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Evaluation of a Social Support Measure That May Indicate Risk of Depression During Pregnancy

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EVALUATION OF A SOCIAL SUPPORT MEASURE THAT MAY INDICATE

RISK OF DEPRESSION DURING PREGNANCY

A Thesis Submitted to the Yale University School of Medicine in Partial

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By

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RISK OF DEPRESSION DURING PREGNANCY. Lori Spoozak, Nathan
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The objective of this study was to evaluate the psychometric properties of
the Kendler Social Support Interview modified for administration to pregnant
women and to assess the relationship between social support and depression in
the first trimester of pregnancy.   Subjects were administered the Modified
Kendler Social Support Interview (MKSSI) and the Composite International
Diagnostic Index to diagnose depression. Principal components analysis was
employed to construct the MKSSI score. Cronbach's coefficient alpha and
principal factor analysis were run for items included in the MKSSI score. The
relationship between a depressive diagnosis and the MKSSI score and
subscales was assessed by logistic regression. Cronbach's coefficient alpha
was high at 0.86. A one-unit increase in the MKSSI score, the difference between
the 25th and 75th percentile, was associated with a 58.3% lower odds of
depression (OR = 0.417, 95% CI=0.284-0.612). Higher MKSSI score, indicating
greater social support, was significantly associated (p< 0.001) with reduced odds
for depression in the first trimester. Subscales were factored by source of
support. A high subscale score for all relationships except siblings was
significantly associated (p< 0.05) with reduced odds for depression, but not as
robustly as the total score. Therefore, the MKSSI is reliable and valid for use in
pregnant women to assess social support.

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Table of Contents

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Introduction:

Social support, health and well-being

Conventional wisdom holds that positive, supportive social relationships contribute to health. However, only recently have social scientists worked to provide a conceptual framework for the measurement of this phenomenon. Social environment and more specifically social support have been studied extensively as contributors to disease.[1-4] Some research has suggested that the degree to which a person is socially networked and the quality of support perceived by the individual, relate to incidence of specific diseases and age-related mortality. However, for general health, results are difficult to interpret in due to lack of consistency in measurement.[2, 3, 5-7] This problem arises from the wide spectrum of definitions used to describe social support.

Social support has been theorized to consist of several different domains from both sociological and psychological perspectives. These have been most notably described by Cobb.[1] Cobb suggests that the essential components of social support are reliant on the following perceived or subjective information leading the subject to believe he or she a) is cared for and loved, b) is esteemed and valued, and c) belongs to a network of communication and mutual obligation in which one can count on others should the necessity arise. As Turner summarizes in his review, "Social support refers to the clarity or certainty with

which the individual experiences being loved, valued and able to count on others should the need arise."[8]

Other concepts have been explored under the umbrella of social support with emotional support being relegated to a single domain in the spectrum of support. For example, instrumental support has been proposed to include the provision of relevant counseling and assistance, sometimes but not always including an exchange of goods or money. Some would conflate this with tangible support or material support. Informational support has been proposed to include telling people things they need to know and helping them solve problems. Esteem support and appraisal support might be considered components of emotional support. Other components of social support include network size and frequency of contact with individuals, church or groups, otherwise termed social integration. Additionally, it has been argued that social support investigations should include positive and negative interactions with sources of support (*c.f., Schwarzer and Leppin, 1992*[3] *and Turner, 1992*[8] for review of all aforementioned social support concepts). Broadening of these definitions has led to extreme variation in results of studies trying to assess the relationship between "social support" and disease.

Social support and its mechanism in health promotion

The mechanism by which social support exerts a beneficial effect on health has been investigated using two different models. Cohen and Wills assembled the most influential review of the subject in 1985.[7] They explore a buffering model and main-effect/direct-effect model. The former posits that social support promotes well-being only for persons under stress. Maintaining a high level of social support buffers or protects persons from the potentially harmful effects of stressful stimuli. Based on proposed definitions of stress by Lazarus,[9] Cohen and Wills state, "stress arises when one appraises a situation as threatening or otherwise demanding and does not have an appropriate coping response."[7] Further they describe various ways stress may relate to physical illness.   In each of these proposed mechanisms, a type or category of social support might be elicited to offset the effect of stress. For example, if a stressful event occurs and a person feels they are personally unable to cope with the event (*e.g.*, financial instability), but he or she believes that a support network is in place to provide the necessary resources, it can attenuate the stress or prevent the stress reaction from occurring, to promote or maintain physical and mental health. Thus, material or instrumental support can maintain health when stress results from resource deprivation. Similarly, Cohen and Wills report that illness increases when the type of social support available does not align with the type of stressful event requiring support. For example, the presence of high emotional support will not ameliorate stress associated with a financial crisis.

In contrast to the buffering model, the main-effect/direct-effect model holds that social resources have a beneficial effect even if the person is not under stress. This is examined statistically by determining the main effect of support on health with insignificant stress/support interaction nor does it require a positive interaction. It is hypothesized to occur through the:

> beneficial effect of large social networks providing persons with regular positive experiences and a set of stable socially rewarded roles in the community. This kind of support could be related to overall well-being because it supports a positive affect, a sense of predictability and stability in one's life situation, and a recognition of self-worth…[and] helps one avoid negative experiences that would increase the probability of psychological or physical disorder.[7]

This can be interpreted to view social support as a global phenomenon that is difficult to dissect into the categories described before and it is in the global structure of positive support that the individual derives benefit.

