic pregnant women was a center- and group-based activity program, to help expand the women's social networks and to encourage healthy habits during this time.⁵

Neighborhood or Environmental Level

In our study, neighborhood/environmental, policy, and organizational barriers were infrequently cited as barriers to physical activity. Neighborhood or environmental barriers to physical activity have been identified by pregnant women in other studies,^{5, 14} but they are mentioned less frequently as well.¹⁴

Socioecologic Framework

For both the survey findings and the focus group themes, we grouped results according to the socioecologic framework. The socioecologic framework is a comprehensive health promotion model that is multifaceted, taking into account multiple factors and their relationships among these factors.^{17–19} Fundamentally, in order to change behavior, an intervention should consider these multiple dimensions simultaneously and comprehensively, applying theory to address these different levels.¹⁷ While our results indicate the usefulness of this model in addressing our research questions, and barriers were identified across most of the dimensions, the women predominately identified intrapersonal factors as preventing them from being more physically active. The model also highlights that health behaviors can be described and influenced in a variety of settings, including within families, organizations, or communities. This was certainly supported through the focus group conversations.

Interventions

The focus group participants had an opportunity to propose interventions to help them be more active during pregnancy and postpartum. Interventional strategies developed through participatory research are more likely to reflect the cultural values and preferences of the women.^{5, 29} Primarily the African American and White women suggested interventions including making it easier to be physically active at work, child care provision, and social support as strategies to engage in physical activity throughout the day.

Together our work and other studies indicate the need for any interventions of pregnant women to focus on the woman's lack of time and on strategies to adapt physical activity to the physical or somatic changes of pregnancy. Lifestyle approaches to physical activity, incorporating physical activity throughout the day in a gradual and moderate intensity, can be as effective as structured programs.^{30, 31} This sort of approach to incorporating physical activity throughout the day might be more amenable and sustainable to pregnant women, since tiredness and lack of time were barriers often mentioned.^{30, 31} However, studies of the lifestyle approach demonstrate that cognitive and behavioral strategies are needed to help sedentary adults achieve physical activity goals.³¹ The stages of change model³² identifies ten cognitive and behavioral strategies to help people move to higher levels of motivational readiness to change physical activity.^{31, 33, 34} While cognitive strategies may not be sufficient to change physical activity, they can help shape behavior and move individuals along the stages of change.³⁵ Cognitive strategies include increasing knowledge about activity, understanding the risks of not being active, caring about the consequence of one not being active on others, comprehending the benefits of activity, and increasing opportunities to be active. Among adults, behavioral processes of change have mediated changes in physical activity.³⁵ Behavioral strategies include substituting alternatives (e.g., engaging in activity at times when it is not usually done such as when one is under stress or tired), enlisting social support, rewarding oneself, committing oneself to being active, and reminding oneself about being active. Based on our focus group conversations, many of these strategies could be delivered through health care providers to their pregnant patients, and ideally to their spouse/partner or other family member as well, and might assist pregnant women and their family support members in overcoming some of their barriers to physical activity.

In the focus group conversations, although women were encouraged to discuss both enablers and barriers to physical activity, they primarily mentioned barriers. While the identification of barriers is an important step to help develop appropriate interventions, this should be tested through a mediating variable framework.³⁶ We are not aware of any intervention studies of pregnant women that assessed change in barriers to physical activity as a potential mediator of change in physical activity. In postpartum women, a group-mediated cognitive behavioral intervention was successful at changing self-efficacy to address barriers to exercise.³⁷ However, barrier efficacy was not assessed as a potential mediator of change in physical activity. Furthermore, a determinant of a behavior is not the same as a determinant of behavior change.³⁸ Intervention mapping would argue to search for determinants of increasing to appropriate levels of physical activity among pregnant women. These studies should integrate the potential determinants at all levels, as without such integration of the socioecologic framework, it will remain unclear what causal pathways determine changes in physical activity.³⁸

Limitations

Despite the strengths of this study, several limitations of this work should be acknowledged. There may be other barriers or enablers of physical activity not addressed in these particular focus groups or with other ethnic groups. The generalizability of this study may be limited, as the women were volunteers from central North Carolina. Also, the pregnant women participating in the qualitative and quantitative studies differed; for example, the percentage of Hispanics was much higher in the focus groups by design as compared to the quantitative study. The quantitative study only enrolled women who spoke English, while our Hispanic focus groups were conducted in Spanish. Furthermore, the focus groups were limited to women 18 to 35 years, while the quantitative analysis did not pose an upper age limit, and the gestational ages of the focus groups (20–37 weeks) did not exactly match those of the survey participants (27–30 weeks). Thus, direct comparisons across the two study designs must be interpreted with those caveats, although we found many more similarities than differences.

