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Low socioeconomic status, parental stress, depression, and the buffering role of network social capital in mothers

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Background: Pathways underlying the stress-depression relationship in mothers, and the factors that buffer this relationship are not well understood.

Aims: Drawing from the Stress Process model, this study examines (1) if parental stress mediates the association between socioeconomic characteristics and depressive symptoms, and (2) if social support and network capital moderate these pathways.

Method: Data came from 101 mothers from Montreal. Generalized structural equation models were conducted, with depressive symptoms (CES-D scores) as the outcome, socioeconomic stressors as independent variables, parental stress as the mediator, and social support and network social capital as moderators.

Results: Parental stress partially mediated the association between household income and depressive symptoms (indirect effect: β = -0.09, Bootstrap SE = 0.03, 95% CI = -0.15 - -0.03 p = 0.00). Network diversity moderated the relationship between parental stress and depressive symptoms (β = -0.25, 95% CI = -0.42 - -0.09, p = 0.00); at high levels of stress, mothers with high compared to low network diversity reported fewer symptoms.

Conclusion: Findings highlight the role that socioeconomic factors play in influencing women's risk of depression and shaping the benefits that ensue from social resources. Addressing these factors requires interventions that target the social determinants of depression.

Introduction

Stress related to parenting is one of the largest contributors to depression in mothers (Thomason, et al., 2014). Certain groups of mothers are particularly vulnerable to stress and depression, including those with lower income and education levels (Field, Hernandez-Reif, & Diego, 2006). The pathways by which stress may impact depression are complex, with certain types of stress (e.g., parental stress) potentially mediating the path between chronic stressors (such as living with low income) and depression (Katerndahl & Parchman, 2002). Yet, not every mother who experiences chronic stress develops depression. A mother's social resources can protect against stress and poor mental health (Wang, Cai, Qian, & Peng, 2014). Identifying the specific pathways through which socioeconomic and parental stressors lead to depression in mothers, and identifying those factors that act as "buffers" against stress are important research areas to pursue, as they can inform how public health initiatives might better support mothers and protect their mental health (England & Slim, 2009).

The Stress Process Model

The Stress Process Model suggests that there is a sequential pathway between different types of stress and depression and that social resources may be protective against the impact of stress on depression (Pearlin, Menaghan, Lieberman, & Mullan, 1981). The core constructs of the Stress Process Model suggest that the relationship between chronic stress and depression may be (1) mediated by other forms of stress and (2) modified by personal and social resources (Pearlin, 1999).

Mediators in the stress process

The Stress Process Model suggests that chronic stress can proliferate other types of stress, which

can lead to adverse mental health outcomes (Pearlin, Menaghan, Lieberman, & Mullan, 1981). Primary stressors refer to the first sources of stress in the sequence, and secondary stressors refer to the types of stress that emerge from, or are exacerbated by, the primary stressors (Pearlin, 1999). Primary stressors often include chronic socioeconomic conditions, such as limited financial means (Pearlin, 1999). Low socioeconomic status (SES) can expose one to other stressors in a person's life, including parental stress in mothers (Leigh & Milgrom, 2008). Parental stress has been shown associated with increased depression among mothers (Thomason, et al., 2014), suggesting that parental stress may be one mediating pathway that links SES with depression.

Moderators of the stress process

An important caveat is that stress does not always lead to depression. In fact, the Stress Process Model postulates that certain social and psychological resources may moderate the association between stress and depression by altering the ways in which individuals appraise or react to stressors (Pearlin, 1999). Social support and social capital are two types of social resources that may buffer against stress (Thoits, 2011). Social support tends to emerge from one's close social ties, whereas social capital tends to emerge from a person's weaker, more extensive ties (Moore et al., 2016). Previous studies examining the buffering effects of social support on depression have not always explicitly tested the stress process model, but only certain sets of relationships within the model. Most research in this area has focused on social support as a stress buffer, with researchers providing mixed support. For example, studies have shown higher social support to buffer the effects of stress on depression (Wang, Cai, Qian, & Peng, 2014; Takizawa, et al., 2006; Dalgard, Biork, & Tambs, 1995), while others have found that it does not (Reid & Taylor, 2015). Less research has examined social capital as a stress buffer. Previous studies have shown

higher network social capital may only benefit mental health under certain conditions, thereby potentially having an indirect, rather than direct effect on depression (An & Jang, 2016; Bassett & Moore, 2013).