The review concludes that there is evidence to support both models and suggests that both an overall network and divisions of social support may be correct conceptualizations but provide protection in different ways. We are not utilizing a stress measure to detect the role stress has to play in this scenario for our subjects.

There are many theories about how social support modifies the biological response in the body. Many articles suggest that in times of stress, individuals with high levels of social support compared to those with low levels have less robust physiological responses to stress. One example of this is an article by Gore,[10] that explored the health consequences of the stressful event of losing a job for 100 men during a layoff compared with men who had maintained their

positions at the same plant. Social network size and emotional support were assessed as well as health variables for cholesterol, illness symptoms and affective symptoms. Those who had low levels of social support among the layoff group had higher levels of cholesterol, greater illness symptoms and greater affective symptoms than those men with high levels of social support during the same layoff period.

Proposed pathways of these effects are that either there are neuroendocrine effects at work as per the last example and/or social support maintains better rates of compliance or adherence to medications and health regimens. In a review by Baekeland and Lundwall, 19 of 19 articles provided evidence that a high level of social support was related to increased compliance to medical regimens.[11]

Social support and depression

When social support is evaluated specifically in the realm of mental health, results generally suggest that there is a relationship between multiple categories of social support and the occurrence of psychological illness. Social support has been linked to the presence and development of psychiatric symptoms and disorders,[12-18] and is a particularly salient risk factor in determining the mental health of women compared to men in many,[5, 18-20] but not all studies.[21]

There has been extensive research into the risk factors for depression in women particularly based on the results of the National Comorbidity Survey from 1990-1992.[22] The National Comorbidity Survey administered a structured diagnostic psychiatric interview to a nationally representative sample of 8,098 men and women in the United States.   The survey found that women were approximately 1.7 times as likely as men to report a lifetime history of major depressive disorder. Additionally, this held true in the 12-month prevalence of major depression for adults between the ages of 15-54 with women having a 12.9 percent likelihood of being depressed, while the prevalence among men was 7.7 percent. This sex difference, where the rate of depression increases among women, was an age-related phenomenon, with the rates between men and women diverging at adolescence and converging in the 50's. Additionally, this convergence may be related to the smaller numbers of participants in the study at the opposite ends of the age spectrum. In light of this discovery of the relatively increased prevalence of depression among reproductive age women, depression during pregnancy and postpartum received particular attention.

While conflicting evidence exists about differences in the prevalence of depression between non-pregnant women of childbearing years and pregnant women, it appears that depression is at least as common during pregnancy. The most rigorous meta-analysis to date by *Gavin et al.*[23] included 28 eligible studies of depression in pregnancy utilizing diagnostic interviews for analysis. The range of point prevalence estimates throughout pregnancy and postpartum for major

depression were 1.0% to 5.6% with wide confidence intervals, not dramatically different overall from the 5.9% one month period prevalence of depression for women overall reported by the National Comorbidity Survey.[22] Points in time with the increased prevalence from this baseline occurred during the second and third month postpartum.

However, it remains that there is conflicting evidence of spike in depressive diagnosis and treatment in the postpartum period.[24,25] Also, some of this evidence about treatment suggests that there is less treatment provided in the second and third trimester of pregnancy. It cannot be concluded from these studies, which were based in database extraction, why the decrease or increase in treatment occurred.[26] We can hypothesize multiple scenarios for this decline and increase. On one hand, stigma about depression in pregnancy may reduce the willingness of women to come forward about depression, whereas this stigma has reduced in the postpartum period due to aggressive awareness campaigns. Additionally, a decrease in medication usage in the end of pregnancy may occur due to the perception of the negative consequences of psychotropic medication on the fetus. Alternatively, the rates of depression may in fact decrease in the second and third trimester and increase postpartum. Studies available to us today cannot make this distinction.

Whatever the case may be, it remains that the health risks of depression in pregnant women may be uniquely harmful. Depression in pregnancy has been

implicated as a risk factor for many problems such as poor weight gain, late or delayed prenatal care, self-neglect (*c.f., Stewart et al., 2006* for review)[27,28] poor birth outcomes[29-35] and postpartum depression.[24,36] Women who are depressed have a higher prevalence of co-morbid health habits such as cigarette smoking, drug and alcohol use.[24,28] In 2000-2002, the British Confidential Enquiry into Maternal Deaths described psychiatric illness as the leading cause of maternal deaths overall.[37] Additionally, the effect on the fetus and early infancy and childhood is well documented. In a review by *Fields et al.* from 2006, they explored the constellation of behavioral, physiological, and biochemical effects that depression during pregnancy had on the child.[38] They note that in many studies of the fetuses of depressed mothers, they have notably higher heart rates, activity levels, and physiological reactivity.[38] The newborns of depressed mothers show decreased positive affect and perform sub-optimally on the Brazelton neonatal behavior assessment scale.[38] Continuing to the toddler stage, negative affect can be predicted by their cortisol responses to mild stressors.[38] Finally, infants of depressed mothers show poorer mental, motor and emotional development including poor emotional health compared to infants of non-depressed mothers and this can occur into childhood.[38] It is clear that the need for instruments to anticipate and diagnose depression in pregnancy is great.