Lastly, we ascertained barriers to physical activity during pregnancy only once. It is not known if barriers might differ for women if they were asked earlier in pregnancy.

Conclusions

Since pregnancy may trigger the development of obesity through either excessive gestational weight gain or a decline in physical activity or both,^{6, 7} and since physical activity is recommended for healthy pregnant women,¹¹ it is imperative to promote physical activity for pregnant women in a more relevant way. These two quantitative and qualitative studies of pregnant women revealed many barriers to physical activity among pregnant women and some suggestions for interventions. These studies address a gap in the literature that can be used to provide a framework for developing effective and appropriate physical activity interventions to address barriers reported by pregnant women of diverse ethnic backgrounds.

Acknowledgements

This study was funded by NIH/NICHD grant #HD37584, NIH/NIDDK #DK61981, and NIH/NCI #CA109804. The authors thank Aimee Benson, Shelly Harris, Diane Kaczor, Neeve Neevel, and Fang Wen for assistance with the data management and analysis and Gratia Wright (First Research, Inc.) and her staff for moderating the focus groups. We also thank Drs. Amanda Birnbaum, Leslie Bunce, and Renée Ferrari, as well as the anonymous reviewers, for their helpful comments on earlier drafts of this paper. The Pregnancy, Infection, and Nutrition Study, along with the ancillary projects, are a joint effort of many investigators and staff members whose work we gratefully acknowledge.

References Cited

1. Saris W, Blair S, van Baak M, Eaton S, Davies P, Di Pietro L, et al. How much physical activity is enough to prevent unhealthy weight gain? Outcome of the IASO 1st Stock Conference and consensus statement. *Obesity Reviews* 2003;4:101–114. [PubMed: 12760445]
2. Evenson K, Savitz D, Huston S. Leisure-time physical activity among pregnant U.S. women. *Paediatric Perinatal Epidemiol* 2004;18:400–7.
3. Rousham E, Clarke P, Gross H. Significant changes in physical activity among pregnant women in the UK as assessed by accelerometry and self-reported activity. *Eur J Clin Nutr* 2005;60(3):393–400. [PubMed: 16306930]
4. Sternfeld B, Quesenberry C Jr, Eskenazi B, Newman L. Exercise during pregnancy and pregnancy outcome. *Med Sci Sports Exerc* 1995;27(5):634–640. [PubMed: 7674866]
5. Kieffer E, Willis S, Arellano N, Guzman R. Perspectives of pregnant and postpartum Latino women on diabetes, physical activity, and health. *Health Educ Behav* 2002;29(5):542–556. [PubMed: 12238699]
6. Noppa H, Bengtsson C. Obesity in relation to socioeconomic status: a population study of women in Goteborg, Sweden. *J Epidemiol Comm Health* 1980;34:139–42.
7. Smith D, Lewis C, Caveny J, Perkins L, Burke G, Bild D. Longitudinal changes in adiposity associated with pregnancy: The CARDIA Study. *JAMA* 1994;271:1747–1751. [PubMed: 8196117]
8. Saldana T, Siega-Riz A, Adair L, Suchindran C. The relationship between pregnancy weight gain and glucose tolerance status among black and white women in central North Carolina. *Am J Obstet Gynecol* 2006;195(6):1629–1635. [PubMed: 16824460]
9. Stotland N, Cheng Y, Hopkins L, Caughey A. Gestational weight gain and adverse neonatal outcome among term infants. *Obstet Gynecol* 2006;108(3 Pt 1):635–643. [PubMed: 16946225]
10. Nielsen J, O'Brien K, Witter F, Chang S, Mancini J, Nathanson M, et al. High gestational weight gain does not improve birth weight in a cohort of African American adolescents. *Am J Clin Nutr* 2006;84(1):183–189. [PubMed: 16825694]
11. ACOG. Exercise during pregnancy and the postpartum period. ACOG Committee Opinion No. 267. *Obstet Gynecol* 2002;99(1):171–3. [PubMed: 11777528]
12. Grundy S, Blackburn G, Higgins M, Lauer R, Perri M, Ryan D. Physical activity in the prevention and treatment of obesity and its comorbidities. *Med Sci Sports Exerc* 1999;31:S502–8. [PubMed: 10593519]