Purpose of the current study

In a community-based sample of Quebec, Canada mothers, this study examines the role that primary and secondary stressors and social resources play in depression. Research questions include:

(1) Does parental stress (a secondary stressor) mediate the association between income and education status (primary stressors), and depressive symptoms?

(2) Do social support and network social capital moderate the pathway between stressors and depressive symptoms?

By investigating the mediating role of stress within the home environment, and the relative impact of social support and social capital in buffering the effects of stress on depression, this study will provide insight into the types of interventions that should be designed to combat depression.

Methods

Sample

Data for this study came from the Maternal Adversity, Vulnerability and Neurodevelopment (MAVAN) study. The MAVAN study used a birth cohort design to recruit a community-based sample of mothers (N=551) from Montreal, Quebec and Hamilton, Ontario. Between 2003 and 2009, pregnant women were recruited at obstetrics clinics during routine

ultrasounds between 13 and 20-weeks' gestation. Women were eligible for the study if they were 18 years or older at the time of recruitment, had singleton pregnancies, and were fluent in French or English. Women were excluded from the study if they had severe chronic maternal illness, faced serious complications during pregnancy or delivery, or if their child was born with a very low birth weight, was born before 37 weeks' gestation, or was born with a congenital disease. Ethical approval for MAVAN was obtained from the Douglas Mental Health Hospital at McGill University and St. Joseph's Hospital (protocol #03/45). MAVAN mothers gave their informed consent to participate in this research study. The current study focuses on the cross-sectional relationships among study variables at 72 months postpartum. The sample is novel in that it includes data on the economic, social, particularly social networks, and health characteristics of mothers that is not otherwise routinely collected.

Measures

Depressive symptoms. The 20-item Centre for Epidemiologic Studies Depression (CES-D) scale was used to assess depressive symptoms during the past week. Statements included "I was bothered by things that usually don't bother me", and "I felt that I could not shake of the blues, even with the help of friends and family". Response options and scores ranged from (0) rarely or none of the time (< once a week) to (3) most or all of the time (5-7 days a week). Scores for each item were summed for each participant, with a higher score indicative of more depressive symptoms. The Cronbach's alpha was 0.69, indicating low to moderate reliability.

Socioeconomic stressors. Household income and mother's education level were considered the primary stressors. Income included total gross household income, including welfare payments, before taxes and deductions. Responses were grouped into ranges from "at least $5,000" to "at least $100,000". Mother's attained education was grouped into four

categories: (1) high school diploma or less, (2) some community college, (3) completed community college or some university, and (4) university degree.

Parental stress. Parental stress was measured using the Parental Stress Scale. Mothers rated the extent to which they agreed with 18 items, including: "I am happy in my role as a parent", "the major source of stress in my life is my child", and "I find my child enjoyable". Response options ranged from disagree strongly (1) to agree strongly (5), with certain items reverse coded. Parent's stress score was their average for the 18 items, with a possible range from 1 to 5. The Cronbach's alpha was 0.61, indicating low reliability.

Social capital. Social network diversity and presence of a partner were measured to assess network social capital. Social network diversity was measured using a position generator. The position generator asked participants whether they knew any individuals on a first-name basis who held a specific occupation from a list of ten occupations including a high school teacher, a carpenter, or artist on a first name basis. Responses were coded as 1 ('yes') or 0 ('no') for each occupation, with scores ranged from 0 to 10. The presence of a partner was measured by asking mothers if they presently had a partner (e.g., husband).

Social support needs. Social support was measured by asking participants if they needed help with certain tasks or situations during the past two weeks, including: (1) have you needed help with something like furniture, money, clothes, or food?, (2) have you needed help babysitting your children, running errands or cleaning the house?, (3) have you needed information, input, or guidance in a particular situation, for you or another member of your family?, (4) have you needed to talk to someone about something personal or intimate in nature?, (5) did you feel that you needed someone to give you positive feedback or approval to be told

that you have made the right decision? One point was assigned to each 'yes' response with higher scores indicating the need for more types of social support.

Covariates. Race was self-reported as white, Asian, black, Hispanic, or other race. For these analyses, mothers who reported being white were compared to those who reported any of the other categories. Mother's age was recorded in years.

