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Increasing Prenatal Care and Healthy Behaviors in Pregnant Substance Users†

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Abstract

Evidence suggests that prenatal care, healthy behaviors such as exercise and nutrition, and general stress level are associated with fetal and maternal health but there is a relative dearth of research on interventions to improve these factors in pregnant substance users. Two hundred pregnant substance users entering outpatient substance abuse treatment were randomized to receive either three individual sessions of Motivational Enhancement Therapy for pregnant substance users (MET-PS) or the first three individual sessions normally provided by the program. The present study evaluated the relative efficacy of MET-PS, compared to treatment as usual, on modifiable healthy behaviors and the impact of treatment when the groups were pooled. The results suggest that MET-PS was not more effective than treatment as usual in improving modifiable healthy behaviors. When the treatment groups were pooled, the results suggest that there were significant increases in prenatal care utilization and prenatal/multi-vitamin and water consumption, and a significant decrease in stress. Limitations and recommendations for further research are discussed.

Keywords

healthy behaviors; Motivational Enhancement Therapy; pregnant; prenatal care; substance abuse

To date, studies of modifiable health behaviors in pregnant substance users have been generally limited to describing patterns of use or investigating interventions to decrease use of alcohol, tobacco, and other drugs. A few studies have explored rates of prenatal care utilization, but overall there is a paucity of research on modifiable pregnancy health behaviors other than substance use for this population. While studies of modifiable pregnancy health behaviors in the general population also explore the negative impact of substance use, particularly alcohol and tobacco, they place a heavy emphasis on the positive impact of prenatal care utilization and other factors associated with fetal and maternal health such as exercise and nutrition as

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well (e.g., Bailey & Byrom 2007; Chomitz, Cheung, & Lieberman 1995; Dewey & McCrory 1994; Jarski & Trippett 1990). In a study analyzing data from the 1988 National Maternal and Infant Health Survey (done by the Department of Health and Human Services, National Center for Health Statistics), researchers reported that engaging in positive health behaviors such as prenatal care, prenatal classes, vitamins, and exercise are associated with higher birth weight, longer gestation, and higher Apgar scores, even in women using multiple substances during pregnancy (Faden, Hanna, & Graubard 1997). It is important, then, to explore not only reducing the negative consequences of substance use during pregnancy, but also increasing the pregnant substance user's ability to perform positive behaviors associated with a healthy pregnancy.

The positive overall impact of adequate prenatal care on birth outcomes is well documented. For pregnant substance users, the receipt of adequate prenatal care is especially critical. Several studies have reported that increasing the adequacy of prenatal care utilization in pregnant substance users reduces risks for prematurity, low birth weight, and perinatal mortality (El-Mohandes et al. 2003; Racine, Joyce & Anderson 1993; Broekhuizen, Utrie & Van Mullem 1992). While drug use by itself has an adverse effect on birth outcome, the number of prenatal visits reportedly has a much greater influence. Broekhuizen and colleagues (1992) found that drug use combined with more than five prenatal care visits had only a minimal effect on birth outcome. Several studies have reported that although most pregnant substance users receive some prenatal care, women who use substances during pregnancy tend to have fewer prenatal care visits than women who do not use substances (e.g., Funai et al. 2003; Faden, Hanna & Graubard 1997; Funkhouser et al. 1993; Zambrana, Dunkel-Schetter & Scrimshaw 1991). In the Treatment Improvement Protocol 2 (TIP 2; Mitchell 1993), the Center for Substance Abuse Treatment (CSAT) has outlined best practice guidelines for providing a comprehensive system of specialized integrated treatment services for pregnant substance-abusing women. These guidelines specifically underscore the importance of linking substance abuse services with prenatal care in order to reduce the negative impact of substance use on birth outcomes. A number of studies have explored the impact of providing substance abuse treatment that is enhanced with prenatal care and other comprehensive services (e.g. Elk et al. 1998, 1995; Jansson et al. 1996; Chang et al. 1992), finding that this comprehensive services model resulted in improved outcomes in both substance abuse treatment and prenatal care utilization. Methadone maintenance (MM) has also been associated with increased prenatal utilization (Edelin et al. 1988). Additional work is needed to examine factors impacting rates of prenatal care for non-MM treatment sites that do not provide linked substance abuse and prenatal services.

