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A Prospective Study on the Influence of Stress, Social Support and Coping on Birth Outcomes and Depressive Symptomology During Pregnancy and the Postpartum

Deborah M. Da Costa

A Thesis

in

The Department

of

Psychology

Presented in Partial Fulfillment of the Requirements

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Abstract

A Prospective Study on the Influence of Stress, Social Support and Coping on Birth Outcomes and Depressive Symptomology During Pregnancy and the Postpartum

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Concordia University, 1997

The role of psychosocial factors in adverse birth outcomes and postpartum depressed mood remains unclear mainly due to methodological flaws and difficulties conceptualizing and measuring maternal stress. As well, variables such as social support and coping styles during pregnancy which may have an influence on birth outcomes and depressed mood have not received adequate empirical attention. Using a multidimensional approach to measure stress and a prospective design while controlling for demographic and biomedical variables, this study examined the influence of maternal stress, social support and coping styles on labor/delivery complications, infant birth weight and depressed mood pre-and postpartum. Beginning in the third month of pregnancy, data on numerous variables including daily stress (Hassles), state-anxiety (STAI-state), pregnancy-specific stress (PEQ) and depressed mood (DACL) were collected monthly. As well, in each trimester social support and coping strategies (CISS) were assessed, as were lifestyle behaviors such as smoking, caffeine and alcohol intake, and pregnancy progress. Approximately 4-5 weeks following delivery, information on labor, delivery and infant status was collected and the DACL and the Edinburgh Postnatal Depression Scale (EPDS) were administered. The final sample consisted of 80 women with a mean age of 29.19 (range 20-38).

The results demonstrated that women who experienced greater stress during pregnancy had a more difficult labor/delivery, even after controlling for

parity. Younger maternal age was also linked with intrapartum complications. Perceived prenatal social support emerged as a predictor of infant birth weight. Women who reported less satisfaction with their social support in the second trimester gave birth to infants of lower birthweight. Some evidence for a buffering effect of social support was also shown, as women who reported being less satisfied with their social support in the second trimester and experienced higher levels of depressed mood during pregnancy had infants of lower birthweight. Approximately 16% of the women in this sample experienced depressed mood in the postpartum assessment. Twenty-five percent of the women in this study reported depressed mood only during pregnancy, but not in the postpartum. This study showed that specific psychosocial variables are among the multiple factors involved in the occurrence of the adverse birth outcomes examined. Some support was found for the role of different psychosocial variables on depressed mood during pregnancy compared to the postpartum. Possible etiological mechanisms, clinical recommendations and directions for future research are discussed.

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A Prospective Study on the Influence of Stress, Social Support and Coping on Birth Outcomes and Depressive Symptomology During Pregnancy and the Postpartum

The incidence of labor/delivery complications (LDC) and low birth weight (LBW) have changed little in Western countries since the 1960s (Creasy, 1994; Wilkins, Sherman & Best, 1991). The more adverse birth outcomes such as premature delivery and low birth weight remain the principle determinants of perinatal mortality and impaired child development world wide (Brooke, Anderson, Bland, Peacock & Stewart, 1989; McAnarney & Stevens-Simon, 1990). Demographic and medical factors alone have only limited success in predicting these reproductive complications. Some success has been achieved in linking certain maternal lifestyle behaviors, particularly cigarette smoking with the more serious birth outcomes (MacDonald, Armstrong, & Sloan, 1992; Shiono, Klebanoff, & Rhoads, 1986). The predictive utility of such variables alone, however, remains low. Overall, the results of studies attempting to link cigarette smoking, alcohol and caffeine consumption to specific labor/delivery complications and/or LBW have either failed to consistently demonstrate a relation or yielded only weak relations between these variables (Grisso, Roman, & Inskip, 1984; Shiono et al., 1986; Tennes & Blackard, 1980). Although the literature is by no means consistent, biomedical factors and lifestyle variables combined seem to predict only about one-half to two thirds of all pregnancy complications (Institute

of Medicine, 1985; Wilson and Schifrin, 1980). Psychosocial variables, such as maternal stress, social resources and coping styles have only recently began to emerge as possible factors associated with LDC and LBW. While this literature suffers from methodological difficulties, the findings are encouraging with respect to demonstrating a role of psychosocial variables in influencing pregnancy.

The role of psychosocial variables in predicting postpartum depressed mood on the other hand has received much research attention in the last few decades. Unfortunately poor research designs and wide variations in the operationalization of depression have resulted in only modest progression in identifying early predictors of postpartum depression.

The aims of the present study were to 1) examine psychosocial adjustment over the course of pregnancy, 2) determine the influence of maternal stress, social support and coping styles on labor/delivery complications and low birth weight using a biopsychosocial framework, 3) identify factors related to depressed mood during pregnancy and in the postpartum period. A prospective design was used in the present study. Women were asked on a monthly basis, beginning in the third month of pregnancy, to complete a battery of questionnaires assessing stress and depressed mood. Social support and coping style were assessed once per trimester. Variables assessed during pregnancy were examined as potential predictors of the outcome variables of interest. Medical aspects of labor/delivery complications and low birth weight will be briefly reviewed. Subsequently, psychological influences

on LBW and LDC will be reviewed, followed by research findings on depressed mood during pregnancy and in the postpartum period.

Medical Aspects of Labor/Delivery Complications and Low Birth Weight

Labor/delivery complications or intrapartum complications refer to complications in the final phase of pregnancy. These commonly include: premature delivery, induced or prolonged labor, prolonged ruptured membranes and assisted deliveries.

The World Health Organization defines preterm births as delivery prior to the 37th week of gestation (WHO, 1977). The cutoff of 37 weeks has become well established in the literature. Preterm delivery has a prevalence rate of 6-15% in Western countries and is a principle determinant of infant mortality and impaired child development world wide (Berkowitz & Papiernik, 1993; Freda, Anderson, Damus, Proust & Merkatz, 1990).

The first stage of labor is the longest, beginning with mild contractions and ending when the cervix is completely dilated. In primiparas, it typically lasts 13 hours, while in multiparas it usually lasts approximately 8 hours. The second stage, involving pushing the baby, occurs much faster, with quicker delivery typically occurring for multiparas. It is difficult to obtain a precise estimate of labor length as this information is not always reliably recorded in medical records. The practice of waiting a few hours before going to the hospital contributes to the difficulties in arriving at an accurate estimate of labor length. Currently, there is little consensus on how many hours is required for labor to be considered prolonged. To further

complicate matters, prolonged labor is not typically viewed by medical experts as a high risk intrapartum complication. The implications for mother and newborn are considered minimal. Recent studies, however, have begun to challenge this view. One study has shown that offspring (mean age = 10.5 years) of labors exceeding 12 hours prior to cesarean delivery have lower IQ, compared to their siblings also delivered by cesarean with no prior labor (Roemer, Rowland, & Nuamah, 1991). The authors suggest that labor with slow progress may cause some degree of fetal brain damage. Another study (Chelmow, Kilpatrick, & Laros, 1993) which defined prolonged labor as first stage labor greater than 12 hours for nulliparas and greater than 6 hours for multiparas found that women and their infants were at an increased risk of experiencing further medical complications during labor. Even after controlling for demographic and other medical factors women with prolonged labor were 2.6 times more likely to experience another labor complication and three times more likely to require a cesarean delivery. This study also found that infants born to mothers with prolonged labor had lower 5-minute Apgar scores and were more likely to require resuscitation and incubation for thick meconium.

Labor may be induced by the intravenous administration of pitocin, a synthetic form of oxytocin, resulting in the stimulation of uterine contractions. This procedure is typically performed to reduce the risk of infection following premature rupture of the placental membranes. When the placental membranes rupture and labor has not commenced within 24 hours, the fetus may be at risk as it is no longer protected by the amniotic fluid. Inductions are also indicated if

contractions have begun but demonstrate an irregular pattern. In cases of postdatism, which refers to a gestation of 42 weeks, inducing labor is also indicated as the placenta can no longer provide adequate oxygen and nutrition to the fetus. Hyperstimulation of the uterus and impaired fetal oxygenation have been linked with labor induction (Blakemore & Petrie, 1988). As well, fetal tolerance for the effects of this drug has been found to vary.

Forceps use and cesarean section are the more common forms of assisted deliveries. Forceps delivery is indicated if there is fetal distress, problematic fetal positioning, or to reduce the second stage of labor when a lengthy vaginal delivery is expected at this phase. Injury to both fetus and mother have been linked with this form of delivery (Tapley, Todd, Subak-Sharpe, & Goetz, 1988). Cesarean sections (c-sections) refer to the surgical delivery of an infant by an incision in the abdominal and uterine walls. In western countries, 10-22% of deliveries occur through c-sections (Garel, Lelong, & Kaminiski, 1987; Ryding, 1991). Delivery by c-section is indicated if there is fetal distress, placenta previa, toxemia, or abnormal presentation of the fetus. While c-section has become a more common method of delivery, its medical risk to both mother and fetus are well documented (Miller, 1988). The more prevalent maternal complications include endometriosis (endometrial tissue found in the uterine lining begins to grow throughout the abdomen) and uterine injury hemorrhage. Cesarean deliveries may also be linked to respiratory difficulties in the newborn (Miller, 1988). A recent meta-analytic study reviewing psychosocial outcomes related to cesarean deliveries found that women

who delivered by cesarean expressed less immediate and long-term satisfaction with birth, were less likely to ever breast-feed, took longer to first interact with their infants, had less positive interactions with them after birth and interacted with their infants less at home compared to mothers who had delivered vaginally (DiMatteo, Morton, Lepper, Damush, Carney, Pearson, & Kahn, 1996).

With respect to perinatal complications, low birth weight has been selected as the infant outcome variable in the present study. An infant weighing less than 2500 grams at birth is considered to be in the low range. LBW occurs in about 8% of births (MMWR, 1988) and like preterm delivery, is considered to be a major factor in infant mortality and impaired child development (Brooke, Anderson, Bland, Peacock, & Stewart, 1989; McAnarney & Stevens-Simon, 1990). Follow-up studies have revealed problems in the physical, cognitive and behavioral functioning of children of LBW (Klein, Raziel, Brish & Birenbaum, 1987).

Effects of Stress on LDC and LBW

Earlier studies examining the link between psychosocial variables and specific birth outcomes failed to control for biomedical and lifestyle variables which are known to elevate the risk of reproductive complications and/or influence an individual's psychosocial well-being (Istvan, 1986). In an effort to address this shortcoming, the biopsychosocial approach has guided more recent studies examining the role of psychosocial variables in adverse birth outcomes. This approach asserts that health outcomes are a result of an interplay between

biomedical, lifestyle and psychosocial variables. In the pregnancy outcome literature, the relative importance of each of these factors, particularly the psychosocial dimensions, and the nature of their interacting influence on specific birth complications remain unknown. Studies have failed to adequately conceptualize, incorporate, and assess either the biological (e.g. parity, medical and gestational risk), lifestyle (e.g. smoking, alcohol, caffeine) and psychosocial (e.g. stress, social support, coping) aspects of the model and have often used weak methodologies to test this approach in relation to specific birth outcomes.

Of the psychosocial variables possibly implicated in adverse birth outcomes, stress has been the most widely studied. Research investigating the effects of stress on the course and outcome of pregnancy has conceptualized stress as either a response, measured through anxiety scales, or stimuli assessed by life event scales. Earlier studies examining the influence of life stress and anxiety on pregnancy and infant outcome variables were inconclusive due to conceptual and methodological weaknesses. Many of these studies used retrospective designs (e.g. Areskoz, Uddenburg & Kjessler, 1983; Berkowitz & Kasl, 1983; Newton, Webster, Binu, Maskrey & Phillips, 1979), which introduces the problem of selective recall on the part of the mother. It has been argued that women who experience a major complication during pregnancy, a difficult labor/delivery, or deliver an infant suffering from a birth complication, may in retrospect report a greater number of stressful events during pregnancy, in an effort to explain their mishap (Istvan, 1986; Levin & DeFrank, 1988). In order to minimize this

confound, the majority of studies in the last decade have introduced designs which are more prospective in nature. Despite such efforts to improve the methodology, findings are still inconsistent and at best point to a complex relationship between psychosocial variables and pregnancy outcomes including labor/delivery complications and low birth weight.

Pagel, Smikstein, Regen and Montano (1990) examined the impact of a number of psychosocial variables on gestational age and infant outcomes using a biopsychosocial model. Data were collected on maternal biomedical and demographic factors, lifestyle practices (i.e. smoking, alcohol consumption) and psychosocial variables including life events, anxiety and social support. Participants were 100 women between 21 and 36 weeks of pregnancy. Controlling for gestational age, as well as biomedical and demographic variables, revealed that a larger number of life events before pregnancy accounted for about 5% of the variance in lower birth weight. Lifestyle practices and the remaining psychosocial variables were not linked with lower infant birth weight. Lower income and older maternal age predicted lower gestational age, while the psychosocial variables did not predict this outcome variable. Women who reported higher state anxiety during pregnancy were younger and more often single, lower in income and educational level, smoked more, had higher general biomedical risk and reported lower levels of social support compared to women with lower anxiety. This study succeeded in establishing a modest link between life event stress and lower infant birth weight. It should be noted that the pertinent life events in this study occurred

before pregnancy and were assessed retrospectively at 21-36 weeks of pregnancy. It is possible that women who had already experienced a difficult pregnancy tended to perceive and report more stressful life events before the pregnancy in order to explain their difficult gestation. The weak association between psychosocial variables and the selected outcomes can also be explained by additional methodological and conceptual shortcomings. While this study emphasized its prospective design as a strength, data were collected only once. It is unknown whether one assessment point is representative of stress levels for the entire pregnancy. Furthermore, women were assessed between 21-36 weeks of gestation, meaning that data were collected in the second trimester for some of their sample and in the third trimester for the remainder. There is some evidence to suggest that anxiety levels are not stable during pregnancy and likely reach their peak in the third trimester (Cox & Reading, 1989; Da Costa, 1992). Lastly, an issue that will be further discussed is whether stress assessed in terms of major life events is an adequate measure of stress levels during pregnancy.

A study conducted by Rizzardo, Magni, Cremonese, Rossi and Cosentino (1988) sought to elucidate more precisely the relationship between state anxiety and pregnancy complications. Pregnancy-specific anxiety, social support and coping style were also assessed. A subsample of 47 women completed all three assessments during pregnancy (once per trimester) and one at post delivery (2-3 days). Their findings revealed different patterns of state anxiety during pregnancy for those women experiencing a complicated pregnancy compared to the no

complications group. Women in the complicated group reported higher state anxiety in the first trimester (assessed in month 3) compared to the second trimester (assessed in month 6). No differences in state anxiety for this group were found between the first and third trimester and the second and the third trimester of pregnancy. In comparison, women in the uncomplicated group showed no significant variations in state anxiety during pregnancy. The other psychosocial variables assessed in this study had no relation to pregnancy complications. These findings offer support for the role of state anxiety, particularly in the first trimester of pregnancy, in pregnancy complications. It further suggests the importance of using prospective designs with repeated assessments in order to adequately examine this association. Multivariate analyses, however, were not performed making it impossible to determine whether anxiety interacts with other psychosocial variables when predicting pregnancy complications. A further limitation was the manner in which pregnancy complications were defined. Pregnancies were classified as complicated or uncomplicated, with complications including medical problems pertaining to the gestation period (e.g. hypertension, preeclampsia), labor/delivery (e.g. premature birth, cesarean deliveries) and infant status (e.g. low birth weight, Apgar < 7), resulting in 78% ($n=37$) of the sample classified in the complicated group. As such, it is impossible to specify whether specific anxiety patterns are associated with complications occurring at different stages of pregnancy. As well, the use of such a broadly defined classification system results in the mixing of complications with various degrees of

severity/seriousness, raising questions regarding the clinical importance of these results. Lastly, these limitations also make it more difficult to propose plausible physiological mechanisms aimed at explaining the link between psychosocial stress and pregnancy complications.

Williamson, LeFevre and Hector (1989) assessed life events and social support at 18-22 weeks of gestation and at 32 -36 weeks in a sample of 513 women. The majority of the sample was married and between the ages of 20-34 years. This study found that women who reported an increase in life event stress from the second to the third trimester had a significantly higher rate of poor infant outcomes. Adverse infant complications were defined as the occurrence of one or more of the following: neonatal death, transfer to a neonatal intensive care unit, birth weight less than 2500 g or a 5-minute Apgar score of less than seven. The link between stressful life event change and perinatal complications remained, regardless of social support and even after demographic and biomedical risk factors were controlled. Several limitations in this study should be noted. Firstly, the complication rate was only 6%, meaning only 31 of the 513 pregnancies resulted in one or more perinatal complications. Therefore, not only was the complication group small but when the main hypotheses were tested, this group's size was further reduced as women were classified into high and low stress and high and low social support. Although the infant complications included in their category are all serious in nature, it can be argued that they vary in terms of level of seriousness (e.g. neonatal death versus 5-minute Apgar less than 7). The low

rate of infant complications in this study, however, precludes the possibility of examining factors related to complications that vary in severity. As well, the relationship between stress and infant complications may have been confounded by the occurrence of gestational complications. Women who experience a gestational complication (e.g. preeclampsia) are at higher risk of experiencing a perinatal complication (Brown, 1989; Super, Edelberg, Phipson, Hertz, & Kalhan, 1991). Typically, women are aware of these risks which may account for the reports of higher stress observed at the second assessment point (32-36 weeks) in this study. The incorporation of more frequent assessment points would have controlled for such a potential confound. The long intervals between the two testing points make it difficult to draw conclusions about the pattern of stress in pregnancy most predictive of complications occurring during the different phases of pregnancy.

Using a biopsychosocial model, Lobel, Dunkel-Schetter and Scrimshaw (1992) examined the impact of maternal stress on birth weight and gestational age at delivery in a sample of 130 socioeconomically disadvantaged women. Fifty-eight percent were married, with 78% of the sample indicating upon entry into the study that they were living with their baby's father. This study attempted to address some of the major difficulties in prior studies regarding the conceptualizations of stress during pregnancy. Multiple indices of stress were used to capture the different dimensions of stress proposed by Lazarus and Folkman (1984) in their transactional model (stimulus, appraisal and emotional responses). A latent maternal stress factor was created in order to test its impact on birth

outcomes. The stimulus or environmental component of stress was assessed by the number of stressful life events experienced during pregnancy. This scale was administered in the postpartum interview. Perceptions or appraisals of stress were assessed by two measures: 1) the Perceived Stress Scale assessing general or nonspecific stress, and 2) a subscale of the life event scale which measures appraisals of how stressful life has been. Spielberger's State-Anxiety Inventory (1983) was used to examine the emotional response dimension of stress. Perceived stress and state-anxiety were administered five times during pregnancy, with the first testing occurring at approximately 15 weeks gestation and the last at 30 weeks. Scores for each of these measures were averaged across testings for each subject to create single scores representing the entire pregnancy.

Their analyses yielded a stress factor which included state anxiety, perceived stress and life event distress (not number of stressful life events). The results indicated that stress was independently predictive of lower birth weight and earlier delivery. Interestingly medical risk and stress were found to have almost equivalent relationships to gestational age. Number of stressful life events, parity, marital status, education, and age were not related to either outcome variable in this study. Within a biopsychosocial framework this study was successful in establishing a link between stress and lower birth weight and gestational age. Their results are strengthened by their use of a repeated measures design over pregnancy, multiple indices of stress and by combining these stress scores into a single factor. Their stress factor, however, includes two measures assessed

prospectively and one, life events, assessed retrospectively in the postpartum period. It is possible that these scores were inflated for women who had experienced a difficult labor/delivery and/or a perinatal complication. The use of life events as a measure of perceived environmental stress during pregnancy also has its weaknesses. The events included in life event scales are major and unlikely to occur frequently in pregnancy, if at all. Secondly, the authors note that the stability of their stress measures during pregnancy suggests that their stress factor may not only be an indicator of stable conditions in the lives of their sample but also of stable personality characteristics. The inclusion of measures such as self-confidence and coping style would have been useful in understanding the degree to which personality and situational factors contribute to stress levels during pregnancy. The generalizability of their findings to women of different races and socioeconomic levels are unknown given that their sample consisted of low SES women, most of whom were Latino (64%), followed by African-American (20%) and Anglo (12%). Lastly, only 6 of the 130 women in their sample gave birth prematurely (< 37 weeks gestation). As well, the mean birth weight in this study was 3371 g (SD = 634), ranging from 1000 g to 4470 g. No indication was provided as to the proportion of infants weighing less than 2500 g. Hence, the low frequency of complications in their sample may reduce the generalizability of their findings to clinically significant birth outcomes.

Using a similar model and approach to operationalize and measure prenatal stress, Wadhwa, Sandman, Porto, Dunkel-Schetter and Garite (1993) examined

the influence of psychosocial stress variables on intrapartum complications, birth weight and gestational age on a sample of middle class pregnant women. Data were collected in the third trimester and three stress factors were created from the five stress instruments. These included: 1) life event stress, 2) perceived stress created from a composite of standardized scores on Daily Hassles, Perceived Stress Scale and the Hopkins Symptom Checklist, and 3) pregnancy anxiety measured with a 5-item scale. A relationship between higher prenatal life event stress and lower birth weight was shown, while greater pregnancy anxiety was linked with lower gestational age. No relationship between the perceived stress factor and intrapartum complications was found. Intrapartum complications in this study were coded as a dichotomous variable and included difficulties pertaining to the labor/delivery (e.g. induction, abruptio placentae) and perinatal complications (e.g. fetal distress, neonatal death). The collapsing of these two categories may account for the lack of association observed between the psychosocial stress variables and intrapartum complications. It is possible that certain stress variables may be differentially related and/or may be more influential in predicting a particular category of complications (intrapartum versus perinatal). Overall, this study did find evidence for the role of stress in lower birth weight and lower gestational age. The findings, however, are difficult to compare with those obtained by Lobel et al. (1992), as the stress factors in each study are comprised of different scales assessing different components of stress. That is, the perceived stress factor in the Lobel et al. study included life event distress, whereas in the

Wadhwa et al study (1993) this variable was examined separately. Although Wadhwa et al (1993) included more measures of stress which tapped on daily microstressors and pregnancy-specific anxiety, data were collected only once and late in the pregnancy. Furthermore for most scales women were asked to think back since the beginning of the pregnancy when completing the instruments. These methodological constraints raise some concerns as to whether the stress factors are indeed representative of the entire pregnancy. A more prospective design which would begin to assess these variables earlier in pregnancy would address these issues and clarify their roles on specific birth outcomes.