Statistical analysis

Analyses were conducted using STATA/MP 12. Summary statistics were calculated to describe the sample's characteristics. Generalized structural equation modeling (GSEM) was used to examine the mediating and moderating pathways to depressive symptoms. Depressive symptoms was treated as having a negative binomial distribution given its overdispersion. Three modeling steps were conducted:

(1) The first model included two main components to investigate if parental stress mediated the associations between primary stressors and depressive symptoms: (a) income and education as predictors of parental stress, and (b) income, education, and parental stress as predictors of depressive symptoms. Bootstrapping with 5000 resamples was used to predict the indirect and direct effects of the mediating pathway. This approach has been shown to (i) have higher power than traditional mediation approaches, (ii) lower the likelihood of Type 1 error, and (iii) does not require that the sampling distribution be normally distributed (Hayes, 2009). To calculate the proportion of the total effect that was mediated, the indirect effect was divided by the total effect for each statistically significant indirect pathway.

(2) Step two investigated if social capital and social support moderated the mediation effect(s) observed in Step one. Moderating effects were investigated along the pathways between (a) primary stressors and parental stress, and (b) parental stress and depressive symptoms, controlling for variables associated with depressive symptoms. Further analyses were conducted for the statistically significant interaction terms to visually display their slopes.

(3) In step three, conditional indirect effects were computed to determine if mediation effects changed at different levels of the moderator. For continuous moderators, conditional indirect effects were calculated at low, medium and high levels of the moderator. Bootstrapping with 5000 resamples was conducted to obtain bootstrapped standard errors for the conditional indirect effects.

Results

Sample characteristics

Data on depression were available for 101 mothers from Montreal at 72 months postpartum. Study characteristics can be seen in Table 1. Montreal MAVAN mothers in the sample reported few depressive symptoms (mean = 10.07; standard deviation = 8.63). Mothers most often reported a moderate level of parental stress (mean = 2.61, standard deviation = 0.44), and needed a moderate level of social support in the previous two weeks (mean = 2.61, standard deviation = 1.33). Mothers in the sample had a mean network diversity score of 5.44 (standard deviation = 1.94) out of a possible score of 10. Most mothers had a partner (87.25%), had completed university (54.90%), and reported 'white' as their race (82.18%). Most mothers had relatively high household incomes, with almost one-third (31.68%) of the sample reporting a household

income of $100,000 or greater. Results from preliminary analyses (results not shown) indicated that potential covariates, including non-white race (β = 0.04, 95% CI = -0.38 – 0.47, p = 0.84), and maternal age (β = -0.03, 95% CI = -0.06 - 0.01, p = 0.11), were not associated with depressive symptoms and so were not included in the analyses below.

Mediation models

The first component of the model examined if primary stressors were associated with parental stress. Results (Table 2 and Figure 1) indicated that higher household income was associated with lower parental stress (B = -0.09, 95% CI = -0.15 - -0.03, p = 0.03) but not educational attainment, when controlling for the other. The second component examined associations between primary stressors, the mediating variable, and depressive symptoms. Higher household income (B = -0.15, 95% CI = -0.25 – -0.05, p = 0.00) was but mother's attained education was not associated with fewer depressive symptoms. Higher parental stress was associated with more depressive symptoms (B = 0.51, 95% CI = 0.19 – 0.83, p = 0.00). Social support needed also had a positive relationship with depressive symptoms (B = 0.24, 95% CI = 0.14 – 0.35, p = 0.00).

Results from the bootstrapped GSEM, with 5000 resamples indicated that parental stress partially mediated the association between household income and depressive symptoms (indirect effect: β = -0.09, Bootstrap SE = 0.03, 95% CI = -0.15 - -0.03 *p* = 0.00). Parental stress mediated 60% of the total effect of household income on depressive symptoms, with household income and depressive symptoms no longer associated after adjusting for parental stress. Mothers' educational attainment was neither directly nor indirectly associated with depressive symptoms.

Moderated mediation models

Results from the GSEMs that examined if social support and social capital moderated the

mediation effect revealed that higher network diversity was directly associated with higher depressive symptoms (β = 0.51, 95% CI = 0.13 - 0.89, p = 0.01) (Table 3). Network diversity was also shown to moderate the association between parental stress and depressive symptoms (β = -0.25, 95% CI = -0.42 - -0.09, p = 0.00). As shown in Figure 2, mothers with high levels of parental stress and high diversity had fewer depressive symptoms than those with high stress and low network diversity. Network diversity did not moderate the association between household income and parental stress. Neither the presence of a partner nor social support needs moderated the path between household income and parental stress or parental stress and depressive symptoms (data not shown).