As a group, pregnant substance-abusing women have enormous psychosocial stressors, including unmet basic needs (Jones et al. 2004), high rates of physical and sexual abuse (Velez et al. 2006), and problematic relationships (Hutchins & DiPietro 1997; Scafidi et al. 1997; Amaro & Hardy-Fanta 1995). Recent studies suggest a direct relationship between prenatal maternal stress and a number of pregnancy complications, including spontaneous abortion, structural malformations in the fetus, preeclampsia, preterm delivery, and low birth weight (Mulder et al. 2002). Research on prenatal influences on fetal development suggests that high levels of maternal stress during pregnancy may increase the risk of psychopathology in the child by influencing the integrity of fetal development, perhaps activating genes linked to mental health problems (Fishbein 2000). Additionally, it has been suggested that combined prenatal exposure to stress and substances of abuse may increase the vulnerability of the child to substance abuse in adulthood (Thadani 2002). Given the high rates of psychosocial problems in pregnant substance users, finding methods of reducing their stress levels appears to be an important area of investigation. To our knowledge, however, there have been no studies in which the impact of interventions on maternal stress has been reported for this population.

The present study reports on prenatal care attendance, engagement in healthy behaviors and stress in pregnant substance users participating in a randomized controlled trial of Motivational Enhancement Therapy for pregnant substance users (MET-PS) compared to treatment as usual (TAU; Winhusen et al. 2008). The primary objective of the trial was to evaluate the efficacy of MET-PS, compared to treatment as usual, in increasing treatment utilization and decreasing substance use. The results suggested that MET-PS is not more effective than treatment as usual for pregnant substance users in general but that there might be particular subgroups or treatment programs for which MET-PS might be more or less effective than treatment as usual (Winhusen et al. 2008). In the present study, we conducted post-hoc analyses to evaluate the efficacy of MET-PS, compared to TAU, in increasing prenatal care utilization and healthy pregnancy behaviors, and in decreasing stress. We also conducted analyses in which the treatment groups were pooled to evaluate pre-post treatment changes for these targets.

METHOD

Study Design

The study was conducted by the National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN) in which clinical trials are implemented in community treatment settings to maximize the generalizability of study results. Two hundred pregnant substance users entering outpatient substance abuse treatment at one of four community substance abuse treatment centers were randomly assigned to receive MET-PS or TAU in addition to other treatment provided at the clinic. This randomized, parallel, two-group trial included a one month active study phase with two follow-up assessments completed at one and three months, respectively, following the end of the active study phase.

Study Sites

Each of the four community treatment programs participating in this study were women-specific programs. Two of the four sites included prenatal care as part of the clinic services. The Horizons Program in North Carolina provides comprehensive treatment services for substance-using women and their children. Several levels of outpatient treatment are offered (including intensive outpatient—IOP) as well as specialized services, such as a prenatal clinic, a residential program for women and children, and a licensed childcare facility. The Milagro Program in New Mexico is a perinatal substance abuse treatment program that provides a wide variety of services to alcohol- and other drug-dependent pregnant or postpartum women and their children. High-risk prenatal care, outpatient and residential substance abuse treatment, opioid replacement therapy, nursing care management (prenatal and post partum), delivery, inpatient care, parenting classes, and pediatric follow up are offered as part of the Milagro comprehensive service system.

The remaining two programs did not offer prenatal care as part of the services within their specific clinics, but utilized referral and case management for services other than substance abuse treatment. Project Home at Midtown Community Mental Health Center in Indiana provides a home-based outpatient treatment program with comprehensive services to pregnant and parenting women who use substances and their families. Project Home includes individual, group and family therapy as well as education that focus on perinatal substance use, parenting, vocational goals, life skills and independent living. The program also operates a transitional housing program for clients and their children. Project Link at the Jefferson Alcohol and Drug Abuse Center (JADAC) in Kentucky utilizes a case management model for treatment engagement and retention. Ongoing assessment and case management are used to engage and connect Project Link clients to substance abuse treatment modalities at JADAC, including women's IOP, substance abuse education, detoxification, and residential substance abuse

treatment. As appropriate, Project Link case managers assist clients in accessing other community resources, including prenatal care.