The majority of studies suggest that low social support may contribute to the risk of developing depression in pregnancy or in the postpartum period.[39-50]

although the strength of this risk factor varies among studies (*c.f., O'Hara and Swain*, 1996 for review).[41] Inconsistencies in reported results of the role for social support in perinatal depression may reflect use of different social support scales. Some investigations used scales that assessed only a few domains of support.[39, 40, 47-49, 51-54] For instance, emotional support was investigated broadly but not asked in relationship to a particular source of support such as family, friend or spouse support. Alternatively, questions only asked about the existence of certain relationships such as spouse or family or friends without investigating type of support received. Other measures explored multiple domains of support inconsistently based on subject responses,[42, 43, 46, 49, 52] so within a particular study, multiple types of support were assessed and compared inconsistently.

To our knowledge only a single study assessed the association between social support and a syndromal, rather than continuous measure of depression. For example, many studies used instruments such as the Edinburgh Postnatal Depression Scale, a screening instrument for detection of symptoms of depression within a small window period for evaluation. Additionally, various score points are utilized for evidence of depression. These cutoff scores can be inconsistent between studies and can artificially inflate rates of depression. The one study that utilized a syndromal interview used outdated definitions of depression and had a small sample size (N=85).[50] Other social support measures have been psychometrically evaluated in pregnant women without external validation using depressive diagnosis.[55, 56] The variable time periods of

measurement in pregnancy and postpartum in these studies are another

potential source of inconsistency limiting the value of meta-analysis. Most

studies take place in the postpartum period and this is variously defined

anywhere from one month to one year following delivery. Finally, it would be

inappropriate to generalize results in many studies due to limited demographic

sampling.

Given the potential health risks of low social support in pregnancy and the

need for an accurate and feasible social support instrument, this study evaluated

the reliability and validity of a social support instrument, the Kendler Social

Support Interview, in a large pregnant cohort.[20]

Specific Aims:

The objective of this study was to evaluate the psychometric properties of reliability and validity for the Kendler Social Support Interview modified for administration to pregnant women and to assess the relationship between social support and depression in the first trimester of pregnancy. This is a cross-sectional analysis of a nested cohort from the Pink and Blue study of depression in pregnancy. The Pink and Blue study is a longitudinal study of pregnant women evaluating rates of depression and psychiatric medication use throughout pregnancy and postpartum and assessing birth outcomes. In this particular part of the analysis of the Pink and Blue cohort we are assessing depression as an external validator of our scale due to the lack of a gold standard social support measure with which we may provide convergent validity. Because the relationship between social support and depression has been established using this scale in non-pregnant women, we will use this scale and depressive diagnosis to cross-sectionally validate a modified version for use in pregnant women. It is necessary to validate this tool for use in a future study that will utilize the social support score to predict depression in a longitudinal fashion utilizing the Pink and Blue cohort.

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Methods:

Procedures

Women were recruited from obstetrical offices and clinics throughout Connecticut and Western Massachusetts to participate in the Yale Pink and Blue Study, a large epidemiological study of depression, antidepressant treatment use and birth outcomes. While this is the primary outcome of the Pink and Blue study, many factors relating to affective disorders in pregnancy are also being investigated. Social support is one of these factors. Women were screened and verbally consented over the telephone. They were eligible if they spoke English or Spanish, to their knowledge were having a singleton pregnancy, did not require insulin for diabetes, they would be delivering at a participating hospital and had not yet completed their 16th week of pregnancy.

Subjects were interviewed face-to-face prior to 16 completed weeks of pregnancy at which time all participants provided verbal and written consent. They were then re-interviewed by telephone at 28 weeks of pregnancy and two months postpartum. They were reimbursed $20 per interview and an additional $20 for completing all three interviews. Interviewers underwent several days of training and completed a minimum of six practice interviews and at least two fully supervised interviews of each type. Interviews were fully scripted and were audio-taped. At least 5% of tapes were reviewed for quality control. An additional 5% of subjects were re-contacted by supervisory staff to confirm

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critical elements of the interview. Approval for the study was obtained from the

Human Investigation Committee at the Yale University School of Medicine and

from affiliated hospitals.

Assessment Measures

Screening instruments included depression stem questions from the

Composite International Diagnostic Index (CIDI)[57] and the Modified Post

Traumatic Stress Disorder Symptom Scale-Self-Report.[58] Interview assessment

measures relevant to this analysis included the modified Kendler Social Support

Interview (MKSSI) and the CIDI administered at the first aforementioned

interview prior to 16 weeks of pregnancy.