Difficulties in Assessing/Conceptualizing Stress

The Lobel et al. (1992) study has made the best attempt to incorporate a multidimensional approach to studying stress in pregnancy. It has been argued that the weak manner in which stress has been operationalized and assessed in the pregnancy literature is likely to be a significant factor accounting for the inconsistencies observed in this literature (Lobel et al., 1992; Lobel, 1994). Lobel et al. (1992) argued that for stress to have a detectable effect on such complex and multiply determined outcomes such as low birth weight and preterm delivery, it is important that this concept be adequately operationalized. In most of the studies discussed (e.g. Rizzardo et al., 1988; Williamson et al., 1989) a unidimensional approach to stress was used, in contrast to more recent theoretical approaches to stress. For example the transactional approach proposed by Lazarus and Folkman

(1984) views stress as a transaction between the person and the environment. The person's appraisal of stress is dependent upon the environmental demand and amount of resources the individual has available to deal with the specific demand. Adaptations of this transactionist viewpoint have guided much of the stress research in mental health outcomes and many physical health domains. The pregnancy area has lagged behind in this respect. While there is currently no single measure to assess the multiple dimensions of the stress process outlined by Lazarus' transactional approach (stimulus, appraisal and emotional responses), the use of multiple indices and their subsequent aggregation into a construct may be a partial solution to this major shortcoming.

If pregnancy research is to incorporate a more transactional approach to stress, it is important that the stress measures not only capture these multiple dimensions, but they must also be appropriate to pregnant samples. It appears from the few attempts in the pregnancy literature to employ a more multidimensional assessment of stress in pregnancy, the stimulus and appraisal components have been the most poorly measured. As previously mentioned, life events scales include major events unlikely to occur with sufficient frequency during the limited time period of pregnancy to allow for its adequate assessment. It has been suggested that recurring daily hassles may provide a more direct and broader estimate of the stimulus/appraisal component of stress in contrast to major life events (Kanner, Coyne, Schaefer, & Lazarus, 1981). Kanner et al. (1981) define hassles as irritating, distressing demands or occurrences that characterize people's

daily lives. They are considered more representative of the everyday concerns an individual perceives as salient for his/her well-being (Lazarus & Folkman, 1984). Not only may this measure be more easily adaptable to prospective studies of the impact of stress on pregnancy outcomes, but it may also be a more precise assessment of the environmental appraisal component of stress than the life event approach.

Several studies have found hassles to be a better predictor of physical health outcomes than life events. For instance, Delongis, Lazarus and Folkman (1988) determined that hassles assessed over a six month period were associated with the occurrence of health problems including flus, sore throat, headaches and backaches. This link was found to be stronger for individuals who were also low in social support and self-esteem. In pregnancy, Da Costa, Brender and Larouche (submitted) using a prospective design, found that hassles assessed over pregnancy were related to both gestational and intrapartum complications, after controlling for biomedical and demographic factors. This study, however, did not find a relation between hassles and lower birth weight. Whether such a finding would have been found had a more multidimensional approach to stress been taken was not examined. The perceived stress factor in the Wadhwa et al. (1993) study included a score on the hassles, however, no relationship was observed with lower birth weight and intrapartum complications. The methodological limitations in that study which were discussed earlier make it difficult to draw definitive conclusions.

The literature investigating the impact of stress on the occurrence of adverse pregnancy outcomes has also been criticized for its neglect of stressors specifically related to pregnancy (Standley, Soule, & Copans, 1979; Yammoto & Kinney, 1976). It is possible that stress scales which have been initially developed for nonpregnant samples of women and men may not adequately assess stress as experienced by pregnant women. Even the more rigorous attempts to measure stress in pregnancy (e.g. Lobel et al., 1992) have failed to address this issue. It has recently been argued that the use of developmentally appropriate stress measures are imperative in order to investigate the relation between stress and health outcomes (Aldwin, 1994). The few studies which have examined pregnancy-specific stress have yielded findings demonstrating the potential value of including such a measure.

Standley et al. (1979) found that women who reported more anxiety about the pregnancy, the upcoming birth and the anticipated care of a child, were more likely given anesthetics during their delivery and had infants with poor motor maturity. These two outcomes, however, are likely to be interdependent. As well, this study did not use other standardized measures of stress or anxiety, making it impossible to determine the relationship between the various components of stress during pregnancy and their independent and/or combined impact on the outcome variables. As well, the pregnancy-specific stressors assessed in this study were limited in scope and were obtained from interview data.

Arizmendi and Affonso (1987) asked women in their first and third trimesters of pregnancy and those who had recently delivered to identify stressful situations specific to childbearing. They found that women in all three groups reported stressors concerning the infant's welfare, labor and delivery, and issues regarding their partner. Similarly, questionnaire studies have found pregnant women to be most concerned with their body image, somatic symptoms, the marital relationship, attitudes to sex, and about the pregnancy and infant (Kumar, Robson, & Smith, 1984). These studies did not examine the impact of such pregnancy-specific stress on adverse pregnancy complications. Wadhwa et al. (1993), however, did include a measure of pregnancy-specific anxiety and found it to predict a small proportion of the variance in gestational age at birth. Their scale was comprised of only five items and may have not adequately represented the range of pregnancy-specific concerns experienced during pregnancy. The single assessment point in the third trimester may have also been insufficient to capture the level of pregnancy-specific anxiety excperienced by women over the course of the pregnancy.

Da Costa (1992) constructed a pregnancy-specific stress questionnaire based on the descriptive studies which have attempted to identify stressful events specifically related to childbearing (Arizmendi & Affonso, 1987; Kumar et al., 1984). Initial findings using this scale in a prospective design over pregnancy, have demonstrated wide variability among pregnant women in their experience of these stressors (Da Costa, Brender, Larouche, & Wrzesinska, 1993). Preliminary

findings indicate that women who experience a gestational complication report higher pregnancy-specific stress over the pregnancy. Its relationship to intrapartum and perinatal complications remains to be clarified. Overall, there is evidence to suggest that stress scales specifically tailored to pregnancy warrant further exploration when attempting to predict adverse outcomes in pregnancy.

Social Support In Pregnancy

As with stress, there has been much debate on the definition and assessment of social support. It is largely agreed that social support is not a unidimensional concept. The three social support constructs outlined by Vaux (1988), support network resources, supportive behavior and subjective appraisals of support, have been influential in the development of social support scales. It has recently been noted that most measures of social support can be classified into one of these three categories (Sarason, Sarason, & Pierce, 1990). Network measures focus on the number of persons the individual has available and the relationships among members within that network. Received social support scales assess the amount of support the individual actually receives, or reports to have received from others, while perceived social support measures the amount of social support the individual believes is available to them should they require it. Overall, it is perceived social support which has been most frequently linked with various health outcomes (Fitzpatrick, Newman, Lamb & Shipley, 1988; House, Landis & Umberson, 1988). This finding is consistent with current transactional theories of

stress (Lazarus & Folkman, 1984) which emphasize the role of cognitive appraisal over the actual situation as a better measure of the individual's experience (Sarason et al., 1990).

The recent interest in examining the role of social support in pregnancy stems from the possibility that it might reduce the adverse effects of stress on pregnancy outcome. Findings to support the buffering effects of social support on the relationship between stress and pregnancy complications are inconsistent. Neither Williamson et al. (1989) nor Pagel et al. (1990) found evidence for the buffering effects of social support on perinatal complications. Pagel et al. (1990) did find a significant main effect for satisfaction with social support and 1- and 5-minute Apgar scores. Methodological weaknesses and inadequate measures of social support in this area have precluded any definitive conclusions on the role of social support on pregnancy outcomes.

More recently, Collins, Dunkel-Schetter, Lobel and Scrimshaw (1993) using a prospective design, examined the impact of received social support during pregnancy on labor progress, infant birth weight and 5-minute Apgar scores in a sample of low income women. The design of this study and composition of the sample is parallel to the study by Lobel et al. (1992) described earlier, as these findings are based on a subset of that data. Sixty-eight percent of the sample were multiparas, with more than one-half choosing to be interviewed in Spanish. The authors developed a support questionnaire designed to obtain information on the amount of received support, satisfaction with received support and number of

network resources, all of which were administered at least three times during pregnancy. The results indicated that women with more network resources during pregnancy delivered infants of higher birth weight. Women who reported higher satisfaction with social support and received more support had infants with higher Apgar scores. Higher levels of received support during pregnancy were also related to fewer difficulties in labor. The effects of social support were significant even after controlling for biomedical factors. When examining stress buffering effects, the findings showed that when life events were elevated, greater satisfaction with received social support predicted higher birth weight. When life events were low, support quality was not related to birth weight. The authors note that the stress-buffering effects were weak and suggest that the impact of social support is more consistent with a main effect model. They further explain that in economically disadvantaged pregnant samples, behavioral provisions of social support are likely to be of benefit to all women, given their life circumstances. Their findings suggest that specific dimensions of support relate differently to specific birth outcomes. It should be noted that in their model, which demonstrated a main effect for social support, total variance in birth weight accounted for by the predictor variables was a modest 4% and only 10 of the 129 infants delivered weighed less than 2500 g. Given these low rates, it is unknown whether social support contributes in this manner to clinically significant cases of low birth weight. As well, prenatal life events were assessed retrospectively 6-8 weeks following delivery, hence it is possible that women with lower levels of social

support who had experienced an adverse birth outcome, recalled more negative life events during pregnancy. This study measured received or enacted support rather than perceived available support based on the argument that the former should be more closely related to an individual's well-being. It is interesting, however, that even in a sample of pregnant, economically disadvantaged women, it was women's appraisals of the quality of the support received that had the most consistent beneficial impact on the outcomes studied. The mobilization of social support is contingent upon a number of other factors, including personality and coping styles, measures which this study did not incorporate. The inclusion of these variables, however, would be useful for understanding the relationship between social support and adverse birth outcomes. Lastly, the social support measure devised for this study targeted issues specifically relevant to the ethnic and socioeconomic background of their sample, these results may not be generalizable to pregnant samples from other cultural and socioeconomic backgrounds.

To summarize, the role of social support during pregnancy requires further clarification. The use of more standardized measures and clearly formulated questions are needed to delineate the relationship between social support, stress, and pregnancy outcomes.

Coping

There is evidence to suggest that coping processes play a significant role in

the physical and psychological well-being of individuals when confronted with stress. Coping strategies refer to cognitive and behavioral efforts that are employed by an individual to reduce the effects of stress (Fleming, Baum, & Singer, 1984; Lazarus, 1984). In contrast, coping resources refer to the relatively stable personal capacities and social strengths by which individuals try to manage stressful situations (Moos & Schaefer, 1993). The central process in coping seems to be cognitive appraisal, a process by which people assess whether a demand threatens their well-being (primary appraisal) and by which they evaluate their resources for meeting the demand, formulate solutions, and select strategies for dealing with the situation (secondary appraisal).

Two types of coping have traditionally been described, namely problem-focused and emotion-focused coping (Folkman, 1984; Folkman & Lazarus, 1984). Problem-focused coping processes are directed to the management of a problem, whereas emotion-focused coping processes are directed toward amelioration of the associated level of emotional distress. In addition, there are strategies that serve both functions. Seeking social support is one such strategy to the extent that others can provide emotional, practical or informational support (Moos & Schaefer, 1993; Terry, 1994). More recently avoidance-oriented strategies have also received attention. These strategies involve cognitive (e.g. wishful thinking) and behavioral (e.g. eating, drinking) efforts aimed at denying or minimizing the seriousness of a crisis and its consequences.

A number of studies in the coping literature have examined the relationship between coping processes and various health outcomes (Miller, Brody, & Summerton, 1988; Nowack, 1989). One well-supported finding is that individuals who rely more on problem or task-oriented coping strategies (e.g. *focus on the problem and see how I can solve it*) tend to adapt better to environmental stressors and experience less psychological distress (Moos & Schaefer, 1993). In contrast, reliance on predominantly avoidance and emotional coping styles have been shown to be important risk factors in predicting poor mental health (Aldwin & Revenson, 1987; Terry, 1994).

The view that individuals cope with stress differently and that some strategies are more adaptive than others has been empirically supported in various populations, including healthy adults, medical patients with diverse disorders and family caregivers (Aldwin & Revenson, 1987; Costa & McCrae, 1990; Revenson & Felton, 1989; Suls & Fletcher, 1985; Taylor & Brown, 1988). In contrast, very few studies in the pregnancy literature have examined coping processes in pregnant women. Rutter, Quine and Chesham (1993) proposed that some women may view pregnancy care as the responsibility of health professionals, possibly leading to the selection and use of ineffective coping strategies.

There appears to be only one study which has systematically examined coping processes in relation to pregnancy complications (Demyttenaere, Maes, Mijs, Odendael, & Van Assche, 1995). Demyttenaere et al. (1995) examined the coping styles of 23 primiparous women hospitalized for preterm labor and 22

pregnant women matched on duration of gestation upon entry into the study. No differences were found between these two groups on coping style. When predictors of course and outcome of preterm contractions were examined in the preterm group, the importance of specific coping styles emerged. Higher palliative coping and higher expression of negative emotions predicted shorter duration of hospitalization for preterm labor. Higher social support seeking and low active coping styles were related to longer gestations in women hospitalized for preterm labor. This study was successful in linking specific coping styles to more favorable outcomes in women already hospitalized for preterm labor. It was, however, unable to find differences in the coping styles of women with and without preterm labor. It is not obvious from the study design whether women in the control group were screened for the occurrence of other gestational complications (bleeding, diabetes, hypertension) which would have confounded these results. Furthermore, the nonsignificant findings between the two groups are not surprising given that preterm labor is more likely caused by a complex relationship between multiple factors. Prospective studies which follow women before a complication occurs and incorporate a biopsychosocial approach are the most suitable designs to begin to elucidate the nature of these complex relationships.

The literature on coping and stress has successfully demonstrated that the coping processes individuals employ can be important moderators of stress. Although studies examining the role of coping in pregnancy are sparse, these findings coupled with those in other health areas suggest that further exploration of

coping processes during pregnancy may clarify the link between stress and adverse birth outcomes.

Obstacles in Measuring Coping Processes

Although a number of instruments have been developed to assess the various dimensions of coping (e.g. COPE, Carver, Scheier, & Weintraub, 1989; Ways of Coping, Folkman & Lazarus, 1980) many have been criticized for their psychometric limitations, including lack of empirical support and relatively low subscale reliabilities. In an attempt to address these psychometric problems and difficulties in operationalizing the coping construct, Endler and Parker (1990) developed the Multidimensional Coping Inventory(MCI). Given the consensus in the literature regarding problem-focused and emotion-focused coping, these two dimensions are assessed in their inventory. A third basic coping strategy - avoidance, was also incorporated in their scale. Endler and Parker (1990) argue that the inclusion of avoidance coping is important as a stressful situation can be avoided through seeking out people (e.g. social support) or through engaging in an alternative task.

Folkman, Lazarus, Dunkel-Schetter, DeLongis, and Gruen (1986) made a distinction between intraindividual and interindividual approaches to coping. The intraindividual approach to coping involves studying the behaviors of the same individual across numerous stressful situations. This is a process oriented approach to coping, which determines the impact of a specific stressful situation on coping behaviors. Although individuals are likely to actively and consciously choose and

engage in particular coping behaviors, Endler and Parker (1990) argue that there is also evidence to suggest that the range of coping behaviors can be conceptualized along a limited number of dimensions (e.g. Billings & Moos, 1981; 1984; Carver et al., 1989; McCrae, 1984). Evidence for the interindividual approach is provided from studies suggesting that individuals may have coping preferences as they appear to engage in similar behaviors across different situations (Endler & Parker, 1989; Fleischman, 1984; Miller, Brody, & Summerton,1988). Given that coping remains a relatively unexplored area in pregnancy, the interindividual approach is appealing as a means of exploring whether the coping styles that pregnant women employ remain stable over pregnancy and to determine the styles most and least adaptive in terms of physical and psychological outcomes during this period.

Depressed Mood During Pregnancy and in the Postpartum

Prevalence rates for postpartum depression range from 3-33%(Cox, 1989; Gotlib, Whiffen, Mount, Milne, & Cordy, 1989; Whiffen, 1992). This wide range is largely a result of the numerous methods which have been used across studies to define postpartum depression. Rates in the lower range are typically found in studies which use medical treatment (e.g. antidepressants) as the criterion for defining postpartum depression, while the highest rates are found in studies using elevated scores on measures of self-reported depression. Whiffen (1992) reviewed the studies which used diagnostic interviews (e.g. DSM-III, RDC, PSE or ICD-9) as the criteria for defining postpartum depression and concluded prevelance rates to be approximately 13% (range 3.5% - 17.5%). With respect to clinical

presentation, the majority of postpartum depression cases are mild in severity, with more than one-half of diagnosable cases meeting the criteria for minor rather than major depression (Whiffen, 1992; Whiffen & Gotlib, 1993).

A proportion of women also experience depression during pregnancy. Recent findings suggest that only a subset of these women continue to be depressed in the postpartum. Gotlib et al. (1989) used the Beck Depression Scale (BDI) and Research Diagnostoc Criteria (RDC: Spitzer, Endicott, & Robins, 1978) to determine rates of depression during pregnancy and in the postpartum. Women were assessed once in the second and in the third trimester and at 4-5 weeks postpartum. The rate of depressive symptomology during pregnancy using the BDI was found to be approximately 25%. The rate dropped to 10% when diagnostic criteria were used to define depression during pregnancy. This discrepancy can be partially explained by the limited usefulness of the BDI to assess depression during pregnancy as some items are clearly confounded with somatic symptoms common to pregnancy (e.g. sleeping and eating difficulties). In the postpartum, approximately 7% of the women met diagnostic criteria for depression, while only one-half of these cases had also been depressed during pregnancy. These findings suggest that continuity in mood from pre- to postpartum is not as stable as previously believed. This study was able to show that different demographic variables were related to depression occurring during these two phases. Women who were depressed during pregnancy were younger, less well-educated, unemployed, and had more children than nondepressed

pregnant women. In contrast none of these demographic variables differentiated postpartum depressed from nondepressed women. The authors point out that in addition to socioeconomic factors, different psychosocial variables may predict depression occuring in the prepartum compared to the postpartum. Conclusions concerning the issue of whether depression at these two times is linked with different psychosocial variables await further emperical evidence.

Using a similar design as the Gotlib et al. (1989) study, Hobfoll, Ritter, Hulsizer, Cameron and Lavin (1995), with an economically disadvantaged and ethnically mixed sample, found that approximately 42% of the women met RDC criteria for depression at either the second or third trimester assessment. At the postpartum assessment (7-9 weeks following delivery) approximately 23% of the sample was depressed with only slightly more than one-half (53.3%) also having been depressed at one of the prepartum assessment points. While this study suggests that depression rates pre- and postpartum may be higher for low SES women, it is also consistent with earlier findings suggesting that although depression during pregnancy is related to depression in the postpartum, a significant proportion of women experience depression in only one of these stages (Gotlib et al., 1989).

Numerous studies have been conducted to examine predictors of postpartum depression, but far fewer have looked at predictors of depressed mood during pregnancy. The greater interest in postpartum depression likely stems from its well-documented short- and long-term negative impact on both mother and

infant. Postpartum depression, as well as postpartum depressed mood, have been linked with a poorer quality of mothering and an increased risk for children to develop a variety of emotional, cognitive and social problems (Cogill, Kaplan, & Alexandra, 1986; Dodge, 1990; Rutter, 1990). Depressed mood during pregnancy however, has also been linked to numerous adverse outcomes. Aside from placing women at higher risk for postpartum depression, it has also been associated with preterm delivery, lower birth weight, and engaging in adverse health behaviors such as smoking and alcohol use during pregnancy (Molfese et al., 1987; Steer, Scholl, Hediger & Fischer, 1992; Zuckerman, Amaro, Bauchner & Cabral, 1989). These findings clearly point to the importance of studying depression during pregnancy to strenghten our understanding of both pregnancy complications and postpartum depression.

A number of psychosocial variables have been linked with postpartum depression. The impact of perceived support and hassles on postpartum depressive mood was examined in a sample 287 women (Powell & Drotar, 1992). Subjects completed the BDI and a perceived social support questionnaire in the third trimester (month 8). At 2 and 6 months postpartum, hassles was also included in the battery of measures. The rate of depressed mood using an established BDI cutoff was 31.8% at the third trimester and 23.1% at 2 months postpartum. The study did not report depression rates for the 6 month postpartum testing. Prepartum mood, hassles and perceived social support were related to postpartum depressed mood at 2 and 6 months. After statistically controlling for prepartum

mood, hassles was found to be the next most important predictor of postpartum depressed mood. This study, however, did not assess hassles in the prepartum. Both hassles and depressed mood were assessed concurrently in the postpartum, making it difficult to draw any firm conclusion on the nature of this relationship. The authors do point out that hassles assessed at 2 months predicted depressed mood at six months, which they suggest provides evidence that hassles predicts depressed mood. However, maternal reports of hassles at the 2 month assessment could have still been confounded by women's depressed mood state at that time. There is no indication as to how many women depressed at two months continued to be depressed at the six month post-delivery follow-up. It can be assumed that the majority remained depressed given the literature which indicates that the course of postpartum depression is relatively stable. Most cases detected between 4 and 12 weeks postdelivery tend to remain depressed for about 6 months, remitting almost fully at about 1 year (Whiffen, 1992). Hence, it is certainly possible that depressed mood at two months influenced women's perceptions of greater hassles at that assessment, rendering it premature to conclude that hassles predicts postpartum depression. This methodological limitation could have been reduced by assessing hassles during pregnancy and ideally prior to the experience of elevated mood scores. These same limitations may apply to the relationship found between perceived social support and postpartum depressed mood, as it is unclear whether the authors used prepartum social support or social support measured concurrently with depressed mood as a predictor variable in their

hierarchical multiple regression equation. To date, there have been no studies which simultaneously track hassles, perceived social support, coping and depressed mood from the first trimester of pregnancy. Such a design is needed if one is to understand what combination of factors are involved in the development of depression in the postpartum.

The impact of social support in pregnancy on depressed mood during pregnancy and in the postpartum, was examined in the Collins et al. (1993) study. Depressive symptomology was measured during pregnancy and at 4-8 weeks following delivery using the Center for Epidemiological Studies Depression Scale (CESD). Details regarding methodology and measures in this study were discussed earlier. The results indicated that women who were less satisfied with the prenatal support they received were more likely to experience depressed mood during pregnancy and in the postpartum. This study was able to show prospectively a direct relationship between social support quality and depressed mood during pregnancy and in the postpartum. A stress buffering effect also emerged as women who received more social support during pregnancy and experienced a higher rate of prenatal life events, reported less depression in the postpartum. This effect, however, was weak and it is important to note that prenatal life events were measured retrospectively and concurrently with postpartum depressed mood.