Participants

Participants for the study were recruited from intakes to the outpatient treatment programs of the four participating community-based substance abuse treatment programs (CTPs) between October 2003 and April 2006. All participants were given a thorough explanation of the study and signed an informed consent form that was approved by the Institutional Review Boards of the participating sites.

Eligible participants were at least 18 years of age, pregnant (as confirmed by a pregnancy test), and not planning to terminate the pregnancy. To be eligible, participants were required to be identified as needing substance abuse treatment via the CTP's usual screening procedure and to have a living arrangement of sufficient stability to allow for outpatient treatment. Participants were excluded from the study if they required residential or inpatient treatment (other than detoxification), were more than 32 weeks pregnant, planned to relocate from the area within four months of signing the study consent form, had pending legal charges that might lead to incarceration (other than those requiring the participant to attend treatment), or were a significant suicidal/homicidal risk. Of the 204 candidates signing consent, only four failed screening: two for not being pregnant, one for having a legal charge that could lead to incarceration, and one for having both an unstable living situation and a condition requiring residential or inpatient treatment.

Procedures

Pregnant women identified by CTP clinical staff as needing substance abuse treatment and who expressed a willingness to learn more about the study were referred to the research assistant (RA). After signing the Informed Consent Form, the study candidate completed screening and baseline assessments. Ineligible individuals continued into the site's standard intake assessment and treatment program. Eligible participants were assigned to MET or TAU via urn randomization to balance on three dichotomous variables: pressure to attend treatment, self-reported frequency of drug and alcohol use, and need for methadone maintenance. The active study phase was four weeks in duration. During this time, sites were required to offer at least three individual counseling sessions to participants in both treatment conditions. Participants in both conditions were also encouraged to participate in the other treatment services offered by the program (e.g., group treatment, case management, intensive outpatient, etc.), although specific additional services were not required by the study. During the first month of treatment, participants were scheduled to meet with the RA on a weekly basis. In addition, the participants were scheduled to meet with the RA at the one and three month post-randomization follow-up visits. Study participants received \$30 in retail scrip or vouchers for each of the five research visits that were relatively long (i.e., the two baseline visits, the end of active phase visit, and the two follow-up visits) and \$25 for each of three research visits that were relatively brief.

Study Treatments

The MET-PS intervention is comprised of the brief motivational techniques described by Miller and colleagues (Miller 1999; Miller & Rollnick 1991), modified specifically for pregnant substance users. Participants assigned to the MET-PS intervention received three individual sessions with the MET clinician; the first session was approximately one and a half to two hours in length, and the remaining two sessions were approximately one hour each. Information on the MET-PS intervention, as well as the characteristics, training and fidelity of the MET-PS clinicians are detailed in the article by Winhusen and colleagues (2008). In addition to addressing the participant's substance abuse issues, the MET-PS intervention included

personalized feedback for the participant about her engagement in behaviors for a healthy pregnancy, prenatal care attendance, and current level of perceived stress. Feedback from this section focused first on behaviors the participant was doing well (i.e., performed at least six out of seven days in the past week). If the client had attended a prenatal care visit within the seven-day time-frame, the importance of that was emphasized. The MET-PS clinician then provided additional feedback on any behaviors in the current healthy behaviors section for which the client had a low score and on the woman's stress level if she scored in the upper range. Clinicians were instructed to check with the participant about her response to the feedback if she did not spontaneously state what she was thinking.

Participants assigned to TAU were offered the treatment typically provided at the CTP with the constraint that they receive at least three individual sessions with a clinician, including the intake session. For three of the sites, this did not require any modification to their normal program. The fourth site, which has a primary focus on case management and typically offers individual counseling only on a monthly basis, modified its program to include two weekly individual counseling sessions in addition to the standard intake. All study participants were offered the other services typically provided by the CTP (e.g., group treatment, additional individual treatment, case management, etc.) based on individual need. The three individual sessions were audiotaped to allow for an evaluation of the discriminability between TAU and MET-PS sessions. As in the MET-PS intervention, the first TAU session was approximately one and a half to two hours in length while the other two sessions were approximately an hour in length.