The Kendler Social Support Interview was chosen for its ability to

investigate many social support variables simultaneously and observe how they

are grouped in a factor structure. It is based on the Social Interaction Scale

developed at the Institute for Social Research.[15] Recently, the Kendler Social

Support Interview showed significant ability to predict the onset of a depressive

disorder among women participating in a study of 1057 opposite sex dizygotic

twin pairs.[20] This longitudinal study assessed the quality and quantity of social

support as a predictive measure of depression onset over one year. Women and

men were interviewed at the start of the study, the Wave I interview, and

assessed for social support and depression. This was followed by a second

interview in one year. A greater degree of social support in women at the Wave I

interview significantly predicted decreased rate of depression onset at the Wave

II interview. For every increase in one standard deviation away from the average

global social support score, the risk of depression decreased by 40%. The

greater the initial global social support score, the lower the risk of developing a

major depressive episode over one year. This relationship was not observed in

men. Even after controlling for history of depression, this relationship remained

intact for women, with the same odds ratio.[20]

The original Kendler Social Support Interview was composed of 24

questions. The items were designed to assess "quality of support" with questions

based on concepts of emotional support, which is the communication of caring

and concern and instrumental support, operationalized as the provision of

relevant counseling and assistance. The first two questions addressing

emotional support asked: 1) How much does your____listen to you if you need to

talk about your worries or problems? and 2) How much does your___understand

the way you feel and think about things? The instrumental support question

asked: 1) How much does your___go out of their way to help you if you really

need it? Additionally, frequency of contact was assessed for all relationships: 1)

How frequently do you and your___see each other, talk on the phone, or

communicate through letters or email? The quality of support and frequency of

contact items were asked in regard to specific personal relationships with

spouse, parents, co-twin, children, other relatives, and friends. Group

relationships with church or clubs were assessed by a frequency of contact question only. Finally, network size was assessed by number of confidants with the following questions: 1) Is there anyone with whom you have a close confiding relationship and can share your most private feelings? and 2) With how many people do you have this kind of relationship?[20]

In the current study, the social support interview was modified to include 26 items and has been named the modified Kendler Social Support Interview (MKSSI) for clarity. We based our scale modifications on the factor structure of the Kendler study and replaced questions by source of support groupings in the following manner. Items about the co-twin, were substituted with the group "Siblings". As the average age of our subjects was younger than the Kendler sample, we decided to eliminate the category of support from children. Additionally, we divided the "Parents" subscale into "Mother" and "Father" subscales. The first 23 items assessed the quality of social support received from six different relationships and the frequency of contact with those individuals. They were Spouse/Partner, Mother, Father, Siblings, Other Relatives, and Friends. The last three questions assessed frequency of attendance at church, clubs or meetings and confidant network size.

Most items on the MKSSI were scored with Likert style questions corresponding to a score of 0 to 5. For consistency, the following questions were recoded prior to analysis. Existence of a spouse or partner was recoded from

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0/1 (no/yes) to 0/5 to make the question comparable to other relationship questions. Respondents reporting more than 5 confidants were given a value of 5. Respondents without the living applicable relative, *e.g.*, father not living, or not in contact with that relative, *e.g.*, don't see father, were given the minimum value of 0 out of 5 for frequency of contact and 1 out of 5 for questions within the sections probing emotional and instrumental support. Thus, values to every question ranged from 0 to 5 for frequency of contact and number of confidants or 1 to 5 for emotional and instrumental support type questions. A composite MKSSI score variable was obtained by averaging items that were retained in the principal components analysis. For the subscales of the MKSSI score, items were grouped by principal factor analysis and then averaged.

A comprehensive psychiatric assessment was conducted using the CIDI, version 2.1,[57] a structured diagnostic interview that produces psychiatric diagnoses based on the criteria defined by both the DSM-IV[59] and ICD-10.[60] It can be administered by trained lay interviewers.[61] The CIDI has excellent test-retest and procedural reliability, and validity.[62, 63] World Health Organization CIDI field trials have shown adequate reliability and validity of the mood and anxiety disorder modules, specifically.

Statistical Analysis

SAS version 9.1.3 on Windows XP Pro 2002 was utilized for all analyses. To construct the MKSSI score, principal components analysis was used. Varimax rotation was used to interpret the MKSSI and construct MKSSI score subscales. Reliability of the MKSSI score was measured with Cronbach's Coefficient Alpha.

Logistic regression was used to assess the relationship between social support and depression in the first trimester of pregnancy and provide external validity. All regression analyses included age, race, and education. Age was categorized as 20 years old or less, between 20 and 30, or over 30 years old. Education as defined by grade level, was grouped as less than 12th, 12th through 15th, and 16th or greater. Race was combined into three categories: White + Asian, Black, and Other (Hispanic + Mixed + Other). For the first regression model, depression was the dependent variable and MKSSI score one of the independent variables. For the second regression analysis, the dependent variable of depression was predicted by each source of support in individual models. P-values and odds ratios, with associated 95% confidence intervals, for a one-unit increase in composite source of support were determined.