Only recently has the role of coping strategies been explored in relation to depression during pregnancy and the postpartum. Demyttenaere, Lenaerts, Nijs, and Van Assche (1995) measured coping style, trait anxiety, and pregnancy

specific attitudes in the third trimester (30-32 weeks) in a sample of 50 primiparous women. The BDI was also administered at that point and again at 5 days, 6 weeks and 6 months after delivery. In this study the rate of depressed mood was 24% in the third trimester, 20% at 5-days post delivery, 6% at 6-weeks and 10% at 6 months postpartum. Certain subscales of the pregnancy specific attitude measure were related to higher BDI scores in the third trimester and at 6 months postpartum. Specifically, lower spousal involvement and feeling unfulfilled during pregnancy were associated with higher BDI scores in the third trimester. These two factors along with perceiving the pregnancy as having a negative impact on one's body image were related to higher BDI scores at 6 months postpartum. Higher trait anxiety and a depressive coping style were also related to higher BDI scores during pregnancy, while only depressive coping was linked to higher BDI scores at 6 months postpartum. These findings offer support for the role of pregnancy specific psychosocial and personality factors in depressed mood during pregnancy and the postpartum. Although their measure of coping style (a Dutch adaptation of the Westbrook coping scale) is not a widely used measure of coping in North America, the findings suggest that individual coping styles may contribute to depressed mood during pregnancy and in the postpartum. Interestingly, none of the variables assessed in this study were associated with BDI scores at 5 days and 6 weeks postpartum. The selection of the BDI as a measure of postpartum mood may have been a factor contributing to these results. It has recently been noted that a substantial number of women meeting criteria for depression in the postpartum,

score below the established BDI cutoff score (Whiffen, 1988; Whiffen, 1992). This could account for why the rate of depressed mood at 6 weeks was somewhat lower compared to those found in prior studies. This shortcoming casts some doubt on the generalizability of these findings. The use of measures with higher sensitivity for detecting depression in the postpartum might be useful for corroborating these findings.

Although numerous studies have explored predictors of postpartum depression, few have been directed by theoretical developments in the stress and coping literature. A recent study expanded and tested the utility of a model proposed by Lazarus and Folkman (1984), in predicting postpartum depressive symptomology (Terry, Mayocchi, & Hynes, 1996). The authors proposed that stress experienced during pregnancy and early in the postpartum, how women cope with that stress, and the extent to which coping resources are available, will influence postpartum depressive symptomology. In the last trimester of pregnancy, depressive symptomology and coping resources were measured. At 4 weeks postpartum, stress, coping strategies and depressed mood were assessed, while a final measurement of depressive symptomology was collected at 6 months postpartum. Their sample was comprised of largely middle-class, married women. Coping resources included measurements of personal control, self-esteem, partner and family support. Stress in this study was conceptualized as the experience of delivery complications, infant fussiness (as rated by mother and father) and the experience of life events in the last year. Coping strategies tapped into cognitive

problem focused coping, wishful thinking and seeking information. Partners also rated how effectively they felt their wives were coping with the arrival of the new baby. Both the Edinburgh Postpartum Depression Scale (EPDS) and the BDI were used to measure depression. A composite (mean) score of these two depression inventories was used in the analyses. The study found evidence that stress, coping strategies, and coping resources influenced postpartum depressive symptomology. In specific, infant fussiness (as rated by the partner), engaging in more wishful thinking and low levels of cognitive problem-focused coping were related to depressive symptomology at 4 weeks. Wishful thinking (assessed at 4 weeks postpartum) and lower self-esteem (assessed in the third trimester) were related to depressive symptomolgy at 6 months. These latter findings shed some light on the etiology of postpartum depressed mood as they can not be attributed to same source affects. That is, the predictors were not assessed concurrently with depressed mood at 6 months post delivery. When examining predictors of postpartum depression for women not depressed during pregnancy, a similar pattern of results emerged. However, in this analysis, stressful life events were also related to true cases of postpartum depression at 6 months. While stress, coping strategies and coping resources were related to depressive symptomology at 4 and 6 months postdelivery, it should be noted that depressive symptomology during pregnancy emerged as the most important predictor, particularly when predicting depressed mood at 6 months. Secondly, the strongest findings were obtained when predicting depression at 4 weeks. However, most of the predictor variables were

assessed concurrently, precluding any definitive conclusions regarding causality. It can be argued that even husband ratings of coping effectiveness and infant fussiness can be biased by their perception of their spouses current mood. This shortcoming could be minimized by assessing maternal stress and coping strategies during pregnancy.

Differences in timing of assessment, methodological weaknesses and the diversity of methods and scales which have been used to assess psychosocial predictors and depressive symptomology make comparisons between studies difficult. The most consistent finding is the link between depressed mood during pregnancy and postpartum depression. However, it has also been shown that only about one-half of women with depressed mood during pregnancy go on to experience depressed mood in the postpartum, pointing to the involvement of other variables. While stress, coping processes, and social support are likely involved in depression during pregnancy and the postpartum, their roles are currently unclear. This may be due to studies assessing these variables concurrently with depressed mood in the postpartum and/or collecting data on these psychosocial variables only once and late in the pregnancy (e.g. Demyttenaere et al., 1995; Powell & Drotar, 1992; Terry et al., 1996). Greater use of findings from the stress, social support and coping literature combined with methodology which assesses these variables as early as the first trimester of pregnancy could help clarify their role in depression during pregnancy and in the postpartum.

Present Study

Several main objectives were addressed in the present study. Psychosocial adjustment during pregnancy was examined prospectively, as were early predictors of maternal stress during pregnancy. Using a biopsychosocial framework, the influence of maternal stress on labor/delivery complications and infant birth weight was investigated. Another goal was to examine factors related to depressive symptomology during pregnancy and the postpartum. Coping style, personal resources (e.g. self-esteem) and perceived social support were assessed in order to determine their influence on labor/delivery complications, infant birth weight, and depressed mood during pregnancy and the postpartum.

Several conceptual and methodological weaknesses in the literature were addressed in the present study. Firstly, this study incorporated and expanded upon the transactional approach in its operationalization of maternal stress during pregnancy. Beginning in the third month of pregnancy, hassles, state anxiety and pregnancy specific stress were assessed monthly. A factor score to capture maternal stress level during pregnancy was created and its impact on birth outcomes was examined. Secondly, coping processes which have been neglected in the pregnancy complications and postpartum depression literatures were examined in the present study. The prospective, repeated measures approach used in the present study allowed for the detection of fluctuations on the psychosocial variables assessed over the course of pregnancy. This design feature made it possible to identify and further examine those women who report depressed mood

only during pregnancy, rather than the more common practice of pooling this group with women who do not report elevated depressive symptomogy in the postpartum.

With respect to labor/delivery complications and infant birth weight the goals were to determine the impact of maternal stress and examine the direct or indirect influence of coping processes and perceived social support, while controlling for demographic, lifestyle and biomedical factors. Early predictors of elevated stress during pregnancy were also explored. Differences between women reporting depressed mood only during pregnancy compared to those reporting depression at postpartum and women not reporting depressed mood in the pre- and postpartum were examined. Distinguishing between these three groups made it possible to identify factors related to depressed mood at each of these periods (pre- and postpartum).

Method

Subjects

One hundred pregnant women were recruited for the present study. Subjects were recruited from 4 obstetrician/gynecologists offices in the Montreal area. Pregnant women in their first trimester, between 8 and 14 weeks of gestation were invited to participate in this study. All participants received an information sheet (See Appendix C) while in the waiting room by either their physician's secretary or a research assistant. The information sheet provided a brief description of the study's objectives and timing of the data collection points. Additional selection criteria included: (a) age range between 19-40 years; (b) able to read and understand English or French; (c) married or in a stable relationship; (d) pregnancy achieved without the aid of medical interventions such as artificial insemination. Of these participants, three miscarried toward the end of the first trimester, 10 failed to return their first set of questionnaires following the first telephone interview, while seven had three or more months of data missing. In all 17 women dropped out of the study, with most indicating 'lack of time' as their reason. Independent t-tests were carried out to examine differences between the final sample and those who dropped out on; demographics (age, income, education, number of children), lifestyle (work status, smoking, alcohol and caffeine intake) and pregnancy related variables (planned pregnancy, happiness about the pregnancy and gestational complications). Women who dropped out had significantly more children at home ($t(95)=-2.38$, $p < .05$). Chi-square statistics computed on dichotomous variables also revealed that a greater proportion of women who remained in the study were

primiparous (68%) as compared to those who dropped out (24%) ($\underline{X^2} = 9.28$, $\underline{p}$ <.01). No significant group differences were found on the remaining variables. The final sample consisted of 80 women with a mean age of 29.19 years (range 20-38). Selected demographic and lifestyle variables of the final sample are shown in Table 1. The method of recruitment did not permit an assessment of overall participation rate in this study.

Measures

1. Structured Interviews:

Four structured interviews were devised for the present study - one for each trimester and the fourth for post delivery (see Appendix A). The initial interview inquired about demographic information (e.g. age, education) and medical history. In addition, interviews in each trimester obtained data on medical condition, physical and emotional changes, as well as intake of certain substances (e.g. alcohol, caffeine, cigarette smoking) during the course of pregnancy. Post delivery, the interview dealt with labor, delivery and neonatal status.

2. Stress Indices: (see Appendix B)

State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Luchene, 1970).

This questionnaire measures trait anxiety, how the subject generally feels with respect to 20 statements, and state anxiety, how she presently feels about the same statements. High test-retest reliability (.73-.86) has been reported for trait

Table 1

Selected Demographic and Lifestyle Variables of the Sample

Variables		
Demographic:	Mean	SD
Age	29.19	3.66
Education	14.91	3.18
Combined Income[a]	5.68	2.08
Marital Status	% (n)	
Married	86% (69)	
Co-habiting	14% (11)	
Length of Time Living together[b]	Mean 3.59	SD 1.46
Employment	% (n)	
Employed	81% (65)	
Unemployed	19% (15)	
Planned Pregnancy	70% (56)	
Parity		
Primiparous	64% (51)	
Multiparous	36% (29)	

Note: [a]Combined income scale - 8 categories; Category '5' = $40,000 - $50,000 '6' = $60,000-$70,000.

[b] Scale for time living together -'1' = < 12 months; '2' = 13-24 months; '3' = 25-48 months; '4' = 49-72 months; '5' = 73-96 months; '6' = 97 or more months.

Table 1 (Continued)

Variables		
Number of Children at Home	%	
0	64% (51)	
1	22% (18)	
2	14% (11)	
Lifestyle:		
Religion		
Catholic	49% (39)	
Orthodox	19% (15)	
Protestant	3% (2)	
Jewish	13% (10)	
Other/none	17% (14)	
Alcohol Drinkers		
1st trimester	18% (14)	
2nd trimester	19% (15)	
3rd trimester	16% (13)	
Smokers		
1st trimester	15% (12)	
2nd trimester	14% (11)	
3rd trimester	11% (9)	
Weekly Caffeinated Beverages[c]	Mean	SD
1st trimester	5.68	(7.17)
2nd trimester	6.36	(7.68)
3rd trimester	6.89	(7.47)

[c] Number of caffeinated beverages per week.

anxiety, whereas reliability for state anxiety is low, as would be expected for this fluctuating dimension. Internal consistency coefficients have been shown to be .92 for the Trait scale (STAI-trait) and .81 for the State scale (STAI-state) (Spielberger, 1983). There are numerous studies showing the STAI to be a good measure of stress in pregnancy (e.g. Rizzardo et al., 1988). Therefore this scale was used to assess subjects' predisposition to stress (trait) and to determine variations in state anxiety during pregnancy. Both scales were included in the assessment battery following the first interview which occurred in the third month of pregnancy. Further, the STAI-state was subsequently completed on a monthly basis until delivery, in order to monitor changes in stress levels during the course of pregnancy.

Hassles Scale (Revised) (DeLongis, Lazarus, & Folkman, 1988)

This revised version of the Hassles Scale asks subjects to rate on a four-point scale how distressing a list of 53 minor events and concerns have been in the past month. Items focus on common occurrences and concerns in areas such as work, health, family, friends and environment, which may be considered irritating, frustrating, or distressing. Preliminary normative data on the hassles scales have shown it to possess adequate test-retest reliability and validity (Kanner, Coyne, Schaefer, & Lazarus, 1981). In the present study test-retest reliability coefficients varied from .62 -.83, depending on the time period sampled (one to six months).

A hassles questionnaire was employed instead of a life events instrument because of evidence demonstrating that minor everyday life events are better predictors of psychological and health symptoms (DeLongis et al., 1988; Kanner et al., 1981; Zarski, 1984). Given the contradictory findings in the literature regarding the relation between stressful life events and pregnancy outcome, further understanding may be obtained by using the daily hassles approach. The hassles questionnaire was administered on a monthly basis (asking subjects to report their hassles of the past month) starting in the third month of pregnancy in an attempt to assess fluctuations in stress due to minor daily stressors.

Pregnancy Experiences Questionnaire (PEQ).

The Pregnancy Experiences Questionnaire was assembled to address pregnancy-specific stressors and concerns experienced during pregnancy (Da Costa, 1992). The 42 items were drawn from findings from previous studies attempting to identify the psychosocial stressors of childbearing (e.g. Arizmendi & Affonso, 1987; Standley et al., 1978) and from a maternal adjustment and attitudes questionnaire developed by Kumar et al. (1984). The questionnaire has items on somatic symptoms, pregnancy, fetus/infant and parenting concerns, body-image, and attitudes to sex. Women are asked to rate how severe each item has been for them in the past month on a three-point scale. The PEQ was administered monthly beginning in the third month of gestation, to measure variations in pregnancy-specific stresses. Preliminary analyses have shown the PEQ to have good internal

consistency (α = .87 -.91) (Da Costa, Larouche & Brender, 1995). Test-retest reliability coefficients in the present study varied from .64-.84, depending on the time period sampled (one to six months).

3. Mood Assessment

Lubin Depression Adjective Check-List (DACL) (Lubin, 1965).

Form C of the DACL was used in this study as a measure of depression. It consists of 32 items which assess affective state as distinguished from clinical, psychophysiological depression (Lubin, 1965, 1967). This instrument was chosen because it avoids somatic indices of depression, which may be confounded with pregnancy or the early postpartum period. Form C has a split-half reliability of .92 and a concurrent validity with the Beck Depression Inventory of .50. Its internal consistency has been shown to be .88. In the present sample, test-retest reliability ranged between .27 -.54 over the months of pregnancy, consistent with the fluctuating nature of mood states in pregnancy. The internal consistency of the DACL administered in the postpartum period (4-5 weeks post delivery) was .83 in this study. The DACL has been shown to be useful for multiple mood ratings in a short period of time (Rabkin & Klein, 1987). The DACL was administered on a monthly basis during pregnancy and four to five weeks after delivery to assess mood fluctuations over the course of pregnancy and postpartum.

Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987)

This widely used measure includes 10 items which inquire about the mother's mood in the past seven days. Each item is rated on a four point scale. The items refer to depressed mood, anhedonia, guilt, anxiety, and suicidal ideation. The split-half reliability of the scale is .88, and its internal consistency coefficient is .87. In the present study internal consistency was found to be .81. In validation studies, the EPDS has been found to have a sensitivity (proportion of depressed women correctly identified) of 68-95% and a specificity (proportion of non-depressed women correctly identified) of 78-96%, when compared to a diagnosis of major depression made through a psychiatric interview (Cox et al., 1987; Murray & Carothers, 1990). The EPDS was administered as part of the last telephone interview four to five weeks postpartum and together with the DACL was used to determine the occurrence of postpartum depression in this sample.

4. Psychological Resources

Marital Adjustment Scale (MAS) (Kimmel & Van der Veen, 1974).

The new version of the Locke Wallace Marital Adjustment Scale consists of 23 items with weighted scores to denote current sex differences in responding patterns. It has consistently been found to be a highly reliable and valid measure of marital adjustment (Schiavi, Derogatis, Kuriansky, O'Connor, & Sharpe, 1979). The MAS was administered to all subjects in the initial battery of questionnaires to evaluate marital compatibility and adjustment. It has been suggested that a good marital relationship may contribute to reducing the stresses related to pregnancy

and childbirth (Dimitrovsky, Perez-Hirshberg, & Itskowitz, 1986). As well, there is some evidence linking a poor marital relationship to increased vulnerability to depression during pregnancy and postpartum (Dimitrovsky et al., 1986; O'Hara, 1985).

Personality Characteristics (Holahan & Moos, 1985)

This measure adapted by Holahan and Moos, was based on earlier work by Gough and Heilbrun (1965). It assesses individuals' self-labels of a general and enduring nature in two areas; self-confidence and personal disposition. Subjects are asked to rate the accuracy of a series of self-descriptive adjectives in these two domains. Cronbach's alpha coefficients for the Self-confidence and Easygoing sections have been shown to be .79 and .64, respectively. The score for each dimension is determined by adding the ratings for all the adjectives that constitute that dimension. This measure have been linked to stress resistance and improved psychological functioning (Holahan & Moos, 1986, 1990).

Social Support Questionnaire (SSQ) (Sarason, Levine, Basham, & Sarason, 1983).

This instrument quantifies the dimensions of perceived availability and satisfaction with social support. A shortened version of this measure was used in the present study. This sixteen item scale, consists of two subscales, with eight items assessing perceived network size and eight items measuring satisfaction with the available support. Given the modest intercorrelation between the subscales, it is

suggested that both scores be examined separately (Sarason et al., 1983). The SSQ has sound psychometric properties. The alpha coefficients for perceived network availability and satisfaction with support in the present study were found to be to be .88 and .89 -.93, respectively. Test-retest reliability for perceived network size ranged between .70 -.75 and .46-.51 for satisfaction with social support over the three assessment points. This questionnaire was administered once in each trimester of pregnancy.

5. Social Desirability Scale (SDS) (Crowne & Marlowe, 1964)

This 33-item measure was designed to identify individuals who describe themselves favorably and in a socially desirable manner. The SDS loads equally well on the two factors associated with social desirability: self-deceptive positively (an honest but overly positive self-presentation) and impression management (self-presentation fitted for an audience) (Paulhus, 1984). This scale uses a true-false response format and items describe culturally approved behaviors that are perceived as having a low frequency of occurrence. The scale has been shown to be valid as individuals who score high on the SDS tend to respond more to social reinforcement and are more influenced by the evaluation of others (Crowne & Marlowe, 1964). Its reliability has also been found to be adequate, with an internal consistency of .88 and a one- month test-retest correlation of .88 (Crowne & Marlowe, 1964). A one-week test-retest value of .84 has also been reported, while

Reynolds (1988) found an internal consistency of .79 using Kuder-Richardson formula 20. The SDS was used in the present study to assess response bias.

6. Coping Style

Coping Inventory for Stressful Situations (CISS) (Endler & Parker, 1990).

Research has shown that individuals have cross-situational coping preferences. Hence an inventory assessing stylistic rather than situational coping was employed in the present study. The CISS is a 44-item questionnaire with three subscales including task-, emotion-, and avoidance-oriented coping. Individuals are asked to indicate the degree to which they generally engage in the different coping strategies when encountering a stressful situation. The 16 items that comprise the avoidance subscale have been found to yield two factors relating to avoidance dimensions (Endler & Parker, 1994). This has led to the development of an 8-item Distraction subscale and a 5-item Social Diversion subscale. The reliability coefficients for the CISS subscales range from .77-.90. Test-retest correlations have also been found to be reliable (.51-.73). In the present study test-retest correlations ranged between .67-.75 for emotion-oriented coping; .63-.69 for task oriented, .60-.68 for avoidance coping and .62-.73 for the distraction subscale. The pattern of correlations between the CISS subscales and depression and anxiety were reported by Endler and Parker to be in the expected direction. A similar pattern of intercorrelations was found in the present study and is discussed further in the results section. This inventory was administered on a trimestral basis in order to determine coping strategies during pregnancy and their role. Although this

instrument assesses stable stylistic coping strategies, it was administered repeatedly because it is unknown whether coping preferences change over the course of pregnancy.

7. Neonatal Perception Inventory (NPI)

The "Your Baby" subscale of the NPI developed by Broussard and Hartner (1970,1971) was used to assess maternal perception of her newborn. This brief rating scale asks mothers to respond to items related to infant care and temperament, in terms of degree of difficulty (on a 5-point scale). For instance, mothers are asked to rate "How much crying their baby has done", while other items pertain to their infants sleeping, feeding, elimination and predictability patterns. The alpha reliability coefficient for this scale has been found to be .74 (Blumberg, 1980). In the present study internal consistency was adequate (α = .65).

Procedure

All pregnant women in their first trimester were invited to participate in this study at the office of their physician, who was aware of this study. An information sheet containing a brief description of the study and a phone number where the project coordinator could be reached was given to all participants by a research assistant (RA) or the physician's secretary. Interested patients had the option of either leaving their name and number with the RA or secretary for contact by the project coordinator or calling themselves for more information.

Women who met the selection criteria and were interested in participating were scheduled for a telephone appointment in the third month of pregnancy (8-14 weeks)(See Figure 1). At this time the first structured interview was conducted by a trained interviewer and the first trimester paper-and-pencil questionnaires were mailed to the subjects, along with the consent form to be signed and returned (See Appendix C). These questionnaires included the Marital Adjustment Scale, Personal Resources, CISS, SSQ, STAI-state and trait, PEQ, SDS, the Hassles, and the depression checklist (DACL). Six self-addressed stamped envelops containing the questionnaires to be completed at the end of each month were also mailed to the subjects. These questionnaires included the STAI-state, PEQ, Hassles, and the DACL. In months five and eight of pregnancy in addition to these measures, subjects also completed the CISS and SSQ. Subjects were informed that the questionnaires were to be completed at home and returned by mail promptly. Reminder phone calls were made to subjects whose questionnaires had not been received for a particular month.