13. Rutkowska E, Lepecka-Klusek C. The role of physical activity in preparing women for pregnancy and delivery in Poland. *Health Care Women Intl* 2002;23:919–23.
14. Clarke P, Gross H. Women's behavior, beliefs, and information sources about physical exercise in pregnancy. *Midwifery* 2004;20:133–141. [PubMed: 15177856]
15. Devine C, Bove C, Olson C. Continuity and change in women's weight orientations and lifestyle practices through pregnancy and the postpartum period: the influence of life course trajectories and transitional events. *Soc Sci Med* 2000;50:567–82. [PubMed: 10641808]
16. Thornton P, Kieffer E, Salabarria-Pena Y, Odoms-Young A, Willis S, Kim H, et al. Weight, diet, and physical activity-related beliefs and practices among pregnant and postpartum Latino women: the role of social support. *Maternal Child Health J* 2006;10(1):95–104.
17. National Cancer Institute, National Institutes of Health, US Department of Health and Human Services. *Theory at a Glance: A Guide for Health Promotion Practice*. Vol. 2. Bethesda, MD: [downloaded March 23, 2007]. 2005 at http://www.nci.nih.gov/cancer_information/cancer_literature/
18. Sallis, J.; Owen, N. Ecological models. In: Glanz, K.; Lewis, FM.; Rimer, BK., editors. *Health Behavior and Health Education: Theory, Research, and Practice*. Vol. 2. San Francisco, CA: Jossey-Bass; 1997. p. 403-424.
19. McLeroy K, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educa Q* 1988;15(4):351–377.
20. Weber, R. *Basic Content Analysis*. Vol. 2. Newbury Park: Sage Publications; 1990.
21. Seaman, C. *Research Methods: Principles, Practice, and Theory for Nursing*. Vol. 3. Norwalk, CT: Appleton & Lange; 1987.
22. Institute of Medicine. *Nutrition during pregnancy: Part I, Weight gain; Part II Nutrient supplements*. Washington D.C: Committee on Nutritional Status During Pregnancy and Lactation, Food and Nutrition Board, National Academy Press; 1990.
23. Marin G, Sabogal F, Marin B, Otero-Sabogal R, Perez-Stable E. Development of a short acculturation scale for Hispanics. *Hisp J Behav Sci* 1987;9(2):183–205.
24. Miles, M.; Huberman, A. *An Expanded Sourcebook: Qualitative Data Analysis*. Vol. 2. Thousand Oaks, CA: Sage Publications, Inc; 1994.
25. Duncombe D, Wertheim EH, Skouteris H, Paxton SJ, Kelly L. Factors related to exercise over the course of pregnancy including women's beliefs about the safety of exercise during pregnancy. *Midwifery*. 2007;10.1016/j.midw.2007.03.002:1-9
26. Doran F, O'Brien AP. A brief report of attitudes towards physical activity during pregnancy. *Health Promot J Austr* 2007;18(2):155–8. [PubMed: 17663652]
27. Eyler A, Wilcox S, Matson-Koffman D, Evenson K, Sanderson B, Thompson J, et al. Correlates of physical activity among women from diverse racial/ethnic groups: A review. *J Women Health Gender Based Med* 2002;11(3):239–53.
28. Evenson K, Sarmiento O, Macon M, Tawney K, Ammerman A. Environmental, policy, and cultural factors related to physical activity among Latina immigrants. *Women Health* 2002;36(2):43–57. [PubMed: 12487140]
29. Leung M, Yen I, Minkler M. Community based participatory research: a promising approach for increasing epidemiology's relevance in the 21st century. *Intl J Epidemiol* 2004;33(3):499–506.
30. Dunn A, Marcus B, Kampert J, Garcia M, Kohl H III, Blair S. Project Active- A 24-month randomized trial to compare lifestyle and structured physical activity interventions. *JAMA* 1999;281:327–34. [PubMed: 9929085]
31. Dunn A, Marcus B, Kampert J, Garcia M, Kohl H III, Blair S. Reduction in cardiovascular disease risk factors: 6-month results from Project Active. *Prev Med* 1997;26:883–892. [PubMed: 9388801]
32. Prochaska J, DiClemente C. Stages and processes of self change of smoking: Toward an integrative model of change. *J Consult Clin Psychol* 1983;51:930–935.
33. Marcus B, Rossi J, Selby V, Niaura R, Abrams D. The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psych* 1992;11(6):386–395.
34. Marcus B, Simkin L. The stages of exercise behavior. *J Sports Med Phys Fitness* 1993;33:83–88. [PubMed: 8350613]

35. Lewis B, Marcus B, Pate R, Dunn A. Psychosocial mediators of physical activity behavior among adults and children. *Am J Prev Med* 2002;23(2S):26–35. [PubMed: 12133735]
36. Baranowski T, Anderson C, Carmack C. Mediating variable framework in physical activity interventions: How are we doing? How might we do better? *Am J Prev Med* 1998;15(4):266–297. [PubMed: 9838973]
37. Cramp, A.; Brawley, L. Moms in motion: a group-mediated cognitive-behavioral physical activity intervention; *Intl J Behavioral Nutr Physical Activity*. 2006. p. 9available at www.ijbnpa.org/contents/3/1/23
38. Brug, J.; Oenema, A.; Ferreira, I. Theory, evidence, and intervention mapping to improve behavior nutrition and physical activity interventions; *Intl J Behavioral Nutr Physical Activity*. 2005. p. 7available at <http://www.ijbnpa.org/content/2/1/2>