Measures

At baseline, the participant's self-report of prenatal care attendance was assessed and a release of information was obtained to allow the use of clinic records to track the participant's prenatal care attendance throughout the study or until the pregnancy terminated. The standard prenatal care visit schedule recommended by the American College of Obstetrics and Gynecology (ACOG) was utilized to evaluate the adequacy of the participants' utilization rates. Specifically, we calculated a prenatal utilization ratio (PUR), which reflected the ratio between the ACOG recommendation and the actual prenatal care attendance, for each participant at each study phase (e.g., baseline, active phase, follow-up). The PUR accounted for changes in frequency of visits due to number of weeks pregnant; increases in prenatal care attendance due to gestational age were balanced by accompanying increases in recommended ACOG visit rates for that gestational age.

To assess engagement in healthy pregnancy activities and stress, we created an RA-administered interview, completed at baseline and at the end of the active study phase, which evaluated the participant's perceived stress level as well as her engagement in each of the following healthy activities: taking a multi or prenatal vitamin, drinking milk or consuming other calcium-rich foods, eating at least two nutritious meals a day (defined as a meal that is well-balanced and includes carbohydrates, protein, fruits and vegetables, and calcium), getting at least five hours of sleep, drinking at least four eight-ounce glasses of water, and getting at least 20 minutes of moderate exercise (such as walking, housecleaning, etc). Each healthy pregnancy item was scored according to the number of days in the past week the behavior had been performed based on participant self-report, ranging from zero to seven; scores less than four (ie, occurring at less than 50%) were considered low and, for participants in the MET-PS condition, prompted the MET-PS clinician to spend additional time addressing the importance of these behaviors with the participant and exploring how they might be increased. The item assessing stress required participants to rate their general level of stress on a scale of zero to ten, where zero was defined as no stress at all and ten was defined as extreme stress. Scores greater than six were considered high and, for participants in the MET-PS condition, prompted

the MET-PS clinician to spend additional time with the participant exploring the factors contributing to her high stress level.

Data Analysis

Several statistical analyses were utilized. The first set of analyses, utilizing linear regressions assuming either a normal or Poisson distribution based on the distribution of the outcome measure, evaluated the effect of treatment condition (MET-PS vs. TAU) on the PUR, engagement in healthy behaviors, and stress, controlling for baseline differences between the MET-PS and TAU groups (see Winhusen et al. 2008). These analyses revealed no statistically significant effect for treatment condition and, thus, analyses in which the treatment groups were pooled were conducted to evaluate pre-post treatment changes.

Pre-post treatment changes for the PUR were assessed by using Poisson Generalized Estimating Equations (GEE). One analysis included data through the first month of treatment while the second included data through the three-month follow-up visit. In reviewing the PUR variable, 36 participants (i.e., 18%) were categorized as “intensive”; that is, they significantly exceeded the recommended number of visits (110% or greater). Previous researchers have suggested that women who receive more than the recommended amount of care are a distinct group and should be considered separately (Chen et al. 2007; Kotelchuck 1994) and, thus, these 36 participants were excluded from the prenatal care analysis; the analyses thus were conducted with 164 participants. There was some attrition during the study, with 164 participants with data at baseline, 152 with data during the active study phase, and 144 with data for the entire four-month period. Based on site differences in the availability of prenatal care services, with two sites offering prenatal care as part of clinic services, analyses evaluating site effects on the PUR were also conducted. These site analyses included the three sites with sufficient sample size; specifically, one site which provided in-program prenatal care services randomized a total of only ten participants and, thus, could not be included in the analysis. For the healthy behavior and stress variables, a Wilcoxon signed-rank test was used to evaluate changes between baseline and the end of the active study phase. Because the signed-rank test requires paired data, only the 157 participants (i.e., 79% of the sample) with both baseline and end of active study phase data were included in these analyses.

RESULTS

Participant Characteristics

The participant characteristics by site are provided in Table 1. The participants were, on average, 26 years of age and 20 weeks pregnant at the time of randomization. The majority of study participants were unmarried, were unemployed and had, on average, a high school education. The sample was fairly diverse, as indicated by the significant site differences on many participant characteristics including age, race/ethnicity, marital status, number of weeks pregnant at time of randomization, primary drug of choice, days of cigarette use, and days of substance use.