In the middle of the second (approx. 18-19 weeks) and third trimesters (approx. 31-32 weeks), subjects were contacted by telephone for a brief fifteen minute structured interview to inquire about behavioral habits (smoking, caffeine and alcohol consumption) and emotional and/or physical difficulties occurring at each of these stages. Finally, approximately one month after delivery (4-5 weeks),

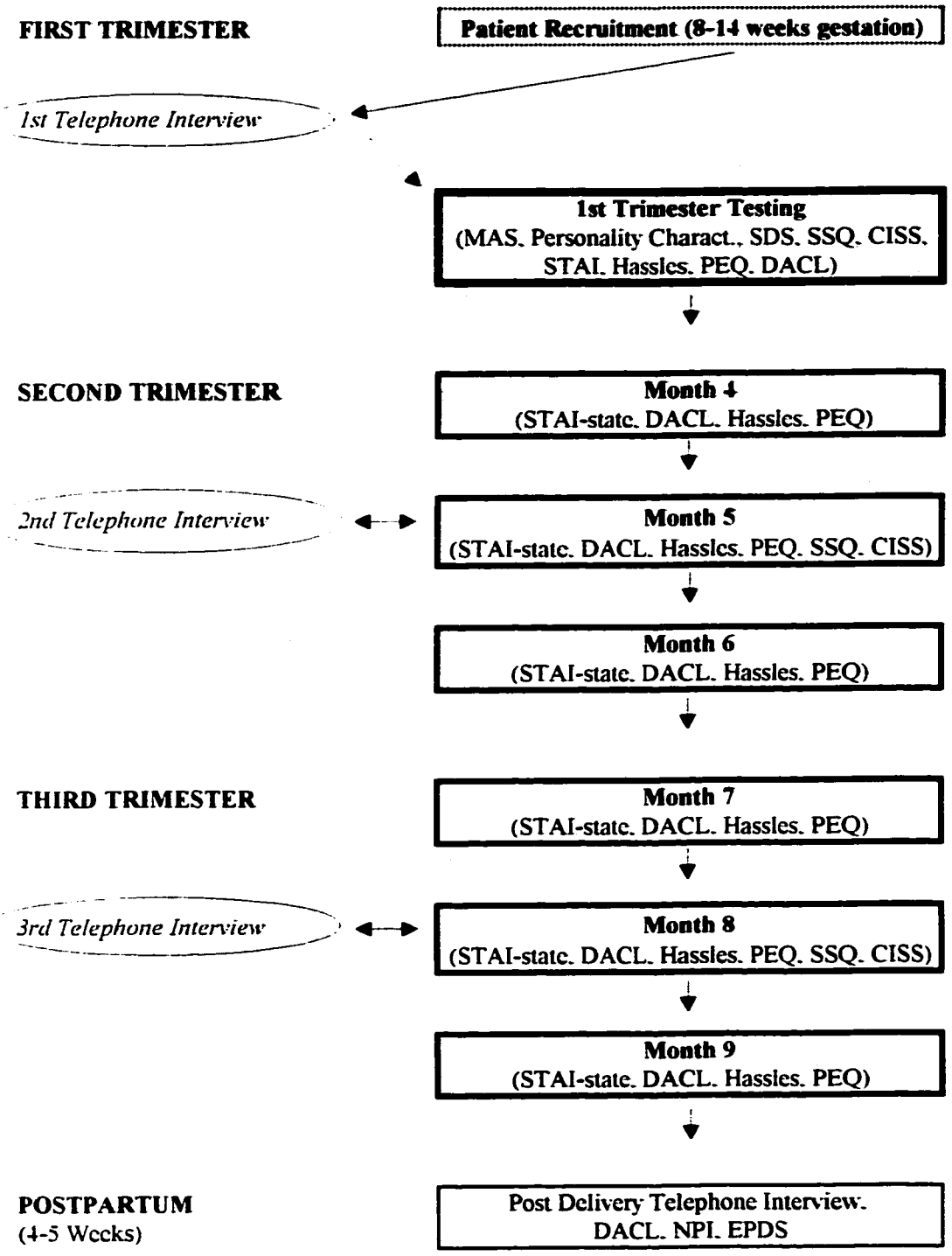

Figure 1: Study Flow Chart

all subjects were contacted by telephone to inquire about the labor/delivery and infant status. At this time the DACL, NPI and EPDS were administered on the telephone. From onset to the completion of the study, there were a total number of ten data collection points including telephone interviews and monthly mailed questionnaires.

Labor and Infant Outcomes

Labor and delivery complications were selected based on outcomes which have the greatest medical significance and have been examined in prior psychosocial research on pregnancy outcome. In order to compute a regression analysis, this outcome variable had to be coded as either an interval or an ordinal scale. Consequently, a code of *0* was assigned to labor/deliveries which progressed normally, instances where one complication occurred were coded as *1*, and a code of *2* was assigned in cases where either two or more complications occurred and/or when delivery was by Cesarean section or occurred prematurely (less than 37 weeks gestation). The seriousness of these latter complications (compared to those assigned a code of 1) are well established in the literature (Berkowitz & Papiernik, 1993; Miller, 1988), and as in prior studies, warrant a code reflecting greater severity (e.g. Terry et al., 1996; Whiffen, 1988). It should be noted that only cesareans indicated by the occurrence of fetal distress or abnormal labor progress were coded as complications of labor/delivery. As shown in Table 2, 44% of the sample experienced a normal labor and delivery, 26% of the

Table 2

Frequency and Rating of Labor/Delivery Difficulties

Code		%	(n)
0	normal labor progress	44%	(34)
1	induced labor - due to abnormal progress and/or fetal distress	17%	(13)
	induced labor - due to prolonged gestation (42 wks)	6%	(5)
	prolonged labor (>18 hrs)	1%	(1)
	ruptured membranes over 24hrs	1%	(1)
	forceps delivery	1%	(1)
2	prolonged labor + forceps	1%	(1)
	prolonged labor + induction	6%	(5)
	induction + forceps	3%	(2)
	Cesarean section (due to fetal distress and/or abnormal labor progress)	12%	(9)
	premature delivery (<37 wks)	8%	(6)

Note: n=77; 3 cases were dropped (1 cesarean for cosmetic reasons; 1 cesarean due to baby in breach position; 1 cesarean due to cephalopelvic disproportion)

women experienced one difficulty during this period, while 30% were given a code of 2, indicating either the occurrence of two difficulties during this stage or a complication with a greater degree of seriousness.

Birth weight was selected as an outcome variable in the present study, as it is regarded as one of the most important objective determinants of newborn health (Collins et al., 1993). Infant birth weight was found to range between 1644 to 4739 g in this sample, with a mean of 3516.64 (SD = 520.48). Two point five percent (2.5%) of the infants weighed less than 2500 g, which the medical literature defines as low birth weight (Cunningham, MacDonald & Grant, 1989). Five percent of the infants in this sample weighed more than 4500 g., which is considered to be abnormally high birth weight.

Data Analyses

The primary statistical analyses in this study consisted of repeated measures analyses of variance (ANOVAs), mixed (between-within) ANOVAs and multiple regression analyses. Statistical considerations applicable to ANOVAs will be discussed first, followed by the multiple regression analyses. Considerations specific to other statistical analyses used (e.g. MANOVAs) in this study appear in the results section.

The Hassles, STAI-state, PEQ and DACL assessed monthly resulted in seven data points per variable for each subject. The first trimester provided one data point per variable only, as questionnaires were completed once (month 3) at this stage of pregnancy. In order to determine whether the multiple data points within the remaining trimesters could be reduced, ANOVAs were computed to examine time differences within each three month block. The results revealed no significant differences between months within the second trimester. Consequently, for each variable, scores were collapsed across three month blocks for the second trimester, resulting in an average second trimester score on each measure. In instances when women forgot to mail in their monthly questionnaire package (month 4= 5 missing; month 5= 1 missing; month 6=4 missing), their second trimester score was averaged from the two available scores for that trimester. This was considered an adequate representation of the second trimester given that the ANOVAs indicated no differences between the three months. With respect to the monthly data for the third trimester, 24 women failed to send in their month nine package because they either delivered before their month nine package was due (n=11) or forgot to send in the last package (n=13). Due to the amount of missing data for this month, comparisons between only months 7 and 8 for each measure were examined using pair-wise t-tests. No significant differences were found between these two months on each variable. Consequently the mean of these two months was computed for each variable to represent the third trimester of pregnancy.

Estimating power for mixed design ANOVAs and to a certain extent repeated measures ANOVAs is rather difficult as power formulas for these designs are not as available (Stevens, 1992). Hence power was estimated for both the repeated measures and mixed ANOVAs using calculations devised for single group within-subjects ANOVAs (Stevens, 1992) and between-subjects ANOVA (Cohen, 1977). Power for the ANOVAs in the present study was found to be between .70 and .84 (based on n=78 or 80; effect size f=.28-.35). Estimates in the lower range occurred when power was calculated using moderate correlations between levels of the repeated measures and/or when using alpha of .01 (in cases when Bonferroni corrections had been applied). Power estimates increased when alpha was set at .05 and/or higher correlations between the levels of the repeated measures were used in the calculations. Overall, the estimated power for the ANOVAs in the present study is within acceptable levels for studies conducted in the domain of psychology (Rossi, 1990).

The assumptions of normality, homogeneity of variance and sphericity (homogeneity of covariance) underlying repeated measures and mixed design ANOVA were verified. Scores on the social support subscale assessing satisfaction with available support (SSQ-S) in each trimester were moderately negatively skewed. Initially, these scores were reflected and several transformations applied (square root; logarithm) as recommended by Tabachnick and Fidell (1989). The ANOVAs yielded the same pattern of results regardless of whether transformations had been applied to this variable. Thus given that the results remained unchanged

and that transformed data are harder to interpret meaningfully, orginal scores on the SSQ-S were used. The assumption of homogeneity of variance was adequately met in the ANOVAs. According to Mauchley's test, the assumption of sphericity was violated only in the repeated measures ANOVAs which examined time differences over pregnancy on depressed mood (DACL), and in the mixed ANOVA which examined mood scores (DACL) over pregnancy in postpartum depressed and nondepressed women. Following recommendations by Stevens, (1992) when this assumption was violated, the significance of the F-ratio was evaluated for each ANOVA using an adjusted degrees of freedom estimated with the Greenhouse-Geisser epsilon. This adjustment results in a more conservative analysis, as it decreases the degrees of freedom when F-ratios are tested as a direct function of the degree to which sphericity has been violated and is recommended with small sample sizes (Steven, 1992). With respect to post-hoc procedures, the Bonferroni correction was applied to test main effects only in the ANOVAs where the sphericity assumption had been violated (Stevens, 1992). This procedure was not applied in cases where sphericity had not been violated as it tends to considerably decrease the power of the statistical analysis (Sedlmeier & Gigerenzer, 1989).

Variables included in the multiple regression analyses were examined to verify that all assumptions pertaining to this statistical analysis were met. Normality was evaluated by tests of skewness. The handling of the few instances where departures from normality occurred are discussed in the results section.

Assumptions of univariate and multivariate linearity and homoscedasticity were evaluated by examining scatterplots of residuals. These observations indicated no serious departures from linearity. Efforts were taken to ensure that the ratio of number of subjects to predictor variables would not exceed 10:1 as recommended by Tabachnick and Fidell (1989; pp. 129). In two regression analysis, due to interaction testing, the ratio was 8:1, which still exceeds the minimum requirement of 5:1 (Tabachnick and Fidell, 1989). Power in each of the multiple regression equations was estimated to be .90-95, depending on the number of subjects and the number of predictors entered into the equation (Cohen, 1977). These power estimates were based on calculations using n=76-80 subjects, 5-9 predictors, alpha =.05 and a medium effect size (Multiple R^2=.25).

Results

Overview

Five main sets of analyses were conducted to test the five major questions of this study. The first examined psychosocial adjustment during pregnancy. This was done by examining Hassles, state anxiety (STAI-state) and pregnancy-specific stress (PEQ) scores over the three trimesters of pregnancy using a multivariate repeated measures analysis of variance (MANOVA). Repeated measures analysis of variance (ANOVAs) were also conducted to determine whether depressed mood, coping style and social support changed over the course of pregnancy.

The second set of analyses examined predictors of labor/delivery difficulties and lower infant birth weight. The aim was to determine the role of psychosocial variables, above and beyond demographic and medical factors in predicting these outcomes. Hierarchical multiple regression analyses were computed for this purpose.

A third aim of this study was to identify predictors of elevated stress during pregnancy, using measures administered early in pregnancy. To this end, a standard multiple regression was computed.

A fourth series of analyses compared nondepressed women with women depressed only during pregnancy and those depressed at the postpartum assessment on a number of demographic and pregnancy related variables, psychosocial factors, and labor/delivery complications. Categorical variables were compared by means of chi-square tests, continuous variables were compared using ANOVAs, while variables assessed repeatedly during the pregnancy were compared using repeated measures ANOVAs and a repeated measures MANOVA.

A final goal involved examining predictors of depressed mood during pregnancy and the postpartum. For the purpose of these analyses depressed mood was entered as a continuous variable, in order to identify psychosocial factors which place pregnant women at higher risk of experiencing higher levels of depressive symptomology at each stage (pre- and postpartum). Two hierarchical multiple regression analyses were computed for this purpose.

I. Psychosocial Adjustment During Pregnancy

A. Sample Means on Stable Psychosocial Variables

The sample mean for marital adjustment was 116.61 (SD = 14.31), suggesting a high level of marital harmony (Nowinski & LoPiccolo, 1979). The sample means for trait anxiety, self-confidence and easygoing disposition are also shown in Table 3. As well for the purpose of comparisons, the normative scores for non-clinical samples between the ages of 19-39 are included for each scale.

B. Stress During Pregnancy

Given the theoretical relationship between Hassles, STAI-state and the PEQ, the pattern of intercorrelations among these variables (see Table 4), and to avoid the alpha inflation that would occur from performing three univariate repeated measures ANOVAs, a repeated measures MANOVA was computed. The assumptions of multivariate normality and homogeneity of variance-covariance matrix required for MANOVA were evaluated. The latter assumption was not adequately met. Consequently, the Pillai criterion was used to determine multivariate significance as this test is less severely influenced by heterogeneity (Tabachnick & Fidell, 1989). The Pillais criterion indicated a significant Time effect (F (6,74) = 6.18, p <.001). Examination of the Roy-Bargman Step-down F-tests indicated that Hassles and the PEQ contributed significantly to the multivariate F statistic.

Table 5 presents the means and standard deviations for Hassles, STAI-state and the PEQ for each trimester. Pairwise t-tests for Hassles using the Bonferroni corrected alpha value set at .017 indicated no significant differences between the

Table 3

Sample Means (SDs) on Stable Psychosocial Variables

Variables	Mean	(SD)	Population Norms
Marital Adjustment	116.61	(14.31)	100.00 (15.00)
STAI-trait	39.44	(10.29)	36.42 (10.59)
SDS	18.79	(4.66)	16.8 (5.5)
Self-confidence	21.41	(3.90)	--
Easygoing Disposition	11.34	(2.33)	--

Table 4

Correlations Among Stress Variables Included in the MANOVA

	2.	3.	4.	5.	6.	7.	8.	9.
1.Stai-1	.65***	.55**	.59***	44***	.35**	.56***	.42***	45***
2. Stai-2		.71***	.48***	.59***	.48***	.47***	.53***	.56***
3.. Stai-3			.49***	.51***	.55***	.51***	.54***	.60***
4. Hassles1				.78***	.62***	.57***	.54***	.50***
5. Hassles2					.83***	.59***	.65***	.62***
6. Hassles3						.59***	.65***	.63***
7. PEQ1							.73***	.71***
8. PEQ2								.81***
9. PEQ3								-

**p < .01; ***p<.001

Table 5

Means (SDs) for the Stress Measures

	Trimester		
Variable	First	Second	Third
Hassles	33.14 (18.29)	29.64 (14.10)	29.42 (15.80)
STAI-state	36.83 (11.40)	37.66 (8.60)	39.13 (9.43)
PEQ	67.13 (10.06)[a]	64.38 (8.68)[b]	66.38 (8.82)[a]

[a,b] denotes a significant Time difference ($p < .01$)

three trimesters. Pairwise t-tests for the PEQ, using the Bonferroni corrected alpha value set at .017, indicated that these scores were higher in the first trimester as compared to the second trimester ($p < .01$) and trimester three scores on the PEQ were significantly higher than in the second trimester ($p < .01$). No significant difference was found between PEQ scores obtained in the first and third trimesters.

C. Depressive Symptomology During Pregnancy

A repeated measures ANOVA revealed a significant effect of time on the DACL (F (1.67,132.02) = 5.73, p <.01). As shown in Table 6, pairwise-tests, using the Bonferroni corrected alpha value set at .017, indicated that women scored higher on the DACL in the first trimester compared to the second ($p < .01$) and third trimesters (p =.014). No differences were found on the DACL when comparing trimesters two and three, indicating that depressed mood scores remained stable during these two trimesters.

D. Coping Styles During Pregnancy

Four repeated measures ANOVAs were carried out to examine any differences over time on the four coping styles measured (Task, Emotional, Avoidance and Distraction). Bonferroni correction was set at .0125, in order to control for possible alpha inflation.

The means and standard deviations for the four coping styles assessed in each trimester are shown in Table 7. The ANOVA results for Task-oriented coping revealed a significant effect of Time (F (2,158) = 10.08, p<.001). Results for the ANOVA on Emotional coping revealed a significant effect of Time (F (2,158) =

Table 6

Means and (SDs) on the Depressive Symptomology (DACL) During Pregnancy

Variable	Trimester 1	Trimester 2	Trimester 3
DACL	11.08 (6.09)[a]	9.39 (4.26)[b]	9.56 (4.52)[b]

[a,b] denotes a significant Time difference ($p < .01$)

Table 7

Means (SDs) for Coping Styles During Pregnancy

Coping Style	Trimester 1	Trimester 2	Trimester 3	Population Norms
Emotion	41.79 (10.75)[a]	35.88 (10.77)[b]	35.34 (10.72)[b]	43.54 (12.91)
Task	56.59 (9.16)[a]	53.23 (9.68)[b]	52.38 (10.36)[b]	57.42 (10.86)
Avoidance	41.51 (9.52)[a]	38.69 (9.28)[b]	36.91 (8.91)[c]	46.62 (11.32)
Distraction	18.43 (5.84)[a]	17.16 (5.39)[b]	16.06 (5.45)[c]	21.88 (6.77)

Note [a, b, c] denotes significant Time differences.

32.20, p<.001). Main effects of Time were also shown in the ANOVAs computed on Avoidance F (2,158) = 14.60 (p < .001) and Distraction F (2,158) 10.98 (p <.001). Pairwise t-tests, revealed that Task-oriented coping was significantly higher in the first trimester compared to the second (p <.001) and third trimesters (p <.001), while no difference was found between the second and third trimesters. Emotional coping was also found to be significantly higher in the first trimester compared to the second (p <.001) and third trimesters (p <.001). No difference was found on emotional coping scores obtained in the second and third trimesters. These findings suggest that while the use of task and emotional coping are higher in the first trimester, the use of these strategies decrease and remains stable in the second and third trimesters. With respect to emotional coping, the decrease observed in the second and third trimester appears substantially lower compared to population norms obtained from a sample of women within the same age group.

Pair-wise t-tests for avoidance coping indicated significantly higher scores in the first trimester when comparing it to the second (p <.01) and third trimesters (p <.001) and significantly higher scores in the second trimester when comparing it to the third (p <.05). This same pattern of results was found for distractive coping with significantly higher scores in the first trimester compared to the second (p <.05) and third trimesters (p <.001) and significantly higher scores in the second trimester when comparing it to the third trimester (p <.05). These results suggest that the use of avoidance and distractive coping strategies decrease as the

pregnancy progresses. Compared to population norms, the means during pregnancy are lower, particularly as the gestation progresses.

E. Perceived Social Support During Pregnancy

The SSQ yields two scores, one indicating the perceived number of support persons (SSQ-N) and the other the degree of satisfaction with the social support system (SSQ-S). Two repeated measures ANOVAs were computed to investigate differences over time on these measures. Bonferroni correction was set at .025, in order to control for possible alpha inflation.

The means and standard deviations for these two dimensions of social support assessed in each trimester are shown in Table 8. No significant time effect was found in the ANOVA on the SSQ-N. The ANOVA results for the SSQ-S revealed a significant difference over pregnancy ($F(2,158) = 4.49$, $p < .025$). Pairwise t-tests, indicated that SSQ-S scores were marginally lower in the second trimester when comparing it to the first ($p < .10$) and significantly lower when compared to the third trimester ($p < .01$). No significant difference on SSQ-S scores was found between the first and third trimester of pregnancy.

II. Predicting Labor/Delivery Difficulties and Low Infant Birth weight

A. Preliminary Analyses

The Pearson correlations among the measures assessing stress (Hassles, STAI-state, PEQ) indicated that these variables were highly intercorrelated and had a similar pattern of relationship to labor/delivery progress. Three principle

Table 8

Means and (SDs) on Social Support Variables During Pregnancy

Variable	Trimester 1	Trimester 2	Trimester 3
SSQ-N	3.55 (1.50)	3.38 (1.26)	3.42 (1.22)
SSQ-S	5.40 (.61) [a]	5.27 (.71)[b]	5.47 (.59)[a]

[a,b] denotes a significant Time difference.

component factor analyses were performed using scores obtained on Hassles, STAI-state and the PEQ in each trimester (see Appendix D). Bartlett's test of sphericity for all three factor analyses was significant ($p < .001$), indicating that the correlations in the matrices were suitable for factor analysis. Additionally, the overall Kaiser-Meyer-Olkin (KMO) index was above .70 and individual KMO values were between .66-.76, further indicating the suitability of the correlation matrices for factor analysis (Tabachnick & Fidell, 1989).

All three factor analyses yielded a strong factor (unrotated). The factor representing stress in the first trimester had an eigenvalue of 2.15 and accounted for 72 % of the variance. The second factor analysis using scores on the Hassles, STAI-state and PEQ obtained in the second trimester, yielded a factor with an eigenvalue of 2.18 and accounted for 73% of the variance. The factor analysis for the third trimester yielded a factor with an eigenvalue of 2.15 and accounted for 72% of the variance. Consequently, a factor score for Multidimensional Stress was created for each trimester by multiplying the factor score coefficients for each measure in each trimester by the scores for each variable in each trimester.

A repeated measures ANOVA was computed to determine any differences over trimesters on the Multidimensional Stress factor scores. The ANOVA revealed no significant time differences on Multidimensional Stress scores in each trimester of pregnancy.

Given the stability of the Multidimensional Stress scores across the three trimesters of pregnancy, a final factor analysis was computed using scores for

Hassles, STAI-state and the PEQ, each collapsed across trimesters, in order to obtain a Multidimensional Stress score representative of the entire pregnancy. Bartlett's test of sphericity was significant ($p < .001$) and the KMO index was above .70, as were all the KMO values, indicating the suitability of the correlation matrix for factor analysis. The factor resulted in an eigenvalue of 2.28 and accounted for 76% of the variance. All factor loadings were greater than .86. A factor score representing Multidimensional Stress level over the entire pregnancy was created by multiplying the factor coefficients for each measure by the scores for each variable (collapsed across trimesters). This factor score representing Multidimensional Stress over pregnancy was used in subsequent analyses aimed at identifying predictors of labor/delivery difficulties and low birth weight. This allowed for a more comprehensive examination of stress that would not have been possible given their intercorrelations, had they been entered simultaneously in the multiple regression analyses.

B. Predictors of Labor/Delivery Complications

A hierarchical multiple regression analysis was computed in order to determine psychosocial predictors of difficult labor/deliveries, while controlling for demographic, biomedical factors and behavioral habits. Variable selection was based on theoretical relevance, statistical intercorrelations among variables (see Appendix E.1) and the assumptions underlying multiple regression.

With the exception of age, no other demographic variables (e.g. income, education, years married/co-habiting) was selected due to their low and nonsignificant correlation with the outcome variable. As well, no relationship was found between the occurrence of a gestational complication and a more difficult labor/delivery, hence this variable was not included in the multiple regression analysis.

Evaluation of the assumptions for multiple regression resulted in a square root transformation of weekly caffeine consumption in the third trimester in order to reduce the moderately positive skewness in its distribution. All other assumptions (linearity, homoscedasticity and normality of residuals) were met.

Parity was entered in the first step, in order to control for this biomedical influence. In step 2, maternal age and weekly caffeine consumption in the third trimester were entered, followed by the Multidimensional Stress score in step 3. Emotional coping and distractive coping during pregnancy (collapsed across trimesters) were entered after the stress factor in step 4, in order to determine whether the women's coping style during pregnancy had an effect on labor/delivery progress, once levels of stress were taken into account.