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Involvement in Study:

My specific involvement with the methods of this project is outlined in the following paragraph. The parent project, Pink and Blue, was conceived of by several faculty members and is overseen mainly by Drs. Yonkers and Belanger. It was and continues to be executed by their respective research groups at the Yale PMS and Perinatal Research Program and the Yale Center for Perinatal, Pediatric and Environmental Epidemiology. Staff members performed screening, interviewing, and data management. I actively screened subjects and performed interview monitoring. I was trained to administer all of the interviews, but I only performed the screening interviews and performed quality control of all the interview types, which gave me direct exposure to the data collection procedures and provided a clear sense of the study protocol and procedures. While doing quality control, I would listen to full length interviews and record deviations from the script. I additionally accompanied Dr. Yonkers to recruitment meetings at different physician offices in Connecticut. Finally, I began work on collecting birth outcomes data for the overall Pink and Blue study by doing chart reviews at Yale New Haven Hospital. I worked with Dr. Yonkers to conceive of this nested evaluation of the social support interview. I worked with Nathan Gotman, Haiqun Lin, and Janneane Gent, on the statistical analysis. Nathan Gotman programmed the analysis in SAS. I worked with Nathan Gotman and Janneane Gent to interpret the data. I was the primary author of the manuscript for publication.

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Results:

Sample

There were 2758 subjects screened on or before August 18, 2006. Interested women were screened by phone using questions regarding current or past depression treatment, current depressive symptoms, trauma and psychotropic medication used. Of those subjects, 510 were women with probable current or recent depression, PTSD or antidepressant treatment "exposed group", and were automatically offered a position in the study, while 1310 women had none of these exposures "not exposed". Of the latter not exposed group, 423 (32%) were randomly selected and offered a position in the study.

Of the 933 total subjects eligible, 812 (87%) successfully completed the home interview, 49 (5%) refused the home interview, 1 terminated her pregnancy, 11 (1%) miscarried before the home interview, 56 (6%) were not interviewed by the 16th completed week gestational age cutoff, and 4 were dropped from the study due to improper screening administration. There were no significant differences in attrition among participants who did or did not have a probable exposure to a mood, an anxiety disorder or psychotropic treatment.

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Of the 812 who were screened, included and successfully completed their home interview, 11 did not complete their home interview before the cutoff of August 23, 2006 for inclusion in this analysis and an additional 10 were excluded due to uncertainty over pregnancy dates. Of the 791 remaining subjects, 8 additional were excluded due to improper administration of the MKSSI, leaving N=783 in the final dataset. Women with major depressive disorder (MDD) or minor depressive disorder (MinD) determined by CIDI score in any of the first three months of pregnancy were considered depressed.

Of the N=783 subjects analyzed, the majority were married (72%), over 30 years old (59%), white (79%), completed 4 years of college (55%), and had a combined family income of $50,000 or greater (69%). However, a sizeable minority of the population were never married (10%), 20 years old or younger (5%), Black (7%) or Hispanic (11%), did not complete high school (6%), and had a combined income of $20,000 or less (11%), Among these 783 women, 6% had major depression and 3% had minor depression (Table 1).

Construction of the MKSSI Score

From the 27 questions included in the MKSSI, one large principal component (eigenvalue = 6.086) representing 22.5% of the total variance emerged in the analysis. Six additional components with eigenvalues greater than unity (3.437, 3.012, 2.383, 2.337, 2.109, 1.163) gave 7 components in total,

accounting for 76.0% of the total variance. The first component seen in Table 2

had positive loadings on all items as in the Kendler study[20] that they termed

"global social support." As a dominant component, accounting for greater than

20% of the total variance, it formed the basis of the MKSSI score. Questions

with loadings of less than the significance cutoff of 0.4 were omitted from the

MKSSI score, including frequency of contact with spouse, siblings, other

relatives, and friends, and attendance of church and clubs.[64] A total of 21

questions remained with loadings ranging from 0.425 to 0.612 (Table 2).

Because the remaining loadings were close in range, it was decided to calculate

the MKSSI score as the simple average of unweighted values. The MKSSI score

had high reliability with Cronbach's Coefficient Alpha of .86.

MKSSI Subscales

Varimax rotation of the 21 question MKSSI score subset provided a clear

decomposition by source of support. The item subgroups that follow were

averaged to create MKSSI score subscales: 1) father quality of support questions

+ frequency question; 2) mother quality of support questions + frequency

question; 3) spouse quality of support questions; 4) friend quality of support

questions + number of confidants question; 5) other relatives quality of support

questions; and 6) siblings quality of support questions. In the logistic regression,

subscales were examined for their relationship to depressive diagnosis.

MKSSI score and depression

Observed MKSSI score values for the data ranged from 1 to 5 (Table 3). The mean of 3.521 and median of 3.571 were approximately equal, roughly corresponding to a support level between "Some" and "Quite a bit" of support for a typical relationship category. Percentile differences were not especially large, with a difference of 1.000 between the 1st and 3rd quartiles, and a difference of 2.000 between the 10th and 90th percentiles.

A higher MKSSI score was associated significantly (p<.001) with reduced odds for depression in the first trimester. As seen in Table 4, a one unit increase in the score was associated with a 58.3% reduction in odds for depression (OR = .417, 95% CI=.284-.612). A two unit increase in the score was associated with an 82.6% decrease in odds for depression (OR = 0.174, 95% CI=0.081-0.374). The model predicted women with very high MKSSI scores greater than 4.7, n=17 , to have low probabilities of depression between 2.5% to 3.6%. See Figure 1. In contrast, predicted probabilities for depression in women with scores between 2.0 and 2.5, n=46, were higher varying between 17.7% and 35.1%. For the women with scores of 2.0 or less, n=19, predicted probabilities of depression ranged from 27.1% to 53.4%.