Table 1
Description of focus group and survey participants

	Focus Group Participants		Survey Participants	
	n=58	Percent	n=1535	Percent
<u>Race/ethnicity</u>				
Nonhispanic White	14	24.1	1084	75.5
Nonhispanic African American	19	32.8	279	19.4
Hispanic	25	43.1	73	5.1
<u>Prepregnancy body mass index:</u>				
Underweight (<19.8 kg/m ²)	5	8.6	217	14.4
Normal (19.8–26.0 kg/m ²)	24	41.4	773	51.2
Overweight (26.1–29.0 kg/m ²)	10	17.2	162	10.7
Obese (>29.0 kg/m ²)	17	29.3	358	23.7
<u>General health (at the time of the survey)</u>				
Excellent	12	20.7	484	31.6
Very good	20	34.5	657	42.8
Good	18	31.0	312	20.3
Fair	8	13.8	72	4.7
Poor	0	0.0	9	0.6
<u>Age</u>				
18–24 years	26	44.8	300	19.5
25–29 years	12	20.7	449	29.3
30–35 years	19	32.8	594	38.7
36+ years	0	0	192	12.5
<u>Marital status</u>				
Never married	17	29.3	300	19.5
Married or living together	36	62.1	1181	76.9
Separate/divorced/widowed	3	5.2	54	3.5
<u>Education</u>				
8 or less	11	19.0	6	0.4
9 to 11	8	13.8	78	5.1
High school	9	15.5	203	13.2
Some college	16	27.6	305	19.9
College graduate	14	24.1	943	61.4
<u>Employment</u>				
Employed	26	42.6	1033	67.3
Not Employed	35	57.4	502	32.7

Table 2
Survey participants main barrier to not being physically active during pregnancy

	Sample Size(n=1535)	Percent	Example Quote(s) on the Topic
<u>Barriers coded according to the socioecologic framework</u>			
Intrapersonal - health related	799	52.1	
Intrapersonal - not health related	501	32.7	
Interpersonal	34	2.2	
Neighborhood or environmental	47	3.1	
Organizational	8	0.5	
Policy	20	1.3	
No reason	125	8.2	
<u>Barriers coded by type</u>			
Lack of time, work or social conflicts, too busy	378	24.6	"Work takes too much time."
Lack of energy, tired, sleepy	355	23.1	"I just can't move as fast because of my girth and it takes more energy to do what I have to so there's no energy left for other things."
Activity causes discomfort or pain, other medical conditions	263	17.1	"I've been put on complete bedrest."
Concerned for the baby, does not want to overdo it	168	11.0	"I'm scared I might lose my baby." "I'm scared to death about hurting the baby."
No reason	125	8.2	"I am as active as I want to be."
Procrastination	74	4.8	"I'm not disciplined enough."
Afraid of injury	47	3.1	"Afraid of injury which would negatively affect the operation I had."
Weather - too hot or cold	44	2.9	"Too hot outside." "I don't want to go outside in the cold weather."
Caregiving duties	25	1.6	"I have to keep my kids, so I can't go out and exercise."
Too costly	20	1.3	"Financial reasons."
Has contractions with activity	13	0.9	"I get some contractions when I walk and it makes me uncomfortable and scared." "I'd rather have a safe pregnancy than be in shape."
Lack of transportation	8	0.5	"No transportation and I have to walk to where I want to go."
Others don't encourage activity	6	0.4	"My family constantly tells me not to put too much strain on the baby."
Not enough recreational facilities	3	0.2	"The pool I use has been closed, so I haven't been able to swim recently."
No one to exercise with	3	0.2	"I don't want to exercise alone and I don't have anybody to exercise with."
Other	2	0.1	

Table 3

Summary of focus group participants barriers to not being physically active during pregnancy

Barriers according to the socioecologic framework	Examples
Intrapersonal - health related	tiredness, lack of sleep, shortness of breath, musculoskeletal problems, concern with pregnancy complications
Intrapersonal - not health related	low motivation, not enough time, does not enjoy being physically active, lack of child care, costs, lack of knowledge about activity
Interpersonal	lack of social support, overly protective family members, conflicting advice from others, isolation from other people
Neighborhood or environmental	weather, season of the year, lack of outdoor spaces to be active