Emotional coping and distractive coping styles were selected from the four styles measured in the Coping Inventory on the basis of the following rationales. Firstly, the pattern of intercorrelations between the these two styles and the outcome variable as well as results from prior studies, suggested that emotional and distractive styles may have the most potential for moderating the effects of

stress. As well, inclusion of all the coping styles and their interactive terms with the Multidimensional Stress score would decrease the subjects per variable ratio and hence fail to meet the minimum requirement needed for multiple regression.

Finally, to test the hypothesis that coping styles during pregnancy would moderate the effects of stress during pregnancy on the outcome variable, interaction terms between emotional coping and the Multidimensional Stress score and for distractive coping and the Multidimensional Stress score were created. The interaction terms were entered in the fourth and fifth step of the analysis, as the significance of an interaction term cannot be tested without first controlling for the component main effects (Cohen & Cohen, 1983). The preliminary results of the multiple regression revealed that these interactions were not significant and thus these terms were dropped from the final analysis.

Table 9 displays the standardized regression coefficient (Beta), the correlation (r) between each independent variable and labor/delivery difficulties, and the squared semi-partial correlation coefficient (SR^2), the significance of t, R^2, and adjusted R^2. At step 5, with all the variables in the equation, the R^2 value showed that 25% of the variability in labor/delivery difficulties could be accounted for by these set of predictors.

In the first step, parity accounted for 8% of the variance, as primiparous women experienced a more difficult labor/delivery. Maternal age in the second step resulted in a significant change in R^2, with younger women having a more difficult labor/delivery. On the third step, the stress score was a significant predictor of

Table 9

Hierarchical Regression Predicting Labor/Delivery Difficulties

Variable	Beta	r	Sr^2	t
Step 1				
Parity	-.27	-.27	.08	-2.47*
R^2=.08 Adj R^2=.06				
F(1,75)=6.10**				
Step 2				
Maternal Age	-.26	-.31	.05	-2.14*
Weekly Caffeine Beverages (Third Trimester)	-.17	-.21	.03	-1.55
R^2=.15 Adj R^2=.11				
F (3,73)=4.24**				
Step 3				
Maternal Stress	.26	.29	.06	2.37*
R^2 = .21 Adj R^2 = .17				
F(4,72)=4.79**				
Step 4				
Emotional Coping	-.18	.11	.02	-1.32
Distractive Coping	.21	.24	.03	1.75t
R^2=.25 Adj R^2=.19				
F(6,70)=3.99**				

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

more difficult labor/deliveries ($R^2 = .21$, $F(4,72) = 4.79$, $p < .005$), adding 6% of unique predictive variance after controlling for age, parity and number of weekly caffeinated beverages in the third trimester. In the final step, a trend was shown for engaging in higher distractive coping during pregnancy as a predictor of more difficult labor/deliveries, explaining an additional 3% of the variance.

In summary, these findings suggest that women who are younger and are giving birth for the first time have a more difficult labor/delivery. As well, the results suggest that higher stress during pregnancy, conceptualized as daily hassles, state anxiety and pregnancy-specific stressors, is predictive of greater difficulty during labor/delivery, as is the use of distractive coping during pregnancy.

C. Predictors of Low Infant Birth weight

Multiple regression analyses were used to identify psychosocial predictors of low infant birth weight, while controlling for demographic, biomedical and lifestyle variables. Following the practice of Collins et al., (1993), infants weighing more than 4500 gms (n=6) were dropped from this set of analyses as this is considered to be abnormally high birth weight. Variable selection was based on theoretical relevance, statistical correlations among variables (see Appendix E.2) and the assumptions underlying multiple regression. As a result of the high correlation between Multidimensional Stress and depressed mood during pregnancy ($r = .73$) and because the minimum ratio of cases to independent variables would not be met if both these variables were entered in the same

regression equation along with their interaction terms with moderator variables, two separate hierarchical multiple regression analyses were computed using the same order of entry.

The variables were evaluated to ensure that all assumptions for multiple regression analysis were met. No outliers were found with the exception of gestational weeks. All variables were normally distributed, with the exceptions of gestational weeks, which was severely negatively skewed, and the SSQ-S which was moderately negatively skewed. Because the distribution for gestational weeks departed so severely from normality, none of the common transformations (e.g. square root) recommended by Tabachnick and Fidell (1989) were helpful. An alternative transformation which involves grouping the data was employed. Weeks gestation which ranged from 35-42 weeks were grouped in the following manner (35-36=*0*; 37=*1*; 38-39=*2*; 40=*3*; 41=*4*; 42=*5*). This transformation was effective in producing a more normal distribution for weeks gestation. Evaluation of the residuals scatterplots to test for the assumptions of univariate and multivariate linearity and homoscedasticity indicated no serious departures from linearity, regardless of whether a logarithm or square root transformation had been applied to the SSQ-S. As well, because transforming the SSQ-S did not affect the results of multiple regression, original scores were used.

Given the relationship between birth weight and gestational age, gestational weeks was entered in the first step in order to control for lower birth weight as a result of earlier gestation. In the second step, parity, income, and exposure to

partner's smoking were entered in an effort to control for the impact of such demographic and environmental risk factors. In the third step the following psychosocial variables were entered; Multidimensional Stress during the pregnancy, emotional coping in the second trimester and satisfaction with social support (SSQ-S) in the second trimester. The interaction term between Multidimensional Stress during pregnancy and emotional coping in the second trimester was entered in the fourth step, followed by the interaction term between Multidimensional Stress during pregnancy and perceived social support in the second trimester.

Table 10 summarizes the results of this regression analysis. Together this set of predictors explained approximately 46% of the variance in infant birth weight. The variables entered in the second step contributed significantly even after controlling for gestational age, with parity and exposure to partner's cigarette smoke each explaining 4% of unique variance, while income added an additional 3%. The psychosocial variables entered in the third step were also significant, as higher satisfaction with social support in the second trimester accounted for 6% of unique variance and greater use of emotional coping in the second trimester explained an additional 5% of the variance in birth weight. The interaction terms were not found to significantly improve prediction.

Table 11 presents the results of the second regression which included the same variables and order of entry used in the previous regression, with the

Table 10

Hierarchical Regression Predicting Infant Birth Weight

Variable	Beta	r	Sr^2	t
Step 1				
Gestational Age	.44	.44	.19	4.21^{***}
R^2=.19 Adj R^2=.18				
F (1,74)=17.71^{***}				
Step 2				
Parity	.19	.21	.04	1.97^{t}
Income	.18	.32	.03	1.75^{t}
Exposure to Partner Smoking	-.19	-.24	.04	-1.95^{t}
R^2 =.32; Adj R^2 =.28				
F (4,71) = 8.38^{***}				
Step 3				
Emotional Coping (Second Trimester)	.30	.20	.05	2.42^{*}
SSQ-S (Second Trimester)	.29	.21	.06	2.79^{**}
Maternal Stress during pregnancy	.00	.01	.00	.03
R^2 = .44 Adj R^2 = .39				
F (7,68) = 7.68^{***}				
Step 4				
Emotional Coping x Maternal Stress	.08	.01	.01	.87
R^2=.45 Adj R^2=.38 F(8,67)=6.87^{***}				
Step 5				
Social Support x Maternal Stress	.11	.13	.01	.87
R^2=.46 Adj R^2=.38 F(9,66)=6.16^{***}				

^{t} $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

Table 11

Hierarchical Regression Predicting Infant Birth Weight

Variable	Beta	r	Sr^2	t
Step 1				
Gestational Age	.44	.44	.19	4.21^{***}
R^2=.19 Adj R^2=.18 F (1,74)=17.71***				
Step 2				
Parity	.19	.21	.04	1.97^{t}
Income	.18	.32	.03	1.75^{t}
Exposure to Partner Smoking	-.19	-.24	.04	-1.95^{t}
R^2 =.32; Adj R^2 =.28				
F (4,71) = 8.38***				
Step 3				
Emotional Coping (Second Trimester)	.24	.20	.03	2.05^{*}
SSQ-S (Second Trimester)	.31	.21	.08	3.20^{**}
Depressed mood during pregnancy	.11	.11	.01	.96
R^2 = .45 Adj R^2 = .40				
F (7,68) = 8.00***				
Step 4				
Emotional Coping x Depressed mood	.17	.02	.02	1.67
R^2=.47 Adj R^2=.41 F(8,67) = 7.53***				
Step 5				
Social Support x Depressed Mood	.31	.16	.05	2.58^{*}
R^2=.52 Adj R^2=.46 F(9,66)=8.00***				

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

exception that Multidimensional Stress was replaced with depressed mood during pregnancy. These variables were found to explain approximately 52% of the variance in infant birth weight. The same pattern of results emerged in steps 1 and 2. In step 3, social support now accounted for 8% of the unique variance in birth weight, while emotional coping added 3% of unique variance. The interaction between emotional coping and depressed mood did not significantly increase $\underline{R^2}$. The interaction between social support in the second trimester and depressed mood during pregnancy was significant. Figure 2 illustrates this interaction with the regression of birth weight on satisfaction with social support in the second trimester plotted at one standard deviation above and below the mean of depressed mood (Cohen & Cohen, 1983). Satisfaction with social support was unrelated to birth weight when depressed mood during pregnancy was low ($\underline{\beta}$ = .07). When depressed mood during pregnancy was high, greater satisfaction with social support in the second trimester predicted higher birth weight ($\underline{\beta}$ = .44).

The relationship between lower social support satisfaction in the second trimester and lower birth weight is unlikely to be mediated by behavioral habits such as maternal smoking, alcohol intake and caffeine consumption during pregnancy, as these lifestyle variables were not significantly correlated with birth weight (see Appendix E.2). A significant correlation between a possible mediator variable and the outcome variable is one of the first conditions needed when testing mediational hypotheses (Baron & Kenny, 1986).

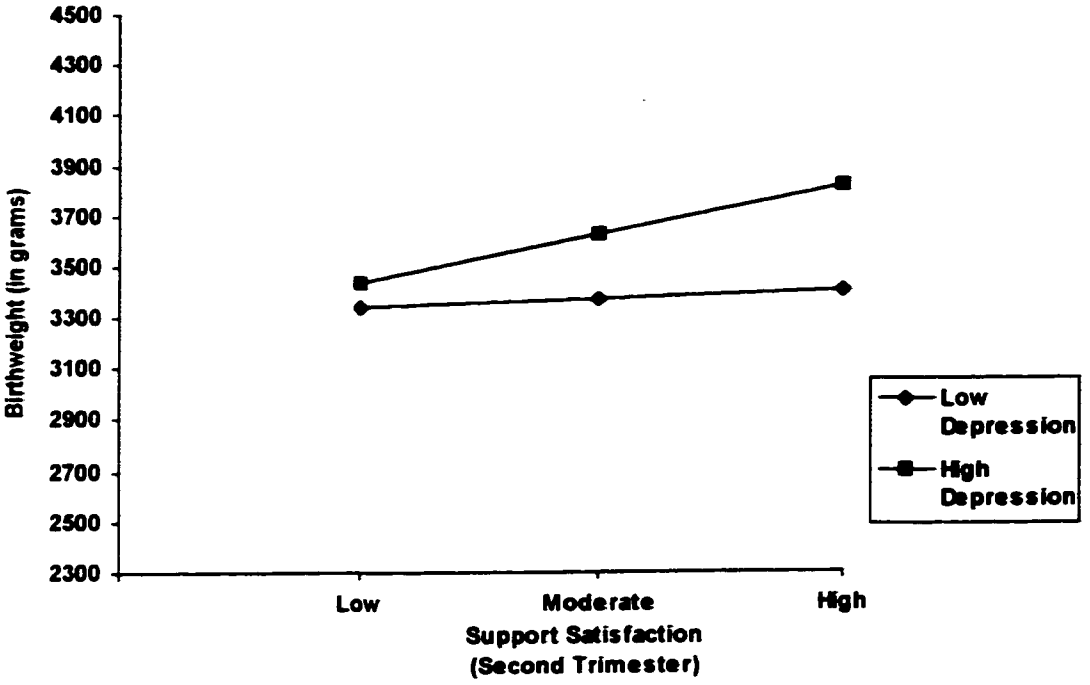

Figure 2. Interaction between depressed mood during pregnancy and maternal satisfaction with social support in the second trimester for the prediction of birth weight.

D. Predicting Multidimensional Stress During Pregnancy

A multiple regression was computed in order to determine predictors of higher scores on the multidimensional stress factor during pregnancy. Demographic, medical and psychosocial variables were considered as potential predictors. Only those variables that had significant pairwise correlations with the dependent variables were included in the regression analysis. The variables entered were; maternal age, perception of the impact of pregnancy on one's career, marital adjustment (MAS), self-confidence, emotional coping and satisfaction with social support (SSQ-S). Among these, only psychosocial variables assessed in the first trimester were selected, as the major aim of this analysis was to identify early predictors of high stress during pregnancy.

Given the high correlation between depressed mood in the first trimester and the multidimensional stress factor ($r = .73$), depressed mood was not entered into the equation as a predictor of multidimensional stress during pregnancy. Variables were entered together in one block in what is known as a simultaneous entry (Cohen & Cohen, 1983). This method was used as there was no *a priori* theoretical reason for entering the variables in a specific order.

Table 12 summarizes the results of this regression analysis. Approximately 47% of the variance in stress during pregnancy was explained by the set of predictors entered. Higher stress during pregnancy was related to younger age, perceiving pregnancy as having a negative impact on one's career, lower marital adjustment, lower self-confidence, using more emotional coping strategies and

Table 12

Summary Statistics for Multiple Regression Analysis Predicting Stress During Pregnancy

Predictors	Beta	r	Sr^2	t
Age	-.22	-.28	.05	-2.51*
Impact on Career	-.21	-.36	.04	-2.40*
MAS	-.23	-.40	.04	-2.40*
Self-Confidence	-.03	-.33	.0	-.34
Emotional Coping (First Trimester)	.35	.54	.09	3.50***
SSQ-S (First Trimester)	-.13	-.30	.01	-1.40

R^2 = .47; Adj R^2 = .42; F(6,73)=10.66, p < .0001

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

reporting less satisfaction with social support. Unique contributions to $\underline{R}^2$ were greatest for emotional coping (9%) and maternal age (5%), while poor marital adjustment and perceiving the pregnancy as having a negative impact on one's career each accounted for 4% of unique variance.

III. Depressed Mood During Pregnancy and in the Postpartum

A. Prevalence of Postpartum Depressed Mood

A significant positive correlation between the DACL and the EPDS, both administered 4-5 weeks postpartum, was found ($\underline{r} = .53$, $p < .001$), suggesting that the two scales assess similar features of dysphoria. Cox et al. (1987) reported that an EPDS score of 13 indicates a probable case of postpartum depression, while a cut-off point of 10 or more would include possible cases. Given the small sample size in the present study a cut-off score of 10 or more on the EPDS was used as indicative of postpartum depression. A lower cut-off score, however, increases the probability of incorrectly classifying nondepressed women as depressed. In an effort to reduce this probability, a cut-off score of 14 or more on the DACL (Lubin, 1967) was also established in order to classify women as experiencing postpartum depression.

Using these criteria (EPDS $\geq$ 10 and DACL $\geq$14), 11 women were classified as depressed. Further examination of their scores on both these measures revealed that two women obtained a score of 14 or more on the EPDS and at least 11 on the DACL. Given the literature indicating that scores of 13 or more on the

EPDS are highly sensitive for correctly identifying true depression cases, these women were also included in the depressed group. Two women in the sample obtained scores of over 20 on the DACL but 7 or less on the EPDS. As these women could not be reliably classified as either depressed or nondepressed, they were dropped from further analyses of postpartum depression.

In total, 13 women (16%) met the criteria for inclusion in the Postpartum Depressed Group (POST-DEP). Examination of their DACL scores obtained during pregnancy as shown in Table 13, revealed that 6 (46%) women scored less than 14 on the DACL in each trimester of pregnancy while the remaining 7 (54%) women scored 14 or more in at least one or more trimesters during their pregnancy. Hence slightly more than one-half (n= 7) of the women in the POST-DEP group (n = 13) reported elevated depressed mood in at least one trimester of pregnancy.

A repeated measures ANOVA was computed on DACL scores obtained during pregnancy (within factor) to determine whether postpartum depressed women differed from the nondepressed postpartum group (between factor). As shown in Table 14, a significant group difference was found on depressed mood during pregnancy ($F(1,76) = 4.28$, $p < .05$). Examination of the group means collapsed across time using pairwise t-tests, indicated that women in the postpartum depressed group scored higher on depressed mood during pregnancy compared to women who were not depressed in the postpartum ($p < .001$).

Table 13

DACL Scores During Pregnancy for Postpartum Depressed and Nondepressed Women

DACL Scores	Postpartum Depressed (n=13)	Nondepressed Postpartum (n=65)
less than 14	46% (6)	69% (45)
14 or higher (in 1 or more trimesters)	54% (7)	31% (20)

Table 14

Means (SD) for Depressed Mood During Pregnancy for Women Depressed and Nondepressed in the Postpartum

	Groups	
	Postpartum Depressed	Nondepressed
Postpartum	(n=13)	(n=65)
Trimester 1		
DACL	13.85 (9.17)[a]	10.34 (5.2)
Trimester 2		
DACL	11.42 (6.82)[a]	9.13 (3.47)
Trimester 3		
DACL	11.15 (6.14)[a]	9.22 (4.10)

Note. [a] denotes a significant main effect for group, i.e.,collapsed across time.

B. Prevalence of Prepartum Depressed Mood

Although sixty-five (65) women were not depressed in the postpartum, examination of their DACL scores during pregnancy indicated that 31% of the nondepressed postpartum women (n=20) had obtained elevated depressed mood scores (DACL 14 or more) in at least one trimester during pregnancy (see Table 15). Hence, twenty-five percent (n=20) of the women in this sample experienced depressed mood in at least one trimester of pregnancy but did not go on to report depressed mood in the postpartum. To determine differences between women who report depressed mood only in the prepartum compared to those who experience depressed mood postpartum, a group comprised of women depressed during pregnancy (PREG-DEP) was formed. The remaining 45 women who did not report depressed mood both during pregnancy and in the postpartum served as the control group. This distinction allowed for an examination of factors related to depression during the prepartum and the postpartum periods.

C. Group Comparison Demographic and Stable Psychosocial Variables

Table 16 presents selected demographic variables for the postpartum depressed, depressed during pregnancy only and the nondepressed control group. No group differences were found on age, combined annual income, years education, years living together, parity, number of prior children, and whether the current pregnancy had been planned.

Table 15

Proportion of Women in Each Group Obtaining Elevated DACL Scores During Pregnancy

Variable		Group	
DACL	Control (n=45)	PREG-DEP (n=20)	POST-DEP (n=13)
First Trimester:			
Mean (SD)	8.00 (3.44)	15.60 (4.52)	13.85 (9.17)
0-13	100% (45)	30% (6)	54% (7)
14 or more	--	70% (14)	46% (6)
Second Trimester:			
Mean (SD)	8.12 (2.58)	11.39 (4.17)	11.42 (6.82)
0-13	100% (45)	65% (13)	77% (10)
14 or more	--	35% (7)	23% (3)
Third Trimester:			
Mean (SD)	8.12 (3.15)	11.70 (4.94)	11.15 (6.14)
0-13	100% (45)	65% (13)	77% (10)
14 or more	--	35% (7)	23% (3)

Note: Women who were not depressed in the postpartum but scored 14 or more on the DACL during pregnancy, comprised the depressed during pregnancy group (n=20), while those scoring less than 14 comprised the Control group (n=45).

Table 16

Means (SD) for Postpartum Depressed and Nondepressed Women on Demographic Variables

	Group			
	POST-DEP (n=13)	PREG-DEP (n=20)	Controls (n=45)	
				F (75)
Maternal Age	27.23 (3.14)	29.35 (4.22)	29.64 (3.50)	2.24
Income	5.0 (2.08)	5.40 (2.30)	6.00 (1.91)	1.40
Yrs Education	14.85 (3.34)	14.45 (2.96)	15.02 (2.82)	.03
Time living together[1]	3.08 (1.38)	3.60 (1.39)	3.76 (1.54)	.92
Number of Children	.31 (.63)	.60 (.82)	.55 (.75)	.66

Combined income scale - 8 categories; category '5' = $40,000 - $50,000; '6' = $50,000- $60,000.

Time living together scale- 6 categories; '1' = < 1 year; '2' = 1-2 years; '3' = 2-3 years.

Table 16 (Continued)

	Group			
	POST-DEP (n=13)	PREG-DEP (n=20)	Control (n=45)	X^2
Parity				1.33
Primiparous	77% (10)	60% (12)	60% (27)	
Multiparous	23% (3)	40% (8)	40% (18)	
Unplanned pregnancy	53% (7)	30% (6)	24% (11)	4.10

Analyses of variance (ANOVAs) were computed to determine group differences on the stable psychological variables assessed during the first trimester and on marital adjustment. Significant group differences were found on the STAI-trait (F (2,75) = 10.26, p <.001) and on easygoing disposition (F (2,75) = 4.80, p <.01) (see Table 17). Tukey comparisons (using the harmonic mean due to unequal sample sizes) indicated that women in the postpartum depressed group and those who were depressed during pregnancy only, scored higher on the STAI-trait (p <.05) compared to women in the control group. These findings indicate that women who report higher depressed mood during pregnancy and/or during the postpartum score higher on trait anxiety compared to nondepressed women. The postpartum depressed group also scored significantly lower on easygoing disposition (p <.05) compared to women who were not depressed in the pre- and postpartum period. No significant group differences were obtained for self-confidence, marital adjustment, and social desirability.

D. Group Comparisons on Prepartum Stress, Coping and Social Resources

Analyses of variance (ANOVAs) and a multivariate analysis of variance were computed in order to examine any group or group by time differences on

Table 17

Means (SD) for Postpartum Depressed, Prepartum Depressed and Nondepressed Pre- and Postpartum Women on Stable Psychological Variables and Marital Adjustment

	Group		
	POST-DEP (n=13)	PREG-DEP (n=20)	Control (n=45)
STAI-trait	45.54 (13.35)[a]	44.85 (9.93)[a]	35.44 (7.56)[b]
Easygoing	10.23 (2.52)[a]	10.55 (2.09)	12.00 (2.21)[b]

Note. [a,b] denote a significant main effect for group.

stress, coping and social support variables assessed in each trimester during pregnancy. Time differences for the sample (collapsed across groups) were discussed earlier in Section I (entitled: Psychosocial Adjustment During Pregnancy). These results will be discussed only in terms of group or group by time differences, as the aim of these analyses was to compare depressed and nondepressed women.