A conditional indirect effect analysis (Table 4) indicated that the mediation effect of parental stress was observed only under certain conditions. The indirect effect of household income on depressive symptoms was mediated by parental stress only among those with low (β = -0.07, 95% CI = -0.14 – -0.004, *p* = 0.04, bootstrapped SE = 0.04) and medium (β = -0.04, 95% CI = -0.08 – -0.01, *p* = 0.02, bootstrapped SE = 0.02) levels of network diversity, and among those with medium levels of needed social support (β = -0.04, 95% CI = -0.08 - -0.01, *p* = 0.02, bootstrapped SE = 0.02) . Parental stress did not mediate the association between household income and depressive symptoms among those with high levels of network diversity (*p* > 0.05), and the conditional indirect effect was not moderated by presence of a partner (*p* > 0.05).

Discussion

Using a community-based sample of mothers that included rich data on women's social networks, we examined certain key pathways linking socioeconomic stressors to depressive

symptoms and the role of social resources in moderating the association between stress and depressive symptoms. Several key findings emerged from our study. First, household income was shown associated with depressive symptoms in mothers - a finding that is consistent with previous research (Leigh & Milgrom, 2008). Moreover, parental stress partially mediated the association between household income and depressive symptoms. This finding extends previous research that has shown direct associations between poorer socioeconomic status and higher parental stress, and direct associations between parental stress and depressive symptoms in mothers. (Fox, Platz, & Bentley, 1995; Venkatesh, Phipps, Triche, & Zlotnick, 2014; Pearlin, 1999). Second, having identified the relationships among socioeconomic stressors, parental stress, and depressive symptoms, our study examined whether social resources - network social capital and social support –might ameliorate the negative consequences of stress on mother's depressive symptoms. In this regard, our study showed, first of all, that the mediating effect of parental stress was conditional upon mothers' levels of social capital and the social support needed. Parental stress mediated the association between household income and depressive symptoms only among mothers with low social capital and medium levels of social capital and needed social support, suggesting that the stress process might operate differently in individuals who have high compared to low social resources. Third, our study examined whether social support and social capital moderated the association between parental stress and depressive symptoms. Neither the presence of a partner nor needing social support was found to modify the association between parental stress and depressive symptoms. Network social capital, on the other hand, did moderate the association between parental stress and depressive symptoms. Among mothers with high levels of social capital the association between parental stress and depressive symptoms was weaker than those with low social capital.

Our study suggests that social support and social capital mechanisms may operate differently when it comes to buffering the relationship between stress and depressive symptoms. The presence of a partner was neither directly nor indirectly associated with depressive symptoms in the current study. Research has shown mixed findings on whether having a partner is beneficial for women's mental health, although research has shown having a partner more beneficial for men (Scott, et al., 2010). The benefits of having a partner or spouse may be contingent on the quality of the relationship (Holt-Lunstad, Birmingham, & Jones, 2008). Furthermore, the study showed a positive association between social support needs and depressive symptoms. Mothers who reported needing higher levels of social support also reported more depressive symptoms. A recent systematic review indicated that instrumental and general support from friends do not always implicate better mental health (Gariepy, Honkaniemi, & Quesnel-Vallee, 2016). Furthermore, despite previous research showing social support to buffer against various forms of stress (Takizawa, Kondo, Sakihara, Ariizumi, Watanabe, & Oyama, 2006; Dalgard, Biork, & Tambs, 1995), our study of the stress-buffering hypothesis did not confirm a buffering role for social support needs. This may be, as other researchers have suggested, due simply to the overwhelming effects of highly stressful circumstances on poor mental health (Manuel, Martinson, Bledsoe-Mansori, & Bellamy, 2012; Reid & Taylor, 2015). Another potential explanation for these findings may be attributed to the measure of social support used. The current study measured mothers' reported need for different types of social support but not whether social support was available or accessed. Our findings indicate that mothers experiencing depressive symptoms may have a greater need for support from their social networks. Future research might examine if other measures or types of social support, including received support, act as buffers against parental stress.