Prenatal Care Utilization

At baseline, participants had attended an average of 2.60 (SD = 2.44, $n = 164$, range 0–10) prenatal care visits. An additional 3.7 (SD = 2.49, $n = 144$, range total visits 0–9) prenatal care visits were attended, on average, during the four-month study period. Analysis of the PUR during the first month of treatment revealed a significant Treatment Phase effect ($Z = 5.33$, $p < .001$). As can be seen in Figure 1, this reflects a significant increase in the PUR during the first month of treatment compared to baseline. To determine whether the significant Treatment Phase effect could be explained by the drop-out of the noncompleters, we conducted a Poisson linear regression to determine whether baseline PUR was related to participant drop-out; the

results ($p = .17$) suggest that the observed effect was not due to participant drop-out. Analysis of the PUR during the entire four-month period also revealed a significant Treatment Phase effect ($Z = 2.67, p < .01$), which reflects the higher PUR for the entire treatment period compared to baseline. The results from a Poisson linear regression ($p = .30$) suggest that the observed effect was not due to participant drop-out.

Because of the difference in the sites' relationships with prenatal clinics, a site analysis was conducted for PUR. An analysis of site effects revealed a significant site effect on PUR, with both a Site main effect ($\chi^2 = 25.40, df = 2, p < .001$) and a Site x Treatment Phase interaction effect ($\chi^2 = 8.01, df = 2, p < .05$) when evaluating the data for the entire four-month study period. Contrast analyses revealed that one site had a significantly greater increase in the PUR compared to the other two sites. Since the site revealing the greatest increase was a site with a large case management component, we conducted analyses to determine whether case management was a mediator of the site effect. These analyses revealed that there was a significant effect for case management on the PUR ($\chi^2 = 6.27, df = 1, p < .05$), with more case management visits being associated with a higher PUR. The mediation analysis results suggested that while case management did account for a significant portion of the Site effect ($\chi^2 = 6.94, df = 1, p < .01$), there was a significant portion still not accounted for ($\chi^2 = 22.05, df = 2, p < .001$); these results suggest that case management was a partial mediator of the observed site effect on the PUR.

Engagement in Healthy Behaviors

As shown in Table 2, participants were already actively engaged in the behaviors associated with a healthy pregnancy more than half the time when assessed at the baseline visit. When reassessed at the end of the active phase, participants were continuing to engage in these activities with either equal or greater frequency than reported at the beginning of their study involvement. As can also be seen in Table 2, there were significant increases in two of the healthy activities: taking prenatal/multi-vitamins and drinking at least four (8 oz) glasses of water per day.

Stress Level

At baseline, participants reported an average stress level of 5.61 (SD = 3.03, range 0–10). At the end of the active phase, their reported average stress level had dropped to 4.34 (SD = 3.04, range 0–10), which represents a statistically significant decrease ($W = -1785.5, p < .001$).

DISCUSSION

The lack of significant effect for MET-PS compared to TAU on modifiable pregnancy behaviors is consistent with the findings for the primary and secondary outcomes from the MET for pregnant substance users study; several possible explanations for this lack of significant difference have been explored already (Winhusen et. al. 2008). In the case of these modifiable pregnancy behaviors, the most likely explanation is that the MET-PS intervention attended to these factors only briefly within the context of an intervention specific to substance abuse for pregnant women. Our findings suggest that providing brief feedback on these behaviors alone is insufficient for promoting significantly greater behavioral change. While these results fail to provide differential guidance on effective treatment modalities for increasing healthy pregnancy behaviors in substance users, it is encouraging that participation in a substance abuse treatment program for pregnant women does appear to have a positive impact on many of these target behaviors.