1. Prepartum Stress

A repeated measures MANOVA was computed for the variables assessing stress during pregnancy. This choice was based on the theoretical relationship and pattern of intercorrelations among these variables as well as to reduce alpha inflation that would occur from performing three univariate repeated measures ANOVAs. Evaluation of the assumptions for MANOVA indicated that they had been adequately met. Specifically, the Mahalanobis distance measure failed to indicate multivariate outliers and both univariate (Bartlett-Box) and multivariate (Box's M) tests evaluating the homogeneity of variance-covariance matrix revealed that these assumptions had been satisfactorily met. The results revealed a significant main effect of Group, (F (6,148) = 2.68. $p < .05$). Examination of stepdown F-tests (which are more appropriate than examining univariate F-tests when the dependent variables are correlated; Tabachnick & Fidell, 1989) revealed that the hassles and the STAI-state contributed significantly to the multivariate F-

statistic (see Appendix E.3 for the MANOVA summary table). Table 18 presents the means and standard deviations for the Hassles and the STAI-state for each group during pregnancy. Examination of the means using Tukey comparisons (calculated with the harmonic mean due to unequal group sizes) collapsed across time, indicated that the prepartum depressed only group reported significantly more Hassles during pregnancy compared to the control group ($p < .05$). No significant difference was found when comparing postpartum depressed women to both the prepartum depressed only women and the control group. With respect to the STAI-state both depressed groups reported higher state anxiety during pregnancy compared to women who were not depressed during pregnancy and in the postpartum ($p < .05$).

2. Prepartum Coping Style and Social Support

Three repeated measures ANOVAs were carried out to examine group and group by time differences in the three major coping styles measured during pregnancy. Bonferroni correction was set at .016, in order to control for possible alpha inflation. A significant main effect of Group was found for emotion-oriented coping during pregnancy ($F(2,75) = 5.64$, $p < .005$). Examination of the means (collapsed across time) using independent t-tests (Table 19), revealed that women

Table 18

Group Means and Standard Deviations for the Variables Included in the Stress MANOVA Collapsed Across Time

	Group		
	POST-DEP (n=13)	PREG-DEP (n=20)	Control (n=45)
Hassles	32.83 (20)	37.68 (14.44)[a]	26.58 (14.99)[b]
STAI-state	41.28 (12.12)[a]	42.20 (9.30)[a]	34.99 (8.48)[b]

Note. [a,b] denotes a significant main effect for group, i.e.,collapsed across time.

Table 19

Group Means and Standard Deviations for the Emotion-Oriented Coping During Pregnancy Collapsed Across Trimesters

	Group		
	POST-DEP (n=13)	PREG-DEP (n=20)	Control (n=45)
Emotion-Oriented	41.03 (10.01)[a]	42.33 (9.79)[a]	34.79 (8.70)[b]

Note. [a,b] denotes a significant main effect for group, i.e.,collapsed across time.

in both depressed groups used more emotional-oriented coping compared to the control group (POST-DEP: $p < .05$; PREG-DEP: $p < .05$).

No significant main effect of group or interaction effects were found in the ANOVAs for task-oriented coping and avoidance coping. As well, repeated measures ANOVAs computed for size of social support network and satisfaction with social support during pregnancy revealed no significant main effect of Group or interaction effects.

3 . Complications During Pregnancy, Labor/delivery and Infant Temperament

No difference was found between the three groups on the occurrence of a complications during gestation and labor/delivery and maternal perception of their infant's temperament at the post delivery assessment (Table 20).

E. Predictors of Depressed Mood During Pregnancy and in the Postpartum

To determine which specific combination of variables assessed during pregnancy might predict severity of depressed mood during pregnancy and in the postpartum, two hierarchical multiple regressions were performed. In the first hierarchical regression which examined predictors of depressed mood during pregnancy, only variables assessed in the first trimester were considered for inclusion in order to identify variables which could have important implications for early prevention or intervention. Selection of variables for both regressions were based on the ANOVA results, the pattern of statistical intercorrelations among

Table 20

Group Comparisons of Gestational and Labor/delivery Complications and Infant Temperament

	Group			
	POST-DEP (n=13)	PREG-DEP (n=20)	Control (n=45)	X^2
Gestational Complication	15% (2)	30% (6)	16% (7)	$X^2(2) = .37$
Labor/delivery Complication	77% (10)	45% (9)	49% (22)	$X^2(2) = 3.79$
Infant Temperament (NPI)	15.85 (4.04)	14.10 (2.59)	13.47 (3.83)	

variables and theoretical relevance. Evaluation of multiple regression assumptions indicated that all were met for each equation.

In step 1 of the multiple regression examining depressed mood during pregnancy, the relatively stable resource variables were entered, followed by hassles in step 2. This sequence allowed for consideration of the extent to which hassle levels predict depressed mood during pregnancy after controlling for the effects of the relatively stable resource variables. In the next step, emotional coping and social support were entered in order to determine their impact on depressed mood during pregnancy once stress was taken into account. Lastly, to test the hypothesis that emotional coping and social support would moderate the effects of Hassles on depressed mood during pregnancy, two interaction terms were created and entered separately in step 4 and step 5. The preliminary results of the regression indicated that these interaction terms were not significant and consequently they were dropped from the final analysis.

As shown in Table 21, once all the independent variables were entered into the equation, 54% of the variance in depressed mood scores during pregnancy was explained. In the first step, self-confidence accounted for 9% of the unique variance, and easygoing added an additional 5% of variance in depressed mood during pregnancy. In step 2, Hassles resulted in a significant increment in $\underline{R}^2$ and explained 17% of unique variance in depressed mood scores during pregnancy. The variables entered in the final step also resulted in a significant increment in $\underline{R}^2$,

Table 21

Hierarchical Regression Predicting Depressed Mood During Pregnancy

Variable	Beta	r	Sr^2	t
Step 1				
Self-Confidence	-.33	-.46	.09	-3.19**
Easygoing	-.25	-.43	.05	-2.35*
Marital Adjustment	-.17	-.37	.02	-1.65
R^2=.32 Adj R^2=.30				
F (3,74)=11.82***				
Step 2				
Hassles	.46	.58	.17	4.90***
R^2 =.49 Adj R^2 =.46				
F(4,73)=17.63***				
Step 4				
Emotional Coping	.24	.56	.04	2.49*
Social Support	-.10	-.38	.00	-1.15
R^2=.54 Adj R^2=.50				
F(6,71)=13.87***				

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

with emotional coping explaining an additional 4% of the unique variance. These results suggest that women who reported lower self-confidence and less easygoing disposition, scored higher on Hassles in the first trimester and used more emotional-oriented coping strategies in the first trimester, were more likely to report higher depressed mood during pregnancy.

In order to examine predictors of severity of postpartum depressed mood scores by multiple regression, the two measures of depression (DACL and EPDS) were combined into a composite mean score. This was considered to be a more reliable measure of postpartum depressed mood as compared to arbitrarily selecting only one measure as the outcome variable. The scores for each measure were standardized before being combined as the two measures differ in terms of how responses are scaled. As shown in Table 22, once all the variables were entered into the equation 22% of the variance in postpartum depressed mood was explained. Depressed mood scores (DACL) during pregnancy (collapsed across trimesters) entered in Step 1 accounted for 11% of the variance. Self-confidence and emotional coping in the third trimester did not result in a significant change in $\underline{R}^2$. The variables entered in the third step resulted in a significant increment in $\underline{R}^2$, with maternal perception of infant temperament accounting for 7% of the unique variance and experiencing a labor/delivery complication explaining an additional 2% of the variance in postpartum depressed mood scores. In summary,

Table 22

Hierarchical Regression Predicting Postpartum Depressed Mood

Variable	Beta	r	Sr^2	t
Step 1				
DACL during Pregnancy	.33	.33	.11	3.01**
R^2=.11 Adj R^2=.10				
F (1,76)=9.09**				
Step 2				
Self-Confidence	-.18	-.30	.02	-1.45
Emotional Coping (3rd trimester)	-.01	.22	.00	-.05
R^2 =.13 Adj R^2 =.09				
F(3,74)=3.78*				
Step 3				
Labor/Delivery Complications	.15	.19	.02	1.39
Infant Temperament (NPI)	.26	.29	.07	2.49*
R^2=.22 Adj R^2=.17				
F(5,72)=4.17**				

* $p < .05$; ** $p < .01$

higher depressed mood scores during pregnancy are predictive of greater depressed mood 4-5 weeks postpartum. Maternal reports of a more difficult infant also contributes to higher depressed mood scores in the postpartum.

Discussion

The primary goal of this study was to delineate the role of psychosocial variables, namely prenatal maternal stress, social support and coping styles, in labor/delivery difficulty and low birth weight, using a prospective, repeated measures design. The results implicate specific psychosocial variables in the birth outcomes examined in the present study. A second focus of this study was to examine factors related to depressed mood during pregnancy and the postpartum. The findings suggest that different psychosocial factors are associated with depressed mood occurring at these two periods.

I. Factors Influencing Labor/Delivery Difficulties

Women who experienced greater stress during pregnancy, subsequently had a more difficult labor/delivery, even after controlling for parity. Younger maternal age was also associated with labor/delivery difficulties. Gestational complications, income, education, marital status, lifestyle habits (e.g. smoking, alcohol consumption) and the other psychosocial variables assessed in this study (e.g. social support, emotional coping) were not related to labor/delivery complications. Women who were giving birth for the first time were found to be at greater risk of experiencing a more difficult labor/delivery. While previous research findings on the impact of parity on intrapartum complications has been inconsistent (e.g. Norbeck & Tilden, 1983; Pagel et al., 1990), the medical literature indicates that childbirth tends to be more difficult for first-time mothers. Consistent with

prior studies, parity was unrelated to elevated stress during pregnancy (Condon & Esuvaranathan, 1990; Mamelle, Gerin, Measson, Munoz & Collet, 1987), suggesting that it may be acting as a biomedical risk factor in its link with labor/delivery complications. This also indicates that the impact of prenatal maternal stress on labor/delivery difficulties observed in this study was independent of parity. It is noteworthy that parity and maternal stress each had a relationship with labor/delivery difficulties of similar magnitude, further supporting the role of stress in the occurrence of intrapartum complications.

The use of multiple measures to assess stress during pregnancy in the present study permitted the development of a prenatal stress factor. Previous work in this area has typically employed a unidimensional approach. The components of the stress factor included state anxiety, hassles and pregnancy-specific stress, all collected monthly over the course of pregnancy. The link between maternal stress and labor/delivery complications in the literature has typically been confounded by relying on stress data which was obtained retrospectively (recall of prenatal life events following delivery). The significant relationship found in this study between maternal stress and labor/delivery difficulties, although small in terms of unique variance accounted for, is unconfounded with the outcome variable. Consistent with the findings in the Lobel et al. (1992) study, the maternal stress factor was highly stable over pregnancy. As suggested by Lobel et al. (1992), this may be indicative of both the stable nature of the situations women encounter during this time period and certain personality predispositions. The present study found some

evidence for both situational and personality factors related to the reporting of higher stress during pregnancy. Women who were younger, felt in the first trimester that the pregnancy would have a negative impact on their career, were less satisfied in their marital relationship and reported using more emotional coping experienced greater stress during pregnancy. While some of these psychosocial variables may reflect personality characteristics, some may be amenable to change. Focusing on personality and situational variables measured in the first trimester when predicting maternal stress during pregnancy allowed for the early identification of psychosocial factors which could be targeted in intervention programs. Women who obtain elevated stress scores in the first trimester may benefit from brief psycho-educational group treatment which focuses on enhancing the marital relationship, exploring negative perceptions of the effects of pregnancy on women's careers and teaching the use of more adaptive coping strategies.

The finding that younger women experienced a more difficult labor/delivery, regardless of parity, can partially be attributed to the relationship between age and stress observed in this study. Younger women were more likely to report elevated stress levels during pregnancy. Pagel et al. (1990) also found that younger women reported higher state anxiety during pregnancy. Similarly, Robinson, Garner, Gare, and Crawford (1987) found that older women in their thirties were less distressed and better adjusted as pregnancy progressed compared to younger women in their twenties. Collectively, these findings indicate that younger women may have a more difficult time adjusting to pregnancy because

they may still be in the process of adjusting to the demands of different roles including marriage and career. The added stressors in this age group may place them at higher risk of experiencing a difficult labor/delivery.

A marginal relationship was found between the use of more distractive coping during pregnancy and labor/delivery complications. Given that the interaction term for stress and distractive coping was not significant, this coping style is unlikely to be moderating the effect of stress on labor/delivery complications. Aldwin and Revenson (1987) have suggested that direct effects for coping support a personality-based coping model, while interaction effects point to a person-situation model. Hence, the direct effects for distractive coping obtained in this study suggest that women who use this strategy more often are probably more distressed irrespective of external environmental factors (Aldwin, 1994). In support of this mechanism, distractive coping was moderately correlated with the more stable personality measures in the present study such as trait anxiety and self-confidence. A more controlled experimental design where the aim is to alter coping strategies and examine the effect on outcome can more adequately address mechanisms involved in the relationship between coping and health outcomes, such as intrapartum complications (Aldwin, 1994).

Based on the present findings and prior studies, there is little doubt that multiple factors, some with complex interrelationships, determine the occurrence of a more difficult labor/delivery. Maternal stress level during pregnancy is one factor contributing to labor/delivery complications. The correlational nature of this

study does place limits on causal inferences with respect to this relationship. However, the fact that all the stress measures included in the stress factor were assessed prospectively provide some of the strongest evidence to date in support of its involvement in labor/delivery difficulties. While psychophysiological mechanisms to explain this link cannot be directly inferred from this study, several mechanisms have been proposed to explain the relationship between stress and intrapartum complications.

The effects of stress on intrapartum complications may be indirect through its role in prompting adverse health behaviors, such as alcohol consumption, smoking and poor diet during pregnancy. Some studies have found a relationship between adverse health behaviors and certain labor/delivery complications such as premature delivery (Mutale, Creed, Maresh, & Hunt, 1991). There is also some support in the literature for highly anxious women engaging in more adverse health behaviors during pregnancy (e.g. Albrecht & Rankins, 1989). The present study, however, did not find an association between higher stress during pregnancy and engaging in adverse health behaviors. A low frequency of such behaviors was found in the present sample, which could have contributed to the lack of association observed between maternal stress and poor health habits. As well, it should be noted that other behaviors not assessed in this study could have mediated the relationship between stress and labor/delivery difficulties, such as eating patterns and nutritional value of foods consumed during pregnancy.

A number of physiological mechanisms have also been suggested as mediating the relationship between stress and pregnancy outcome. Catecholamines have been linked with several birth outcomes. Norepinephrine has been found to stimulate uterine contractions with implications for premature labor (Omer & Everly, 1988). As well, increases in epinephrine produced by psychological stress have been related to prolonged labor through its inhibiting effect on uterine activity (Lederman, Lederman, Work, & McCann, 1981). Endorphinergic responses which influence pain sensitivity have also been implicated in labor and delivery outcomes (Sandman, Wadhwa, Chicz-DeMet, Porto, & Garite, 1995; Scheinin, Scheinin, Ekblad, & Kanto, 1990; Wuitchik, Hesson, & Bakal, 1990). Wadhwa, Dunkel-Schetter, Chicz-DeMet, Porto and Sandman (1996) have recently noted that while several neuroendocrine parameters have been proposed to influence pregnancy outcomes, few human studies have examined whether these parameters are indeed related to prenatal psychosocial conditions. In a cross-sectional study with pregnant women in their third trimester, these authors showed that in spite of the changes linked with the endocrinology of pregnancy, certain neuroendocrine parameters were associated with specific psychosocial factors assessed in pregnancy. In specific, higher prenatal stress was associated with higher levels of plasma ACTH. The authors point out that elevated ACTH has been related to adverse birth outcomes in animal research and can result in co-release and further elevations of other hypothalamic-pituitary-adrenal (HPA) and placental parameters which have also been known to influence birth outcomes (Wadhwa et al., 1996).

Together the scattered findings on psychophysiological mechanisms offer support for the neuroendocrine system as a plausible pathway linking maternal stress to adverse pregnancy outcomes. Further research should be directed at assessing multiple psychosocial variables and numerous neuroendocrine parameters over the course of pregnancy. Examining their relationships to specific birth outcomes would greatly enhance our understanding of the specific pathways involved.

II. Factors Influencing Lower Birth weight (LBW)

Evidence for perceived prenatal social support as a predictor of infant birth weight was found in this study. Women who were less satisfied with their social support in the second trimester, were more likely to give birth to infants of lower weight. These findings held even after controlling for gestational age, parity, income and adverse health behaviors. A relationship between low income and lower birth weight has not always been obtained in the literature (e.g. Brooke et al., 1987; Norbeck & Tilden, 1983; Pagel et al., 1990). Yet, other studies have found support for the role of low income by showing a direct relationship with LBW (Stein, Campbell, Day & McPherson, 1987) or by demonstrating higher rates of LBW in low SES samples (Cameron, 1994). The effects of low income are likely to be associated with poorer maternal nutrition and increased stress resulting from such socioeconomic conditions (Cameron, Wells, & Hobfoll, 1996). The relative contribution of SES to birth weight in this sample was very small (3% of the unique variance explained), however it should be noted that the majority of women in this sample were largely middle class. A more heterogeneous sample

may have resulted in income emerging as a more important factor in relation to LBW.

Maternal smoking, has in many studies, been found to predict LBW (e.g. Brooke et al., 1989; Simpson & Smith, 1986). Such a relationship was not demonstrated in the present study, probably because the majority of women in the present sample did not smoke. The low incidence of clinically significant LBW (<2500 g) may have also hampered the detection of a relationship. Interestingly, the results did suggest that exposure to second hand smoking may contribute to lower infant birth weight, extending the evidence on the hazards of cigarette smoke. Although the relationship was marginal, these results are consistent with prior findings (Martin & Bracken, 1986; Rubin, Krasilnikoff, Leventhal, Weile, & Berget, 1986). This relationship merits further exploration and points to the need of advising women to avoid exposure to cigarette smoke during pregnancy.

Prenatal maternal stress did not emerge as a significant predictor of lower birth weight. Three review articles in this area have concluded that the link between maternal stress and birth weight remains inconclusive (Istvan, 1986; Levin & DeFrank, 1988; Paarlberg, Vingerhoets, Passchier, Dekker & Van Geign, 1995). The nonsignificant role for stress in infant birth weight corroborates some prior findings which have also failed to observe such a relationship (e.g. Aarts & Vingerhoets, 1993; Brooke et al., 1989; Mutale et al., 1991; Stein et al., 1987). It is important to note that the stress factor in the present study was stable and consisted of state-anxiety, hassles, and pregnancy-specific stress during pregnancy.

While chronic anxiety and minor stressors may not impact on infant birth weight, it is possible that the experience of major life stressors during pregnancy contributes to birth weight. The majority of studies which have observed a significant relationship between maternal stress and LBW have measured stress by means of major life events (e.g. Pagel et al., 1990; Reeb, Graham, Zyzanski & Kitson, 1987; Williamson et al., 1989). Life events in these studies have all been assessed retrospectively by asking women following delivery to recall events during pregnancy or in the prior 12 months. The stress factor in the Lobel et al study (1992) which emerged as a significant predictor of LBW also included a life event distress component which was measured retrospectively. Hence, the link observed between life event stress and LBW is based on weak methodology and raises questions as to the influence of this measure of maternal stress on this particular infant outcome.

Greater use of emotional coping strategies in the second trimester was related to higher birth weight. Although few studies have examined coping processes in relation to infant birth weight, this finding was unexpected. The coping and health literature has typically pointed to the negative impact of emotional coping. Several explanations can be suggested for the present findings. It may be important to note that as pregnancy progressed the use of all the coping styles assessed, including emotion-focused, fell below the norms obtained in nonpregnant samples. Although stress levels remained stable, coping strategies decreased. There appears to be some indication that as the pregnancy progresses

women may be adopting a more passive, accepting coping style. Alternatively, it is also possible that women during pregnancy tend to appraise stressors as less changeable or controllable. If this assertion is correct, it would provide some explanation for why the use of more emotion-focused coping resulted in higher infant birth weight. The goodness of fit hypothesis theorizes that certain coping responses will be more effective when they match the individual's appraisal of the stressors (Aldwin, 1994; Vitaliano, DeWolfe, Maiuro, Russo, & Katon, 1990). There is evidence to support this hypothesis, as some findings have emerged showing emotion-focused coping to be more adaptive in situations perceived as less controllable (Aldwin, 1994; Vitaliano et al., 1990). Future research should assess the degree to which women perceive stressors as changeable and controllable over the course of pregnancy in order to clarify whether appraisal changes during pregnancy and how it interacts with different coping responses to influence specific birth outcomes.

Consistent with prior research (Turner, Grinstaff & Phillips, 1990) prenatal social support was related to infant birth weight. This result extends earlier findings in that it was maternal reports of lower satisfaction with social support in the second trimester which predicted lower birth weight. Previous studies have not collected prospective assessments of social support in each trimester of pregnancy making it impossible to determine whether the effects on LBW depended upon support levels in a particular trimester. Although repeated assessments of social support were gathered during pregnancy in the Collins et al. study (1993), scores

were averaged across the pregnancy. Their preliminary findings, however, did indicate some fluctuations over the assessment times in the amount of and satisfaction with social support received during pregnancy. The authors did not pursue the question of whether changes in social support over pregnancy might influence outcomes differently, as it would have increased the number of variables in their study considerably and violated statistical assumptions. Interestingly, satisfaction with available support was lowest in the second trimester compared to the first and third trimester in this sample. Women felt less satisfied with their social support in the second trimester. Interestingly, this stage of pregnancy is often regarded as symptom free, as nausea and vomiting typically cease. There is also some indication in the literature that mood states tend to demonstrate a U-shaped pattern, with decreases occurring in the second trimester (Tunis & Golbus, 1991). A U-shaped pattern did emerge in the present study for pregnancy-specific stress, with lowest scores evidenced in the second trimester. This lends some support to the widely held view that women become more adjusted to the emotional and physiological changes of pregnancy during the second trimester, thereby possibly decreasing the amount of support women receive from their social networks. It is noteworthy that perceived social support scores were generally quite high in each trimester. The decrease noted in the second trimester may have improved the likelihood of detecting a relationship. As there are no prior studies which have examined social support in each trimester, a definitive conclusion on the importance of timing is premature. Hence it may be more accurate to conclude

that continued social support for women throughout pregnancy is important and has implications for infant birth weight.

The effects of social support on lower birth weight provide stronger evidence for a main effect relationship rather than a buffering effect. A weak interaction, however, did emerge between support satisfaction in the second trimester and depressed mood during pregnancy on infant birth weight. Women who were less satisfied with available support in the second trimester and experienced higher levels of depressed mood during pregnancy gave birth to infants of lower birth weight. Both the main and interaction social support effects found suggest that women need to feel that support is available during pregnancy, particularly in the second trimester. The benefits of satisfaction with social support on birth weight are extended to women who experience depressed mood during pregnancy. Depressed mood has not received much research attention in relation to birth outcomes even though a significant proportion of women report elevated depressive symptomology during pregnancy. The indirect influence of depressed mood on birth weight has not previously been shown. A direct effect for depressed mood during pregnancy (assessed at 28 weeks gestation) on LBW, however, has been reported (Steer, Scholl, Hediger & Fischer, 1992). While that study controlled for inadequate weight gain during pregnancy, social support was not measured. Although the interaction found in the present study is novel in the pregnancy literature, it is consistent with some findings in other health psychology domains suggesting that social support may mitigate the negative effects of

depressed mood on physical outcomes (e.g. Cohen, 1988; DeLongis et al., 1988; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). It is important to note that this study focused and found significant main and buffering effects for satisfaction with perceived available support. Future research should be directed at assessing whether satisfaction with specific types of support (emotional, tangible, instrumental) during pregnancy are related to outcome. The relative importance of the different providers of social support also needs clarification.