Most research on the stress-buffering hypothesis has examined the role of social support and not social capital as a stress buffer. Our findings suggest however that social capital may provide unique and important stress-buffering resources to mothers that are not accessible through social support networks. Social capital represents access to broader, more diverse resources through a person's weaker and more extensive social ties (Moore et al., 2016). Higher network social capital may benefit health by decreasing isolation, increasing self-esteem, providing the individual with greater social control (which might pressure the individual to adopt healthy lifestyles), and increasing access to health-benefitting resources (Thoits, 2011; An & Jang, 2016). Higher network capital may also indicate generalized social integration (Granovetter, 1973).

Limitations

There are a number of limitations to consider in interpreting the study findings. First, the study is cross-sectional, meaning that causal relationships cannot be inferred from the study findings. For example, mothers with existing depression may have been more likely to report needing various types of support to help them cope, compared to those mothers who were not depressed and may not have needed additional support. Second, the scales for depressive symptoms and parental stress were shown to have low to moderate internal consistency, thus lowering the reliability of these measures. In response, we used principal components analysis to create alternative scores for parental stress, and conducted ancillary analyses to assess whether the alternative measure provided different results. Findings from these ancillary analyses were similar to those from our main analyses. Third, data on depressive symptoms was missing for 29 mothers. If those mothers also had higher rates of depressive symptoms, the estimates presented in our paper may have been attenuated. Finally, the current study measured the extent to which

social support was needed in the previous two weeks. Debate in the literature indicates that perceived support is a stronger indicator of mental health compared to received support (Haber, Cohen, Lucas, & Baltes, 2007), which may explain why social support was not shown as a protective factor against depressive symptoms in the moderation models. Future research should investigate the role of perceived social support as a buffer against depression in mothers.

Conclusion

This study's findings support the need for upstream policies and interventions that address the social influences on depression, particularly those geared toward addressing low income levels. Findings also support the need for mental wellness initiatives that help to leverage mothers' own social resources to reduce stress and improve mental health. Although previous interventions have often targeted mothers' social support as a means of improving mental health (Evans, Donelle, & Hume-Loveland, 2012; Strange, Fisher, Howat, & Wood, 2014), few have aimed to enhance mothers' social capital. Yet, participation in local parenting groups have been shown to increase mothers' social capital and the mental well-being of their 0-5 year olds (Strange, Fisher, Howat, & Wood, 2014). A public health approach that considers the broader social environment in which mothers inhabit can help to reduce toxic effects of stress on maternal and children's mental health.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Albert, M., Becker, T., McCrone, P., & Thornicroft, G. (1998). Social networks and mental health service utilisation - a literature review. *International Journal of Social Psychiatry, 44*(4), 248-266.

An, S., & Jang, Y. (2016). The role of social capital in the relationship between physical constraint and mental distress in older adults: a latent interaction model. *Aging and Mental Health*, 1-5.

Balaji, A. B., Claussen, A. H., Smith, D. C., Visser, S. N., Johnson Morales, M., & Perou, R. (2007). Social support networks and maternal mental health and well-being. *Journal of Women's Health, 16*(10), 1386-1396.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Barrera, M. J. (1981). Social support in the adjustment of pregnant adolescents. In B. H. Gottlied, *Social networks and social support* (pp. 69-96). Beverly Hills: Sage.

Bassett, E., & Moore, S. (2013). Mental health and social capital: capital as a promising initiative to improving the mental health of communities. In A. J. Rodriguez-Morales, *Current topics in public health* (p. Chapter 28). InTech.

Bassett, E., & Moore, S. (2013). Social capital and depressive symptoms: the association of psychosocial and network dimensions of social capital with depressive symptoms in Montreal, Canada. *Social Science & Medicine, 86*, 96-102.

Cheng, C., & Pickler, R. H. (2009). Effects of Stress and Social Support on Postpartum Health of Chinese Mothers in the United States. *Research in Nursing & Health, 32*, 582-591.

Chou, K. L., Liang, K., & Sareen, J. (2011). The association between social isolation and DSM-IV mood, anxiety, and substance use disorders: wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 72*, 1468-1476.

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *The American Journal of Sociology, 94*, S95-S120.

Cruwys, T., Dingle, G. A., Haslam, C., & Haslam, S. A. (2013). Social group memberships protect against future depression, alleviate depression symptoms and prevent depression relapse. *Social Science & Medicine, 98*, 179-186.

Dalgard, O. S., Biork, S., & Tambs, K. (1995). Social support, negative life events and mental health. *The British Journal of Psychiatry, 166*(1), 29-34.

England, M. J., & Slim, L. J. (2009). *Depression in parents, parenting and children: opportunities to improve identification, treatment, and prevention.* Washington, DC: The National Academies Press.