When subscale scores for individual sources of support were evaluated, reduced odds for depression were significantly related to higher values for

spouse (OR=.777), mother (OR=.802), father (OR=.754), other relatives

(OR=.698), and friends + number of confidants (OR=.621) as seen in Table 4.

Sibling support was not significantly associated with a depressive diagnosis. As

aforementioned, the composite MKSSI score maintained the strongest

association with depression, with an OR of .417 for a one unit increase in score.

Discussion:

After item reduction, the MKSSI was internally consistent and demonstrated construct and external validity in a large pregnant cohort. These results suggest that the MKSSI is a reasonable measure to examine social support in pregnant women. Additionally, a high MKSSI score was significantly correlated to decreased odds of depression in the first trimester of pregnancy, providing excellent external validation of this interview. If this interview is employed in the first trimester of pregnancy to assess a patient's social support status and low score is the result, this study would suggest an increased suspicion for an underlying depressive illness is warranted.

While the relationship between social support and depression was significant in both the original Kendler study[20] and our study, the items retained for creation of our social support score were different. We replicated their principal components analysis method with slightly different results. In *Kendler et al.*[20] all frequency questions and social integration were deemed relevant in the "global social support" principal component, whereas our data showed the frequency of contact items to be related to global social support for mother and father only. We can infer that for our subjects, frequency of contact from only their mother or father was important to overall social support. In this sample, frequency of contact with spouse, other relatives, siblings, and friends was not related to variability in global support, suggesting that perceived support from

these sources was reliant on quality of support rather than amount of contact. Additionally, frequency of contact with clubs/ church was not significant to overall support. This information would be helpful in the creation of social support interventions for pregnant women, where we may hypothesize that perception of social support from parents would need to address contact with the subject, while interventions with other social relationships would need not focus on that aspect of support.

It can be argued that the overall perception of social support by the subjects was quality of emotional support. Further, in the question construction of instrumental support that is phrased 1) How much does your___go out of their way to help you if you really need it?, it is not directly asking about materials or counseling received from the source of support, but rather the reliability of the support gained by that source of support. It may have been perceived that the "reliability" of support type in question was in fact of emotional support rather than goods or counseling and that the overriding domain that was perceived as global social support was indeed emotional.   This would be consistent with Cobb's and House's ideas that the most crucial type of support perceived for the maintenance of psychological health and well-being is perceived emotional support[1] (*c.f., Turner for review*)[8]

The variation in items we retained in our study versus the Kendler study can be attributed to different analytic techniques or group differences. Also, as

the actual factor loadings are not presented in the Kendler study, perhaps different levels of significance were used for item loadings. Additionally, we included subjects missing certain categories of relationships, such as those having a deceased father, instead of excluding them from the analysis as in the Kendler study. We decided to view lack of social support as the absence of a relationship whether through death or interpersonal conflict. Therefore, subjects missing certain categories of relationships still received a score on the interview in that category. Finally, perhaps the items that did not load are less relevant to our cohort in their concept and construction of social support, as our cohort varied dramatically in age and gender from the initial study. As a result of this variance from the original study, we would suggest eliminating these items from the MKSSI for future analysis of social support in pregnant women.

Social support has been theorized to consist of several different measurable domains from both sociological and psychological perspectives.[2,3] While different hypothesized types of social support, in addition to sources of support, were measured in our analysis, our subjects perceived the construct of social support to be described by source of support as compared to the various qualities of emotional support, instrumental support or frequency of support. This is frequently seen in social support literature[8] and consistent with the Kendler study.[20] We can elaborate that this is a good measure of general perceived social support from particular sources of support, such as mother or father, and that each relationship has a different strength and nature of support to our

pregnant subjects. Therefore, it is important to evaluate and score each of these categories separately in the overall construction of the summed scale, instead of using broad evaluations of relationship categories such as family or friends. The significance of each source of support was further illuminated by logistic regression. All individual sources of support except siblings showed a statistically significant relationship to depression.   However, it remains that the combination of these scores provides the strongest association with depression. These results are similar to the Kendler study and reinforce the validity of the scale construction.

This was the first study of social support and depression in pregnancy to utilize a diagnostic interview for depression using current DSM IV diagnostic criteria. The one prior study to have utilized an interview measure,[50] the Hamilton Depression Rating Scale, which assesses symptom severity and correlates this to a diagnosis of depression rather than frankly assessing syndromal diagnosis of depression. Other studies have used screening questionnaires that are not able to diagnose depression specifically but are elevated by general emotional distress, concurrent psychiatric illness or general medical conditions[65, 66] They are highly subjective and can be biased by a few symptoms that may be far more severe than others. We can say with certainty that utilizing this interview there was robust relationship between women who had major and minor depression in the first trimester of pregnancy and low social support score.