Several mechanisms have been proposed to explain the link between social support and infant birth weight. Lobel et al. (1992) have suggested that social support may reduce the degree to which women appraise situations as stressful and may enhance positive mood. These links may influence birth weight through changes in neuroendocrine parameters, immune system functioning or behavioral habits. For instance, catecholamines have been shown to alter uterine blood flow, with implications for low birth weight (Katz, Jenkins, Haley, & Bower, 1991). Increases in corticosteroid secretions in response to stress may also be involved in certain perinatal complications by means of immunosuppression (Jemmot & Locke, 1984; Naye, 1982). Decreases in immune defenses may increase the vulnerability of women under chronic stress to infectious diseases, placing them and their fetus at greater risk for complications. Preliminary evidence was found in this study to lend some support to these mechanisms. For instance, significant correlations were observed between higher social support during pregnancy and lower depressed mood and lower maternal stress. No relationship, however, was

observed between social support and adverse health behaviors such as smoking, alcohol and caffeine consumption. The study by Wadhwha et al.(1996) also offers preliminary support for a physiological model linking social support to birth outcomes. An association was demonstrated between lower perceived social support and higher plasma levels of ACTH, β-E and cortisol. Similarly, women who reported receiving less pregnancy related support had higher concentrations of ACTH and cortisol. Such neuroendocrine changes as a result of lower support can influence birth weight.

The method by which information on the birth outcome variables in this study were obtained might be considered imprecise. Information on the pregnancy, labor/delivery and infant status was gathered by asking women structured questions during the telephone interviews conducted in each trimester and at post delivery. This sample was comprised of largely middle-class, well-educated women, who seemed to have little difficulty in answering the medically related questions during the interviews. The rates found in the present study for the various birth outcomes fall within the range of levels obtained in prior research (e.g. Norbeck & Tilden, 1983; Rizzardo et al., 1988; Wadhwa et al., 1993). As well, recent studies which compare maternal reports with information obtained from medical charts find a high level of agreement between both these methods (Githens, Glass, Sloan, & Entman, 1993; Hewson & Bennett, 1987; Wilcox, Gold, & Tuboku-Metzger, 1991). In addition, the findings by Hewson and Bennett (1987) raises questions about the accuracy of medical records as a data source in

pregnancy outcome. For instance, the study reports recording errors in some labor/delivery procedures, variablity among hospitals in the criteria for recording several labor/delivery and infant outcome variables and errors in the abstraction of information from medical records. Collectively, these findings challenge the assumption that relying on medical records is a more objective and accurate data source to obtain information on birth outcomes.

III. Depressed Mood During Pregnancy and in the Postpartum

At the postpartum assessment, approximately 16% of the sample reported elevated levels of depressive symptomology. These rates fall within the lower range (16%-30%) for studies which have used self-report indices to measure depression (e.g. O'Hara, 1985; Terry et al., 1996) and fall within the upper limit (3.5%-17.5%) for those which have used diagnostic interviews to assess postpartum depression (e.g. Watson, Elliott, Rugg, & Brough, 1984). The more conservative level obtained in the present study suggests that administering the DACL in addition to the EPDS may address some of the sensitivity and specificity limitations which have been reported when using different cutoffs on the EPDS as a screening instrument (e.g. Murray & Carrothers, 1990; Zelkowitz & Milet, 1995). Slightly more than one-half (54%) of women who reported depressed mood in the postpartum also reported elevated depressive symptomology in at least one trimester during pregnancy. This is consistent with previous findings and suggests that not all cases of postpartum depression are a continuation of depression in the prepartum (Gotlib et al., 1989; Hobfoll et al., 1995). In addition, 25% of the

sample reported elevated depressive symptomology only during pregnancy. Similar rates for depressed mood during pregnancy have been reported (Demyttenaere et al., 1995; Gotlib et al., 1989; O'Hara, Neunaber, & Zekoski, 1984; Powell & Drotar, 1992). Other studies, however, have not typically differentiated between women who report depressed mood only during pregnancy and not in the postpartum. This study found some support for examining this group separately as certain variables were differentially related to the experience of depressed mood only during the pregnancy. Some differences also emerged when examining the relative importance of predictor variables on depressive symptoms during pregnancy compared to the postpartum.

Consistent with prior research findings, this study did not find a relationship between demographic factors such as age, education, income and number of prior children and depressed mood during pregnancy (e.g. Hobfoll et al., 1996) and the postpartum (Campbell, Cohn, Flanagan, Popper & Meyers, 1992; Gotlib et al., 1989; Terry et al., 1996). With respect to anxiety levels during pregnancy, the findings indicated that both depressed groups reported higher levels of trait and state anxiety compared to women who did not report elevated depressive symptomology in either the pre or postpartum. A relationship between anxiety and depression has previously been shown in this population, although different measures have been used (Demyttenaere et al., 1995; Dennerstein, Lehert, & Riphagen, 1989; Hayworth, Little, Bonham Carter, Raptopoulos, Priest, & Sandler, 1980). The link between anxiety and depression during pregnancy is

difficult to interpret since these measures were obtained concurrently. The higher scores on the anxiety measures during pregnancy for women who were depressed in the postpartum provides some support for the role of anxiety in subsequent depression. This finding suggests that the experience of more situational anxiety during pregnancy and/or a general predisposition to stress may place women at higher risk for depressed mood in the postpartum. On the other hand, the high correlation between anxiety and depression scales which has been attributed to item overlap casts doubt on the contribution of elevated anxiety scores during pregnancy to postpartum depression.

Interestingly, both the prepartum and postpartum depressed mood groups reported using more emotional coping during pregnancy. This finding is consistent with recent studies implicating coping strategies in depressive symptomology during pregnancy and the postpartum (Deemyttenaere et al., 1995; Terry et al., 1996). When determining its relative importance amongst a number of psychosocial variables, however, higher emotional coping during pregnancy emerged as a significant predictor only in relation to higher depressed mood during pregnancy. Despite the inclusion of first trimester emotional coping scores, when only 26% (n=20) of women reported elevated depressed mood scores, causal pathways to explain the relationship between emotional coping and higher depressed mood during pregnancy cannot be inferred from this finding. After controlling for depressed mood scores during pregnancy, higher emotional coping in the prepartum was not predictive of increased postpartum depressive

symptomology. This finding is inconsistent with those obtained by Terry et al. (1996). However, emotional coping in that study was assessed in the postpartum. While numerous studies in nonpregnant samples have reported a link between greater use of emotion focused coping and depression, it is possible that this coping strategy reflects rather than causes depression (Aldwin, 1994). A larger sample size with a similar prospective design could help delineate the contribution of emotional coping to pre- and postpartum depression.

Hassles were higher among women who were depressed only in the prepartum. As well, when examining early predictors of depressed mood during pregnancy as a continuous variable, first trimester hassles emerged as the most important predictor of depressed mood during pregnancy. This finding suggests that the experience of depressed mood during pregnancy may be stress-related. Interest in assessing hassles in pregnancy has only recently emerged and hence no prior studies have examined the influence of hassles on depressed mood during pregnancy. Prospective research using nonpregnant samples, however, has shown higher hassles to be a strong predictor of mental health outcomes, including depression (DeLongis et al., 1988; Lu, 1991). These results have clinical implications for prevention as the Hassles scale can easily be employed as a screening device to identify women at increased risk for depression during pregnancy, which may in turn have implications for decreasing rates of postpartum depression. The scale points to specific stressors which could be targeted and modified using cost-effective interventions such as psycho-educational groups.

Such an intervention might aim at increasing awareness of the possible negative impact of stress and provide instruction on more adaptive coping skills. These efforts could have important benefits in reducing the rate of depression during the pre- and postpartum period as well as influence birth outcomes.

A relationship between prepartum hassles and postpartum mood in the present study was not found. The association between hassles and postpartum mood observed by Powell and Drotar (1992) may have been confounded by the concurrent assessment of these variables. It is important to note, however, that prepartum hassles may still be indirectly linked to postpartum mood given its relationship to depressed mood during pregnancy. That is, postpartum depression for a subgroup of women is a continuation of depressed mood in the prepartum and it appears that prepartum hassles for these women are likely to be elevated. Studies which have been able to separately examine postpartum depression with prepartum onset versus depression commencing only in the postpartum have found evidence that the former is more likely stress-related (Martin, Brown, Goldberg, & Brockington, 1989).

Consistent with prior findings the best predictor of postpartum depressed mood in the present study was prepartum depressed mood (Collins et al., 1993; Dennerstein et al., 1989; Powell & Drotar, 1992; Terry et al., 1996; Whiffen, 1988). Although significant, the relative importance of prepartum depressed mood in predicting postpartum depressive symptomology was weaker in comparison to values obtained in most previous studies (e.g.Collins et al., 1993; Logsdon,

McBride & Birkimer, 1994; Pfost, Stevens, & Lum, 1990; Powell & Drotar, 1992). The higher prediction obtained in these studies may be related to use of the same measure to assess depressed mood during pregnancy and the postpartum. In the present study, this potential confound was minimized by using a composite of postpartum DACL and EPDS scores as an index of postpartum depression. Two other studies have utilized similar approaches to assess postpartum depression (Terry et al., 1996 ; Whiffen, 1988), with the latter demonstrating similar results on the importance of prepartum mood to those found in the present study.

The only other variable which predicted postpartum mood was maternal ratings of infant temperament. This measure was assessed concurrently with depressed mood in the postpartum hence it is unknown whether a more difficult infant contributes to postpartum depressed mood or is a reflection of the mother's mood state. The findings reported by Terry et al. (1996) weaken this latter explanation as they demonstrated a relationship between infant temperament as rated by the partner and postpartum depressed mood. Interestingly, Terry et al. (1996) found a high level of agreement between mothers' and their partners' ratings of infant's fussiness. As well, Cutrona and Troutman (1986) who used both home observations and maternal assessments of infant temperament also found a modest to high correlation between these two sources of infant information and postpartum mood. The relationship found in the present study supports prior findings and suggests that dealing with a more difficult infant is a likely factor in postpartum depression. Collectively, approximately 22% percent of the variance in

postpartum depression was explained, which points to the need to develop additional models on the etiology of postpartum depression. Although this study attempted to build on prior studies by strengthening methodology and refining the stress and coping assessments, the findings indicate a need to reconsider variables which may be implicated in the development of postpartum depression. The small sample size in this study did not allow for the separate examination of factors related to postpartum onset of depression compared to postpartum depression with prepartum onset. The factors related to postpartum depressive symptomology which is a continuation of a prepartum state may be different from depressive symptomology which begins in the postpartum. It is possible that biological factors play a stronger role than psychosocial factors in depression which begins in the postpartum, while the reverse may be true for postpartum depression which is a continuation of prepartum mood. A larger sample size, using a similar prospective design which could include the assessment of promising biological variables such as those hormones which show dramatic changes during pregnancy and following delivery (e.g. oestrogen, progesterone, prolactin) is needed to clarify this question.

This study relied on self-reports of depressive symptomology as a measure of depression during pregnancy and the postpartum. Although these instruments were carefully selected to control for somatic symptoms, the findings may not be generalizable to cases of clinical depression as measured by formal diagnostic criteria. The rate of depression during pregnancy and the postpartum using such

criteria is much lower and hence would require a much larger sample size to adequately explore its antecedents. Given that most depression cases during these periods are mild, relying on self-reports may be an adequate compromise. The importance of self-reported depressive symptomology, however, should not be underestimated (Kaplan, Roberts, Camacho, & Coyne, 1987). In many instances they are not indicative of a transient mood disturbance. There is little doubt that that high scores on self-report measures of depressive symptomology may correspond to a clinical diagnosis and/or predispose an individual to the experience of a clinical depression at a later point (Philipps & O'Hara, 1991). Finally, there are numerous studies in the literature which have shown mothers reporting depressed mood to have more negative interaction styles with their infants which has implications for the child's emotional adjustment, language development and social responsiveness (Field et al., 1988; Field, Healy, Goldstein, & Guthertz, 1990; Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986).

Conclusions

The present study demonstrated that specific psychosocial variables were associated with intrapartum difficulties and infant birth weight. Moreover their impact seems to be independent of biomedical risk and demographic factors, supporting the value of multifactorial biopsychosocial models when examining the etiology of adverse birth outcomes. It is also worth noting that this sample was largely comprised of middle-class, well educated women and consequently the relationships found between variables such as maternal stress and social support

and birth outcomes may be larger in socioeconomically disadvantaged samples. Finally, different psychosocial variables were shown to be linked to depressed mood during pregnancy compared to postpartum depression. Future research should continue to implement prospective designs with larger samples and incorporate the measurement of physiological parameters in order to shed more light on the mechanisms involved in the relation between psychosocial variables, birth outcomes and postpartum depression.

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Appendix A
Structured Telephone Interviews
Background Information Form
Pregnancy Progress Interviews
Post Questionnaire

BACKGROUND INFORMATION INTERVIEW

TELEPHONE SCREENING
I DEMOGRAPHIC

Name:_____ Date:_____
Address:_____ Postal Code_____
Phone: Home_____ Office:_____

1) How old are you?_____

2) Is this your first pregnancy? NO [ ] YES [ ]

If answered NO, ask the questions BELOW; If YES GO TO PART III

II WOMEN WITH PREVIOUS PREGNANCIES ONLY

1) How many pregnancies have you achieved, excluding your current pregnancy? _____

2) The outcome of each previous pregnancy(ies):
e.g. miscarriage, abortion, ectopic pregnancy, live birth

PREGNANCY #1 _____ PREGNANCY #2 _____ PREGNANCY #3 _____

3) How many children do you have? (specify number)_____

4) For each child indicate his/her AGE, SEX and if conception occurred with or without MEDICAL INTERVENTION (e.g. fertility drugs, artificial insemination etc..):

FIRST CHILD
AGE_____
SEX_____
CONCEPTION_____

SECOND CHILD
AGE_____
SEX_____
CONCEPTION_____

5) In your PREVIOUS pregnancies that resulted in LIVE BIRTHS, to the best of your knowledge did you experience any of the following pregnancy complications:

_____high blood pressure _____gestational diabetes
_____bleeding
_____pre-eclampsia or toxemia (symptoms:high blood pressure, swelling of face and hands)
_____abruptio placentae (partial or complete separation of placenta from the wall of the uterus)
_____premature contractions (only if they occurred one every 10 minutes for 2 consecutive hours before the 9th month of pregnancy)
_____premature contractions resulting in delivery
_____OTHER (specify)_____

6) Did you experience any of the following labor/delivery complications?
_____cesarean birth _____labor induction
_____prolonged labor (labor lasting more than 22 hours) _____forceps delivery
_____meconium (fetal bowel movement in the uterus)
_____OTHER (specify)_____

INFANT STATUS

7) Approximately how much did your baby weigh?_____

8) Was he/she generally in good health at the time of birth? YES [ ] NO [ ]
If NO, specify_____

III CURRENT PREGNANCY -ALL
1) How far along in the pregnancy are you (in weeks)?_____

2) When was your last menstrual period?_____

3) Has your doctor told you when the baby is due? (If YES, specify)_____

4) Was this pregnancy conceived with or without the help of MEDICAL INTERVENTION (e.g. fertility drugs, artificial insemination etc...)?_____

5) While trying to conceive, did you experience any infertility problems (inability to conceive after one year or more of regular sexual relations without contraception or inability to carry a pregnancy to a live birth)?

NO [ ] YES [ ] (Describe the problem)_____

_____

6) Did you ever seek any medical treatment for an infertility related problem?
NO [ ] Yes [ ] (Specify type of treatment e.g. artificial insemination etc...)

_____

I Demographic-continued
1) a) How tall are you?_____

b) How much did you normally weigh before achieving pregnancy?_____

2) Marital Status: married [ ] co-habiting [ ] separated [ ] divorced [ ]

3) How long have you been living with your current partner? (in yrs)_____

4) What is your religion? (please v one below)
Catholic.....[ ] Orthodox.....[ ]
Protestant...[ ] Jewish.....[ ] Other (specify)_____

5) How many years of schooling have you completed?_____

6) What is your current occupation? (Please be specific)_____

7) If you currently are not working what was your last occupation?_____

8) What are/were the most important activities or duties involved in your occupation?

_____

9) How many hours per week do you put into your job?_____

10) If you currently are not employed, please indicate what factor(s) have influenced your decision to stop working?_____

_____

11) What was your combined annual income last year? Please circle one:
$1,000-$10,000 $10,000-$20,000 $20,000-$30,000 $30,000-40,000
$40,000-$50,000 $50,000-$60,000 $60,000-$70,000 more than $70,000

II MEDICAL HISTORY

1) Have you ever suffered a major health problem? NO [ ] YES [ ]
If YES, specify_____
Such as: (Please v):

_____Heart disease
_____Kidney disease
_____Jaundice or liver disease
_____Diabetes
_____Asthma
_____Cancer
_____Sexually transmitted diseases
_____Migraine headaches
_____Herpes
_____An operation
_____Pneumonia
_____Bleeding disorders
_____Stroke
_____Collagen disease
_____Chronic fatigue
_____High blood pressure
_____Other (specify)_____

2) Has there been a significant change in your general health within the past year?
NO [ ] YES [ ] (specify)_____

3) Are your activities limited by health problems? NO [ ] YES [ ]
(specify)_____

4) Are you currently taking any prescribed medications or drugs? NO [ ] YES [ ]

5) Are you taking any non-prescription medications or drugs? NO [ ] YES [ ]

6) Have you at any point in the past, considered consulting or consulted professional help for any emotional problems? NO [ ] YES [ ]

7) If YES, was this related to depression? NO [ ] YES [ ]
How long ago was this?_____

8) Is there any incidence of depression among your parents and/or siblings?
NO [ ] YES [ ] If YES, who?_____

III CURRENT PREGNANCY -continued

1) What method of contraception did you regularly use before achieving your current pregnancy?

_____Birth control pills How long_____
_____Intrauterine device How long_____
_____Diaphragm
_____Condom
_____Creams or jellies
_____Foam
_____Rhythm
_____Withdrawal
_____Douche
_____Other (specify)_____
_____None

2) Was this pregnancy planned? NO [ ] YES [ ]

3) How happy are you about this pregnancy?
1:::::2:::::3:::::4:::::5
not at all somewhat extremely

4) How happy do you feel your partner is about this pregnancy? 1:::::2:::::3:::::4:::::5
not at all happy somewhat happy extremely happy

NAME_____ Date_____

PREGNANCY PROGRESS INTERVIEW
FIRST TRIMESTER

I **PHYSICAL CHANGES**

1. Please indicate whether you have experienced any of the following symptoms in this pregnancy, along with its frequency where appropriate: (please √)

a) _____ Nausea or vomiting →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1::::::2::::3:::::4::::5
not at all somewhat extremely

b) _____Bleeding →→→→→ Specify frequency per month_____

How severe do you feel it has been? 1::::::2::::3:::::4::::5
not at all somewhat extremely

c) _____Severe cramps →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1:::::2:::::3:::::4::::5
not at all somewhat extremely

d) _____Fatigue →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1::::2::::::3:::::4::::5
not at all somewhat extremely

e) _____High blood pressure

f) _____Gestational diabetes

g) Please indicate any OTHER physical problems you have been experiencing regularly or occasionally since achieving pregnancy and specify how often?

_____

_____

II **DIET** and **EXERCISE**

1) Do you smoke? NO [ ] YES [ ]
If YES, how many cigarettes are you smoking a day?_____

2) Does your partner smoke? NO [ ] YES [ ]
If YES, does he smoke in the house? NO [ ] YES [ ]

Specify approximately how many cigarettes he smokes each day?_____

3) Are you exposed to cigarette smoke in your working environment (i.e. office)
NO [ ] YES [ ] If YES, how many hours per day _____

4) If you are consuming alcoholic beverages, please indicate how many per week and specify what type of beverage:_____

_____

_____

5) Please indicate if you drink any of the following and specify on average how many cups per day are consumed?

_____Coffee (caffinated) Cups per day_____

_____Tea Cups per day_____

_____Colas Cups per day_____

6. a) Are you exercising? NO [ ] YES [ ]
b) If YES, indicate what FORMS of exercise (e.g. cycling, aerobics low/high impact, swimming etc...):_____

c) How many times a week do you exercise?_____
d) MINUTES per exercise session (approx.)?_____

7. a) Did you exercise regularly before the pregnancy? NO [ ] YES [ ]
b) If YES, indicate what Forms of exercise (only if they have changed since pregnancy):_____

c) How many times a week do you exercise?_____
d) MINUTES per exercise session (approx.)?_____

8. If you are presently employed please specify approximately how many minutes or hours of standing (being on your feet) your job involves per day._____

III **PREGNANCY**

1. PREGNANCY CHANGES

For each scale below circle the number which best indicates the changes PREGNANCY has had on the following aspects of your life.

Sexual Relationship

(a) - change in frequency of sexual activity:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

much lower frequency	somewhat lower	no change	somewhat higher	much higher frequency

(b) What is your current rate of sexual intercourse per month?_____

Career

(c) - influence on your career life:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

extremely negative	somewhat negative	no change	somewhat positive	extremely positive

Self-Image

(d) - effect on the manner in which you see and value yourself:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

extremely negative	somewhat negative	no change	somewhat positive	extremely positive

3. CONCERNS

a) Please rate the extent of anxiety and/or nervousness you are feeling that is directly related to your pregnancy:

1:::::::::2:::::::::3:::::::::4:::::::::5
not at all anxious — somewhat — extremely anxious

4. SOCIAL NETWORK/INFORMATION

a) How involved in your pregnancy do you feel your partner has been so far?

1:::::::::2:::::::::3:::::::::4:::::::::5
not at all involved — somewhat — extremely involved

b) How supportive has your family and friends been about your pregnancy?

1:::::::::2:::::::::3:::::::::4:::::::::5
not at all supportive — somewhat — extremely supportive

c) So far, other than your doctor, have you consulted additional sources in order to obtain information on different aspects of pregnancy? NO [ ] YES [ ]

If YES, indicate which sources below:
Other medical personnel.....[ ]
Reading material (i.e. books, articles).[ ]
Family or friends.....[ ]
Other.....[ ]

d) Have you registered for any of the prenatal courses offered? NO [ ] YES [ ]
If NO, are you planning to? NO [ ] YES [ ]
If YES, specify the DATE they begin?_____

5) Since achieving pregnancy, how many visits have you made to your doctor?_____

NAME_____ Date_____

PREGNANCY PROGRESS INTERVIEW
SECOND TRIMESTER

Instructions: When completing the following questions please think only of the time period since you completed the last interview, which was near the end of your first trimester until the present.