The finding that the participants in this study had fewer prenatal care visits reported at baseline than recommended is consistent with previous research that has associated substance use during

pregnancy with lower utilization of prenatal care. Interpreting the observed positive effect of substance use treatment on prenatal care utilization is limited by the lack of any direct measure of frequency or method used to address the issue of prenatal care in the treatment programs of the study sites. Given the lack of significant effect for treatment condition on prenatal care utilization, the question is then raised as to what factors contributed to this observed overall positive effect of treatment on the PUR. It may be that since the sites in this study specialized in treating pregnant substance users, their existing methods for promoting prenatal care as a part of their usual treatment programming were effective in increasing the PUR. Indeed, two of the sites offered both prenatal care and substance abuse treatment within their program services; this combined approach has been previously shown to be quite effective in ensuring adequate receipt of prenatal care. However, since the remaining two sites did not offer this combined approach, other possible explanations for the PUR increase must be explored. The site with the greatest increase in the PUR did not offer prenatal care in-clinic, but instead utilized a case management approach to services. This, along with the overall finding that case management had a positive effect on prenatal care utilization, is in agreement with a sizable number of studies that have found case management to be beneficial for addressing psychosocial issues in this population (e.g., Jones et al. 2004; Laken & Ager 1996; Lanehart et al. 1996). Given the substantial barriers to care faced by pregnant substance users, such findings emphasize the value of case management as a way to improve birth outcomes and other psychosocial factors in this population. Case management was only a partial mediator of the observed site effect, however, leaving the question as to what other factors were involved. It is possible that the receipt of substance abuse treatment alone may have played a role in increasing the utilization of prenatal care. In evaluating pregnancy outcomes for the Center for Substance Abuse Treatment (CSAT) Residential Women and Children (RWC) and Pregnant and Postpartum Women (PPW) Demonstration Program, Burgdorf and colleagues (2004) indicate that residential treatment can have a substantial positive effect on birth outcomes, although they acknowledge that the sites involved in this demonstration project provided an unusually intensive focus on the receipt of adequate prenatal care that may not be available in all residential treatment programs. Unfortunately, the RWC/PPW study was not designed to identify the specific factors that produced the observed outcomes, and, to our knowledge, no literature exists exploring factors in non-methadone outpatient substance abuse treatment settings that might account for the remainder of the effect found in the current study. In order to fill this gap, any future investigations of the effect of substance abuse treatment on prenatal care utilization should include a method for examining the ways in which the treatment programs address prenatal care visit attendance with their participants.

Our use of the standard prenatal care visit schedule recommended by the American College of Obstetrics and Gynecology (ACOG) allowed us to at least minimally assess for the adequacy of utilization rates. The results of this study indicate that participants who were assessed through follow-up attended more than five prenatal care visits on average, which was the level of utilization reported as helpful by Broekhuizen and colleagues (1992). Our findings are of limited utility, however, as the adequacy of prenatal care is most accurately discovered by assessing both the number of visits attended and the timing of initiation of prenatal care (Kotelchuck 1994). Considering the finding of investigators such as El-Mohandes et al. (2003), Hutchins & DiPietro (1997), and Jansson et al. (1996) that pregnant substance-users tend to enter prenatal care later in pregnancy, researchers conducting future studies of prenatal care utilization in this population may wish to include both the number of visits and the timing of initiation in order to more accurately assess for the adequacy of prenatal care.

It is encouraging to see that our participants were performing all of the target behaviors to some extent at baseline, and our findings in regards to baseline rates of taking prenatal vitamins and getting regular exercise are in line with one published study (Faden, Hanna & Graubard 1997). Unfortunately, there do not appear to be any published results for the rates of calcium

intake, healthy meals, adequate sleep, and adequate water intake for pregnant substance users, so it is unclear whether our findings are generalizable to that population or simply unique to our study participants. Interpreting the increases found in taking vitamins and drinking water is limited by our use of an unvalidated self-report measure. Considering previous findings that some of these healthy behaviors may actually moderate the deleterious effects of substance use during pregnancy, however, further exploration in this area seems warranted.

The finding that participation in treatment programming for pregnant substance abusers reduced perceived stress is limited by the nonspecific and nonvalidated stress measure used in this study. Further, while the reduction in stress from 5.61 to 4.34 was statistically significant, the clinical significance remains unclear. Given the finding reported by Winhusen and colleagues (2008) that both treatment conditions resulted in reductions in positive urine toxicology screens and days of reported substance use, it is possible that reducing substance use alone accounted for a reduction in stress for the study participants. Future exploration in this area would be better served through the use of validated measures of specific stressors as well as measures of perceived stress.