There are five dominant hypotheses that attempt to explain the interaction between social support and mental health. First, that a deficiency in social support is an independent determinant of common mental disorders. Second, this relationship holds only in the presence of adversity. Third, that social support promotes well-being. Fourth, that social support contributes to the restitution of mental health, not to its destabilization. Last, that a deficiency in social support is associated with increased physical morbidity, mortality, or both.[7, 13, 67-69] Additionally, social support may be a proxy for something else such as personality feature that also defines vulnerability to a psychiatric condition. In other words, those individuals who perceive low social support my be unable to recognize social support, even if it is there and these individuals have personality disturbances that also leave them vulnerable to psychiatric illness such as depression. In a study by Verkerk, high neuroticism and high introversion was the only independent predictor of depression in the first year postpartum.[70] As this study is cross-sectional in nature, we cannot claim that it supports or refutes any of these hypotheses. Also, we do not assess personality profiles. However, in the Kendler study this first hypothesis held true for women. The Pink and Blue study is poised to evaluate depression onset in pregnant women in both the third trimester and postpartum. The next step with this instrument will be to predict depression in a longitudinal analysis of social support and depression during pregnancy. Additionally, this scale may be utilized to evaluate the last

hypothesis in the dynamic relationship between social support, depression, and birth outcomes.

Low social support has been linked to poor birth outcomes.[40, 71] We are focusing on the need to predict depression because social support interventions have already been evaluated with little success in preventing poor birth outcomes in women without depression.[72] Perhaps depression is a mediator/moderator of the relationship between low social support and poor birth outcomes and it is in the screening for low social support and then managing depression that we may address this association.

The creation of a strong predictive index of depression in pregnancy and postpartum is necessary. Studies have addressed the poor recognition of mood and anxiety disorders in obstetric settings, ranging from 23 to 26% detection of psychiatric disorders and only 12% detection of suicidal ideation by providers.[73-75] Perhaps a readily interpretable, predictive social support interview may be incorporated into a depression screening measure that already exists. Thereby, enhancing the sensitivity of a depression scale. Hypothetically, if administered in the first trimester, this might allow for improved early detection of patients at high-risk for future depressive episodes and those with current depression, allowing rapid implementation of mental health services to attempt to prevent the onset of depression or address a current depressive episode, then further down the chain, to prevent or reduce birth outcomes. If in future analysis this tool is consistent

with the Kendler results, it could be used to predict which women are at the

highest risk of becoming depressed. This is where it would be of the greatest

use to health care professionals.

An additional analysis with this instrument that would be very interesting to

see at the completion of the data gathering for the full Pink and Blue study, would

be an evaluation of social support, depression, low birth weight and poor birth

outcomes. It would be interesting to see how the relationship between all of the

factors studied together longitudinally manifests itself. Is social support truly

mediated/modified by depression in relationship to birth outcomes and low birth

weight if race, socioeconomic status, and age are controlled for?

<u>Limitations:</u>

There are several limitations to this study. Feasibility has dictated that only perceived social support can be evaluated by the MKSSI. But as argued previously, it appears that this is the most relevant type of support assessed. Self-report measures are difficult to verify and may be more influenced by personality, mood, or anxiety disorders than actual social support received. Additionally, although external validity of the MKSSI has been established using the CIDI, convergent validity cannot be established with another social support instrument, as there is no gold standard social support scale. We can say that as the relationship between depression and various types of social support has been fairly well documented in non pregnant women and therefore relationship of a low score on this scale to depressive diagnosis is a valid means of assessing the strength of the scale.

Because this is a cross sectional study, we are unable to claim that low social support precedes depression and in fact, low social support may be the result of a prior depressive episode itself. In order to determine if high social support protects a subject from depression onset, this study must be longitudinal and beginning with a group of subjects who have no current symptoms of depression. Furthermore, in our model we did not control for prior history of depression. It would be important to see how a prior history of depression would impact the relationship between depression and social support, especially in a

longitudinal analysis. In the Kendler study,[20] it did not affect the magnitude of the

relationship, it increased the baseline risk of depression in the subjects.

While there was a strong attempt to recruit minorities for the study, the

numbers were not fully representative of the population at large. This may be

partially due to the fact that in the early part of the study, the Spanish interview

was not yet acceptably translated and retranslated, accounting for lower numbers

of Spanish speaking subjects. The subject data pulled for this analysis were

from the very start of the project, which should improve as the project proceeds

over the next several years. The goal for recruitment is 3,500 women, and by the

time the longitudinal analysis of social support and depression is performed,

there will likely be a more representative sample of minorities. It would be

interesting to look at how social support acts in these different racial and ethnic

groups because studies suggest that the impact of social support and its

relationship to depression behaves differently in different populations. *Stuchbery

et al.* evaluated this in a postpartum analysis of social support and depressive

symptoms using three different groups of women.[76] Anglo-Celtic, Arabic and

Vietnamese women were included and the sources of support significantly

related to mood differed in the groups. Anglo-Celtic women were most

significantly affected by perceived need for greater emotional support from

partners and mothers. For Arabic women, low mood was associated with need

for emotional support from their partner. In Vietnamese women, low mood was

associated with poor quality of relationship with the partner and need for more

practical help from him. We can say from this analysis different types of support are more important to different ethnic groups and our subscale results may not be generalizable to all women. We will be able to investigate this further in the future.

Additionally, as the study is near completion there will be greater numbers of depressed women identified and included, which will allow for methodologically sound comparisons to be made between the characteristics of depressed versus non-depressed women. An investigation into these characteristics will allow for further identification of women who are at greatest risk for low social support and therefore depression.