I PHYSICAL CHANGES/MEDICAL UPDATE

1.

a) _____ Nausea or vomiting →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1:::::2:::::3:::::4:::::5
not at all somewhat extremely

b) _____Bleeding →→→→→ Specify frequency per month_____

How severe do you feel it has been? 1:::::2:::::3:::::4:::::5
not at all somewhat extremely

c) _____Severe cramps →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1:::::2:::::3:::::4:::::5
not at all somewhat extremely

d) _____Fatigue →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1:::::2:::::3:::::4:::::5
not at all somewhat extremely

e) _____High blood pressure f) _____Gestational diabetes

g) Please indicate any OTHER physical problems you have been experiencing regularly or occasionally since the last interview and specify how often? Has your doctor mentioned any complications concerning the pregnancy?

_____

_____

2. a) Have you had an ultrasound done? NO [ ] YES [ ]
How many_____
When approximately_____
What did your doctor tell you about the results?_____

b) How nervous/anxious were you for the first ultrasound?

1:::::::2:::::::3:::::::4:::::::5
not at all anxious somewhat extremely anxious

3. a) Have you gone for an amniocentesis? NO [ ] YES [ ]

b) How nervous/anxious were you for this procedure?

1:::::::2:::::::3:::::::4:::::::5
not at all anxious somewhat extremely anxious

II **DIET** and **EXERCISE**

1) If you smoke, how many cigarettes are you smoking a day?_____

2) Are you exposed to cigarette smoke in your working environment (i.e. office)
NO [ ] YES [ ] If YES, how many hours per day _____

3) If you are consuming alcoholic beverages, please indicate how many per week and specify what type of beverage:_____
_____
_____

4) Please indicate if you drink any of the following and specify on average how many cups per day are consumed?
_____Coffee (caffinated) Cups per day_____

_____Tea Cups per day_____

_____Colas Cups per day_____

5. a) Are you exercising? NO [ ] YES [ ]
b) If YES, indicate what FORMS of exercise (e.g. cycling, aerobics low/high impact, swimming etc...):_____

c) How many times a week do you exercise?_____

d) MINUTES per exercise session (approx.)?_____

6. Are you still employed? NO [ ] YES [ ] If YES, how many hours per week?_____

7. If you are presently employed please specify approximately how many minutes or hours of standing (being on your feet) your job involves per day._____

III **PREGNANCY**. - **PREGNANCY CHANGES**
Indicates any changes PREGNANCY has had on the following aspects of your life since our last interview.

Sexual Relationship:
(a) - change in frequency of sexual activity:

1	2	3	4	5
much lower frequency	somewhat lower	no change	somewhat higher	much higher frequency

(b) What is your current rate of sexual intercourse per month?_____

Career
(c) - influence on your career life:

1	2	3	4	5
extremely negative	somewhat negative	no change	somewhat positive	extremely positive

Self-Image
(d) - effect on the manner in which you see and value yourself:

1	2	3	4	5
extremely negative	somewhat negative	no change	somewhat positive	extremely positive

CONCERNS

a) Please rate the extent of anxiety and/or nervousness you are feeling that is directly related to your pregnancy:

1:::::::::2:::::::::3:::::::::4:::::::::5

not at all anxious	somewhat	extremely anxious

SOCIAL NETWORK/INFORMATION

a) How involved in your pregnancy do you feel your partner has been so far?

1:::::::::2:::::::::3:::::::::4:::::::::5

not at all involved	somewhat	extremely involved

b) How supportive has your family and friends been about your pregnancy?

1:::::::::2:::::::::3:::::::::4:::::::::5

not at all supportive	somewhat	extremely supportive

c) So far, other than your doctor, have you consulted additional sources in order to obtain information on different aspects of pregnancy? NO [ ] YES [ ]

If YES, indicate which sources below:

Other medical personnel.....[ ]
Reading material (i.e. books, articles).[ ]
Family or friends.....[ ]
Other.....[ ]

CHECK PREVIOUS INTERVIEW BEFORE ASKING THESE QUESTIONS

2. Have you registered for any of the prenatal courses offered? NO [ ] YES [ ]
If NO, are you planning to? NO [ ] YES [ ]
If YES, specify the DATE they begin?_____
OR
e) Have you started prenatal classes yet? NO [ ] YES [ ]
If Yes when and how long will they last?_____

If YES, how helpful do you feel they have been?

1:::::::::2:::::::::3:::::::::4:::::::::5

not at all helpful	somewhat	extremely helpful

What aspects have or have not been helpful? What would you like to see improved or added to the classes?

_____

_____

5) Since the last interview how many visits have you made to your doctor?_____

NAME_____ Date_____

PREGNANCY PROGRESS INTERVIEW
THIRD TRIMESTER

Instructions: When completing the following questions please think only of the time period since you completed the last interview, which was around mid-second trimester until the present.

I **PHYSICAL CHANGES/MEDICAL UPDATE**

1.

a) _____ Nausea or vomiting →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1::::2::::::3::::4::::5
not at all somewhat extremely

b) _____Bleeding →→→→→ Specify frequency per month_____

How severe do you feel it has been? 1::::2::::::3::::4::::5
not at all somewhat extremely

c) _____Severe cramps →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1::::2::::::3::::4::::5
not at all somewhat extremely

d) _____Fatigue →→→→→ Specify frequency per week_____

How severe do you feel it has been? 1::::2::::::3::::4::::5
not at all somewhat extremely

e) _____High blood pressure f) _____Gestational diabetes

g) Please indicate any OTHER physical problems you have been experiencing regularly or occasionally since the last interview and specify how often? Has your doctor mentioned any complications concerning the pregnancy?

_____

_____

2. a) How many ultrasounds have you had done in all so far?_____
When was your last ultrasound?_____
What did your doctor tell you about the results?_____

b) How nervous/anxious were you for the most recent ultrasound?

1::::::2::::::::::::3::::::::::4::::::::::5
not at all anxious somewhat extremely anxious

3. a) Have you gone for an amniocentesis? NO [ ] YES [ ]
b) How nervous/anxious were you for this procedure?

1::::::2::::::::::::3::::::::::4::::::::::5
not at all anxious somewhat extremely anxious

II **DIET** and **EXERCISE**

1) If you smoke, how many cigarettes are you smoking a day?_____

2) Are you (still) exposed to cigarette smoke in your working environment (i.e. office) NO [ ] YES [ ] If YES, how many hours per day _____

3) If you are consuming alcoholic beverages, please indicate how many per week and specify what type of beverage:_____
_____
_____

4) Please indicate if you drink any of the following and specify on average how many cups per day are consumed?

_____Coffee (caffinated) Cups per day_____

_____Tea Cups per day_____

_____Colas Cups per day_____

5. a) Are you exercising? NO [ ] YES [ ]
b) If YES, indicate what FORMS of exercise (e.g. cycling, aerobics low/high impact, swimming etc...):_____

c) How many times a week do you exercise?_____

d) MINUTES per exercise session (ap(approx.)?_____

6. Are you still employed? NO [ ] YES [ ] If YES, how many hours per week?_____

7. If you are presently employed please specify approximately how many minutes or hours of standing (being on your feet) your job involves per day._____

III **PREGNANCY** - **PREGNANCY CHANGES**

Indicates any changes PREGNANCY has had on the following aspects of your life since our last interview.

Sexual Relationship

(a) - change in frequency of sexual activity:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

much lower frequency	somewhat lower	no change	somewhat higher	much higher frequency

(c) What is your current rate of sexual intercourse per month?_____

Career

d) - influence on your career life:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

extremely negative	somewhat negative	no change	somewhat positive	extremely positive

Self-Image

e) - effect on the manner in which you see and value yourself:

1:::::::::::::::2:::::::::::::::3:::::::::::::::4:::::::::::::::5

extremely negative	somewhat negative	no change	somewhat positive	extremely positive

CONCERNS

a) Please rate the extent of anxiety and/or nervousness you are feeling that is directly related to your pregnancy:

1:::::2:::::::::::3:::::::::4:::::::::5
not at all anxious — somewhat — extremely anxious

SOCIAL NETWORK/INFORMATION

a) How involved in your pregnancy do you feel your partner has been so far?

1:::::2:::::::::::3:::::::::4:::::::::5
not at all involved — somewhat — extremely involved

b) How supportive has your family and friends been about your pregnancy?

1:::::2:::::::::::3:::::::::4:::::::::5
not at all supportive — somewhat — extremely supportive

c) So far, other than your doctor, have you consulted additional sources in order to obtain information on different aspects of pregnancy? NO [ ] YES [ ]

If YES, indicate which sources below:

Other medical personnel.....[ ]
Reading material (i.e. books, articles).[ ]
Family or friends.....[ ]
Other.....[ ]

d) Have you started prenatal classes yet? NO [ ] YES [ ] When and how long will they last?_____

If YES, how helpful do you feel they have been?

1:::::2:::::::::::3:::::::::4:::::::::5
not at all helpful — somewhat — extremely helpful

What aspects have or have not been helpful? What would you like to see improved or added to the classes?_____

_____

5) Since the last interview how many visits have you made to your doctor?_____

Name:_____ Date:_____

POST QUESTIONNAIRE

I. **LABOR/DELIVERY:**

1) On what date was your baby delivered?_____

2) Sex of the baby?_____

3) How painful did you find the labor/delivery?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all

4) How stressful did you find the labor/delivery?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all

5) How frightening did you find the labor/delivery?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all

6) How in control did you feel during the labor/delivery?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all

7) Were you given any medication or anesthetics during the labor and/or delivery?
NO [ ] YES [ ] Specify_____

8) Approximately how long did the labor last?_____

9) Was labor induced? NO [ ] YES [ ]

10) How was the baby delivered? vaginally [ ] cesarean [ ]

11) a. IF VAGINALLY, were forceps used? NO [ ] YES [ ]

b. IF CESAREAN, did the doctor explain why this was preferable?_____

12) Were there any signs of fetal distress during the labor or delivery e.g. meconium? NO [ ] YES [ ] If YES, specify_____
_____

13) Was your husband in the delivery room with you? NO [] YES []

14) Was a family member or friend with you?
NO [ ] YES [ ] Who?_____

15) Did Dr. Wrzesinska deliver your baby? NO [ ] YES [ ]

16) How long was your stay in the hospital?_____

17) Did your baby leave with you? NO [ ] YES [ ]
IF NO, why and when did you bring your baby home?

_____

18) Was the labor and child birth as you expected?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
definitely somewhat definitely
no yes

II. **ONLY FOR MOMS WHO WENT FOR PRENATAL CLASSES:**

16) How helpful did you find the prenatal classes in preparing you for the labor and delivery?

1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all helpful

III. **INFANT STATUS:**

1) How much did your baby weigh at birth?_____

2) Were you told the baby's APGAR scores? NO [ ] YES [ ] If YES specify_____

3) What was your baby's health status at birth?
GOOD [ ] PROBLEM [ ] Specify_____

4) a. Are you breastfeeding your baby? NO [ ] YES [ ]
What reasons prompted this decision?_____

_____

b. Are you only breastfeeding OR are you also using bottle milk?
only breast milk [ ] combination of both [ ]

5) How often are you getting up to attend to your baby's needs?
(record approximate number of times per night)_____

6) How difficult has this been for you?
1:::::::::::2:::::::::::3:::::::::::4:::::::::::5
not somewhat extremely
at all difficult

7) Do you have someone helping you with the baby?
NO [ ] YES [ ]
Is this on a regular or occasional basis?_____

8) Have you gone back to work?
NO [ ] If NO, when do you think you will be returning?_____

_____

YES [ ] If YES, when did you return?_____

9) What factors have been most influential in helping you decide when to go back to work? (job related/person related/ financial/ or amount of help available) _____

_____

****ADMINISTER BLUES, NPI AND LUBIN

Thank Subject for participation

Comments:_____

_____

Appendix B
Questionnaires

State-Trait Anxiety Inventory (STAI)
Hassles Scale
Pregnancy Experiences Questionnaire (PEQ)
Lubin Depression Adjective Check-List (DACL)
Edinburgh Postnatal Depression Scale (EPDS)
Locke Wallace Marital Adjustment Scale (MAS)
Personality Characteristics
Social Support Questionnaire (SSQ)
Social Desirability Scale (SDS)
Coping Inventory for Stressful Situations (CISS)
Neonatal Perception Inventory (NPI)

Appendix C
Information Sheet
Consent Form
Monthly Instructions

The Role of Psychosocial Variables in Physical and Emotional Functioning During Pregnancy

This project is being conducted D. Da Costa, MA and W. Brender, PhD. of the Department of Psychology, Concordia University, in collaboration with your doctor.

Consent Form

Pregnancy is generally regarded as a period associated with various minor physical discomforts and emotional swings. The major aims of this study are to gain more understanding of health and emotional changes occurring during pregnancy. The information you provide will be very helpful in enabling us to better meet the psychological and health needs of pregnant women and their newborns.

Participation in this study would involve:

1. Three (3) interviews during the pregnancy and one (1) after the delivery.

- The first interview (30 minutes approx.) will be in person or on the telephone during your first trimester. At this time you will be asked to complete eight (8) brief paper-and-pencil questionnaires. The purpose of this interview is to obtain background information, your reproductive history and some facts on your current pregnancy. The questionnaires will inquire about marital functioning, occupational satisfaction, stress, mood, and social life.

- The second and third interview will be short (15 minutes) telephone interviews, spaced during the course of pregnancy (months 5 and 8). The purpose of these telephone interviews are to keep track of how you are feeling.

- The fourth and final interview will occur at about 4-5 weeks after delivery (15 minutes). This is to inquire about your experiences with labor and delivery and how your baby is doing.

2. Monthly Questionnaires: At the first interview you will be provided with a six month supply of questionnaires, along with stamped self-addressed envelopes. You will be asked to complete 4-6 questionnaires each month, starting in your 4th month of pregnancy and to return them by mail in the enclosed envelopes.
These questionnaires will take no longer than 5-10 minutes to complete each month. They will inquire about stress, mood, and pregnancy concerns.

The interviews and questionnaires will be administered by Ms. D. Da Costa and J. Larouche (848-7567), who are associated with Concordia University and are part of your doctor's team.

All information provided by participants will be held in the strictest of confidence. The interview and questionnaire responses which we collect over the course of your pregnancy will be kept separate from your medical file.

-I authorize the research team to consult my medical file in order to obtain information concerning my health status and how the pregnancy is progressing.

- I understand that my decision regarding participation in this study will in no way affect my medical care and my present or future relationship with my doctor.

- I understand that I am free to ask any questions regarding the procedures used in this study at any time. If for any reasons I experience discomfort or worries during participation in this study, I am free to discuss this with the project coordinator or my physician and request suitable advice or referrals, or to withdraw from the study.

- I am informed that upon completion of this study I am welcome to request and receive information concerning the findings.

- I understand that if the results of this study are published, my part in the study will be completely anonymous and my privacy will be protected.

I_____consent to participate in this study conducted by Deborah Da Costa, PhD. Candidate, Julie Larouche, PhD. Candidate, and William Brender, PhD.

Signed:_____

Date:_____

I, _____ certify that I have explained to the patient named above the purpose and procedures of the study and the patient acknowledges that she has the option of discontinuing at any time.

Signed:_____

Date:_____

ARE YOU PREGNANT?

If so....

Deborah Da Costa, MA & William Brender, PhD (Psychology Dept.-Concordia University), are currently conducting a project to obtain information on health and emotional changes occurring during pregnancy. This is in order to understand whether and how such factors may be linked to the course of pregnancy.

The information you provide will be very helpful for devising interventions to prevent and/or reduce difficulties which can occur during pregnancy.

Participation in this study would involve:

1. Interviews: One brief interview in you first trimester scheduled at your convenience (telephone or in person; evenings and weekends possible).

2. Questionnaires: Answering brief paper-and-pencil questionnaires on a monthly basis starting in your 3rd month. All the monthly questionnaires will be given to you following the interview, along with self-addressed stamped envelopes.

You can complete the 5-10 minute questionnaires each month in your own home and just drop them in the mail box.

3. Occasional phone calls to keep track of your progress through the pregnancy.

IF YOU HAVE SOME INTEREST IN THIS PROJECT, BUT ARE CONCERNED ABOUT YOUR TIME INVESTMENT OR ANY OTHER MATTERS, WE WOULD LIKE TO HEAR FROM YOU. THERE IS NO OBLIGATION AT ANY TIME.

Fill in your NAME and NUMBER below, Deborah Da Costa or Julie Larouche who are members of this research team, will be in contact with you shortly.

Name:_____

Phone Number (Home):_____and/or Work:_____

Indicate how far along you are in your pregnancy (in weeks)_____

You can also reach Deborah Da Costa or Julie Larouche 848-7567.

(Français au verso)

Appendix D
Factor Analyses on Stress Variables

D.1 Correlations among stress variables included in the factor analyses

D.2 Results of factor analyses for stress variables included in Multidimensional Stress Factor for each trimester

D.1 Correlations Among Stress Variables Included in the Factor Analyses

	Stai-2	Stai-3	Has-sles1	Has-les2	Has-les3	PEQ 1	PEQ 2	PEQ 3
Stai-1	.65***	.55***	.59***	.44***	.35**	.56***	.42***	.45***
Stai-2		.71***	.48***	.59***	.48***	.47***	.53***	.56***
Stai-3			.49***	.51***	.55***	.51***	.54***	.60***
Hassles 1				.78***	.62***	.57***	.54***	.50***
Hassles 2					.83***	.59***	.65***	.62***
Hassles 3						.59***	.65***	.63***
Peq1							.73***	.71***
Peq2								.81***

**p < .01; ***p<.001

D.2 Results of factor analyses for stress variables included in the Multidimensional Stress Factor for each trimester

Individual KMO's, Communalities and Factor Score Coefficients for the Multidimensional Stress Factor using First Trimester Measures

First Trimester Measures	KMO's	Communalities	Factor Score Coefficients
Hassles	.70	.73	.85
STAI-state	.71	.72	.85
PEQ	.72	.71	.84

Individual KMO's, Communalities and Factor Score Coefficients for the Multidimensional Stress Factor using Second Trimester Measures

Second Trimester Measures	KMO's	Communalities	Factor Score Coefficients
Hassles	.66	.78	.88
STAI-state	.76	.67	.82
PEQ	.70	.73	.85

Individual KMO's, Communalities and Factor Score Coefficients for the Multidimensional Stress Factor using Third Trimester Measures

Third Trimester Measures	KMO's	Communalities	Factor Score Coefficients
Hassles	.73	.69	.83
STAI-state	.71	.72	.85
PEQ	.69	.73	.86

Individual KMO's, Communalities and Factor Score Coefficients for the Multidimensional Stress Factor using the stress measures collapsed across trimesters

Measures	KMO's	Communalities	Factor Score Coefficients
Hassles	.73	.76	.87
STAI-state	.75	.75	.86
PEQ	.71	.77	.88

Appendis E:
Correlation Matrices

E.1 Correlation Matrix for Labor/Delivery Difficulties
E.2 Correlation Matrix for Infant Birthweight
E.3 Summary Statistics for Prepartum Stress Manova

Appendix E.1 Correlation Matrix for Labor/Delivery Difficulties

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. LDC	-.31**	-.13	-.27	.22	.06	-.05	-.21[1]	.25[1]	-.20[1]	.15	.29**	-.16	-.34**	.13	.25*
2. Age		.09	.44***	.33***	-.30**	-.20[1]	.05	-.21[1]	.10	-.15	-.25*	.15	-.22[1]	-.21[1]	-.11
3. Education			-.03	.37**	-.20[1]	-.04	-.09	-.15	.11	-.03	-.06	.30**	.01	-.16	-.22*
4. Parity				.07	-.14	.01	.21[1]	-.10	.10	.08	-.10	-.14	.10	-.06	-.16
5.Income					-.09	-.14	-.21[1]	-.28*	.16	-.22*	-.18	.19	-.01	-.22[1]	-.12
6. Smoke						.10	.04	.10	.10	.12	.19	-.02	-.09	.08	.01
7. Alcohol							.17	-.13	-.08	--	-.06	-.06	.06	.02	-.12
8. Caffeine[1]								.03	.03	.16	.18	-.10	--	.08	.21[1]
9. STAI-trait									-.23*	-.68***	.74***	-.22[1]	-.43***	.67***	.40***
10. SDS										-.31**	-.26*	.08	.14	-.37***	-.13
11. DACL											.70***	-.16	-.34**	.62***	.19
12.Stress factor												-.16	-.39***	.65***	.40***
13. SSQ-N													.11	-.16	-.25*
14. SSQ-S														-.18	-.23*
Coping															
15.Emotion															.35**
16.Distractive															----

*p <.05; **p <.01; ***p <.001; (n=77); [1] Third trimester caffeine intake

Appendix E.2 Correlation Matrix for Infant Birthweight

	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Birthweight	.44***	.21'	.32**	-.02	-.25*	.05	.04	.01	.11	.20'	.16	.21'	.10
2. Gestational Age		-.04	.27*	.03	—	.09	.04	.03	-.02	.09	.07	-.08	.17
3. Parity			.04	-.08	-.14	.02	.34**	-.11	.04	-.07	.13	.06	.07
4. Income				-.12	-.13	-.13	.07	-.12	-.15	-.21'	-.10	-.06	-.12
5. Smoke					.37**	.07	.16	-.23*	.17	.05	.02	-.20'	.05
6. Partner smoke						.07	.08	.13	--	-.04	-.05	-.07	.03
7. Alcohol							.23*	-.06	.02	.06	.13	.03	-.02
8. Caffeine								.30**	.28*	.12	.04	-.18	-.02
9. Stress factor									.70***	.65***	-.23*	-.47***	-.11
10. DACL										.60***	-.33**	-.35**	-.05
11. SSQ-N											-.06	-.27*	.04
SSQ-S													
12. *1st trimester*												.48***	.42***
13. *2nd trimester*													52***
14. *3rd trimester*													—

*p <.05; **p <.01; ***p <.001; (n=76)

E. 3 Summary Statistics for Prepartum Stress MANOVA

Effect	Pillais	F	Hypothesis df	Error df	p
Group	.20	2.68	6	148	.02*
Stepdown F tests					
Source	MS		df	Stepdown F	
Hassles	2687.47		2	4.58*	
error	586.94		75		
STAI-state	374.70		2	2.93T	
error	128.09		74		
PEQ	78.92		2	.75	
error	104.68		73		
Effect	Pillais	F	Hypothesis df	Error df	p
Time	.17	4.66	6	298	.001
Stepdown F tests					
Source	MS		df	Stepdown F	
Hassles	376.47		2	5.26**	
error	71.54		150		
STAI	110.61		2	3.57*	
error	31.02		149		
PEQ	101.43		2	5.07**	
error	20.02		148		

Effect	Pillais	F	Hypothesis df	Error df	p
Group X Time	.08	.97	12	450	.48

Stepdown F tests

Source	MS	df	Stepdown F
Hassles	22.37	4	.31
error	71.54	150	
STAI	69.13	4	2.23[t]
error	31.02	149	
PEQ	8.46	4	.42
error	20.02	148	