To summarize, this study of pregnant substance users entering treatment at four outpatient treatment programs for pregnant and post-partum women found that the pregnant substance users in this study were already engaged in positive behaviors associated with a healthy pregnancy upon entrance into the study. Participation in these treatment programs was associated with the pregnant substance users attending a greater proportion of their recommended prenatal visits and increasing some modifiable healthy pregnancy behaviors as well as with decreased levels of perceived stress, although no differential effect was found between MET and TAU. Case management demonstrated a significant positive association with prenatal care visit attendance. Several limitations were noted in the study, including neither capturing the point of entry into prenatal care nor assessing the manner in which prenatal care is addressed in the treatment programming. Despite this, the results of this exploratory analysis suggest that participation in treatment programs for pregnant substance users may have a significant positive effect on several behaviors associated with a healthy pregnancy in addition to addressing substance use problems. Given the literature suggesting that increasing healthy pregnancy behaviors may assist in overcoming some of the negative effects of prenatal substance use, further exploration in this area seems warranted. Specifically, future studies may wish to control for ways in which these behaviors are addressed in the treatment programming in order to more effectively determine whether or not interventions specific to healthy pregnancy behaviors are differentially effective.

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FIGURE 1.
Mean Prenatal Utilization Ratio (PUR) as a Function of Treatment Phase

TABLE 1

Participant Characteristics by Site

	Site A	Site B	Site C	Site D	χ^2 or F
Age (Years)	23.9 (5.0)	27.9 (5.7)	26.6 (4.1)	25.9 (6.8)	10.67**
Race/Ethnicity (%) ⁺					20.53**
African-American	39.7	54.4	0.0	55.6	
Caucasian	56.9	44.1	15.4	33.3	
Hispanic	1.7	1.5	65.4	11.1	
Other	1.7	0.0	19.2	0.0	
Marital Status (%)					13.53**
Married	1.6	14.9	23.6	40.0	
Separated/Divorced	18.0	18.9	10.9	0.0	
Not Married	80.3	66.2	65.5	60.0	
Education (Years)	11.7 (1.5)	11.2 (1.8)	11.7 (1.7)	10.7 (2.4)	1.58
Employed (%)	29.5	20.3	25.5	20.0	1.55
Weeks Pregnant	19.1 (7.5)	23.0 (7.8)	19.1 (7.3)	14.9 (7.7)	6.01**
Primary Drug (%)					
Alcohol	11.5	6.8	10.9	30.0	1.05
Cocaine	8.2	33.8	21.8	50.0	12.72**
Marijuana	65.6	21.6	7.3	20.0	51.06**
Opiates	8.2	4.1	32.7	0.0	24.25**
Methamphetamine	4.9	4.1	16.4	0.0	7.67*
Benzodiazapines	1.6	1.4	0.0	0.0	0.85
Other	0.0	28.4	10.9	0.0	22.78**
Need Methadone (%)	1.6	2.7	40.0	0.0	48.84**
Days of Use (past 28)	8.0 (10.8)	6.7 (9.1)	16.0 (12.4)	6.0 (8.5)	13.23**

Note: Where not specifically indicated, numbers represent means (standard deviations).

⁺ Comparisons are for Caucasian to minority participants.

* $p < .05$.

$p < .01$.
**

TABLE 2**Engagement in Healthy Activities as a Function of Treatment Phase**

Healthy Activity	Baseline Phase	Active Phase	Sign Rank
Taking Prenatal/Multi-Vitamin	4.92 (2.94)	5.47 (2.57)	298.5*
Drinking Milk/Consuming Calcium-Rich Foods	5.94 (1.85)	6.05 (1.74)	84.5
Eating at Least Two Nutritious Meals a Day	5.83 (2.08)	5.81 (2.00)	-30.5
Getting at Least Five Hours of Sleep	5.92 (1.86)	5.94 (1.92)	13.0
Drinking at Least Four 8-Ounce Glasses of Water	4.50 (2.72)	4.94 (2.58)	444.0**
Getting at Least 20 Minutes of Moderate Exercise	5.83 (1.86)	5.50 (2.30)	-314.5

Note: Numbers represent mean number of days in past week (standard deviations)

*
 $p < .05$,

**
 $p < .01$