Table 1: Demographics of Study Population

Characteristic		Frequency (%)
Marital Status	Married	561 (72)
	Living w Partner	125 (16)
	Divorced	6 (1)
	Separated	7 (1)
	Widowed	2 (0)
	Never Married	82 (10)
Age	≤20	42 (5)
	>20 and ≤30	277 (36)
	>30	464 (59)
Race	White	616 (79)
	Asian	19 (2)
	Black	54 (7)
	Hispanic	87 (11)
	Mixed	6 (1)
	Other	1 (0)
Education	Less than High School	49 (6)

	High School or Some College	308 (39)
	College or More	426 (55)
Income	< $20,000	82 (11)
	$20,000-$49,999	155 (20)
	$50,000-$99,999	287 (37)
	≥ $100,000	243 (32)
Depression	MDD	45 (6)
	MinD	23 (3)

Table 2: Loadings of MKSSI items on the "Global Social Support"

Component

MKSSI Item	Loading	MKSSI Item	Loading
Spouse Frequency	.341	Relatives Frequency	.364
Spouse Emotional 1	.449*	Relatives Emotional 1	.528*
Spouse Emotional 2	.448*	Relatives Emotional 2	.563*
Spouse Instrumental	.442*	Relatives Instrumental	.612*
Sibling Frequency	.297	Friends Frequency	.283
Sibling Emotional 1	.478*	Friends Emotional 1	.435*
Sibling Emotional 2	.484*	Friends Emotional 2	.449*
Sibling Instrumental	.530*	Friends Instrumental	.475*
Mother Frequency	.425*	Church Frequency	.081
Mother Emotional 1	.589*	Club Frequency	.097
Mother Emotional 2	.595*	# of Confidants	.483*
Mother Instrumental	.586*		
Father Frequency	.473*		
Father Emotional 1	.591*		
Father Emotional 2	.595*		
Father Instrumental	.584*		

*Question included in the MKSSI score.

Table 3: Percentiles of observed MKSSI score values

Percentile	MKSSI score value
100th (max)	5.000
90th	4.571
75th	4.048
50th	3.571
25th	3.048
10th	2.571
0th (min)	1.000

Table 4: Odds Ratios for subscale scores and MKSSI score

Source	OR	OR 95% CI	P-value
Spouse	0.777	(0.633, 0.953)	0.016
Sibling	0.917	(0.755, 1.113)	0.379
Mother	0.802	(0.667, 0.964)	0.019
Father	0.754	(0.623, 0.912)	0.004
Relatives	0.698	(0.567, 0.858)	0.001
Friends +	0.621	(0.468, 0.825)	0.001
# Confidants			
MKSSI Score	0.417	(0.284, 0.612)	<.0001

Figure 1. Predicted probability of depression from MKSSI score in the first trimester of pregnancy. These probabilities are predicted from a logistic regression, (with race, education, and age as covariates) in which risk for depression was predicted from the main effect of MKSSI score.

Predicted Probability of Depression by MKSSI Score

- N=783 Subjects Analyzed
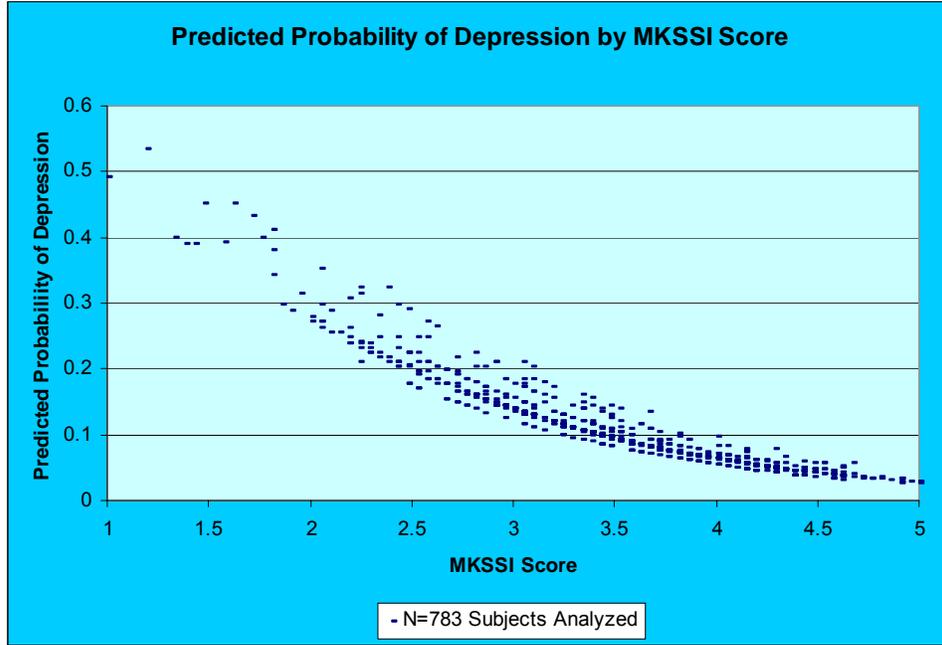
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