Evans, M., Donelle, L., & Hume-Loveland, L. (2012). Social support and online postpartum depression discussion groups: A content analysis. *Patient Education and Counseling, 87*(3), 405-410.

Ferlander, S., Stickley, A., Kislitsyna, O., Jukkula, T., Carlson, P., & Makinen, I. H. (2016). Social capital – a mixed blessing for women? A cross-sectional study of different forms of social relations and self-rated depression in Moscow. *BMC Psychology, 4*, 37.

Field, T., Hernandez-Reif, M., & Diego, M. (2006). Risk factors and stress variables that differentiate depressed from nondepressed pregnant women. *Infant Behavior and Development, 29*(2), 169-174.

Forsman, A. K., Nyqvist, F., Schierenbeck, Y., Gustafson, Y., & Wahlbeck, K. (2012). Structural and cognitive social capital and depression among older adults in two Nordic regions . *Aging and Mental Health, 16*(6), 771-779.

Fox, R. A., Platz, D. L., & Bentley, K. S. (1995). Maternal Factors Related to Parenting Practices, Developmental Expectations, and Perceptions of Child Behavior Problems. *The Journal of Genetic Psychology, 156*(4), 431-441.

Gariepy, G., Honkaniemi, H., & Quesnel-Vallee, A. (2016). Social support and protection from depression: systematic review of current findings in Western countries. *The British Journal of Psychiatry*, 1-10.

Golfenshtein, N., Srulovici, E., & Deatrick, J. A. (2016). Interventions for Reducing Parenting Stress in Families With Pediatric Conditions: An Integrative Review. *Journal of Family Nursing, 22*(4), 460-492.

Goyal, D., Gay, C., & Lee, K. A. (2010). How Much Does Low Socioeconomic Status Increase the Risk of Prenatal and Postpartum Depressive Symptoms in First-Time Mothers? *Women's Health Issues, 20*(2), 96-104.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*, 1360–1380.

Gyamfi, P., Brooks-Gunn, J., & Jackson, A. P. (2008). Associations Between Employment and Financial and Parental Stress in Low-Income Single Black Mothers. *Women & Health*, 119-135.

Haber, M. G., Cohen, J. L., Lucas, T., & Baltes, B. B. (2007). The relationships between self-reported received and perceived social support: A meta-analytic review. *American Journal of Community Psychology, 39*, 133-144.

Haines, V. A., Beggs, J. J., & Hurlbert, J. S. (2011). Neighborhood disadvantage, network social capital, and depressive symptoms . *Journal of Health and Social Behavior, 52*(1), 58-73.

Hammen, C. (2003). Interpersonal stress and depression in women. *Journal of Affective Disorders, 74*, 49-57.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs, 76*(4), 408-420.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach.* New York, NY: Guilford Press.

Hilbe, J. M. (2011). *Negative binomial regression* (Second ed.). Cambridge: Cambridge University Press.

Holt-Lunstad, J., Birmingham, W., & Jones, B. Q. (2008). Is There Something Unique about Marriage? The Relative Impact of Marital Status, Relationship Quality, and Network Social Support on Ambulatory Blood Pressure and Mental Health. *Annals of Behavioral Medicine, 35*(2), 239-244.

Irwin, J., LaGory, M., Ritchey, F., & Fitzpatrick, K. (2008). Social assets and mental distress among the homeless: exploring the roles of social support and other forms of social capital on depression. *Social Science & Medicine, 67*(12), 1935-1943.

Katerndahl, D. A., & Parchman, M. (2002). The ability of the stress process model to explain mental health outcomes. *Comprehensive Psychiatry, 34*(5), 351-360.

Leigh, B., & Milgrom, J. (2008). Risk factors for antenatal depression, postnatal depression and parenting stress. *BMC Psychiatry, 8*, 24.

Lewin, A., Mitchell, S. J., Rasmussen, A., Sanders-Phillips, K., & Joseph, J. G. (2011). Do Human and Social Capital Protect Young African American Mothers From Depression Associated With Ethnic Discrimination and Violence Exposure? *Journal of Black Psychology, 37*(3), 286-310.

Lin, N. (1999). Building a network theory of social capital. *Connections, 22*, 28-51.

Lipman, E. L., Kenny, M., & Marziali, E. (2011). Providing web-based mental health services to at-risk women. *BMC Women's Health, 11*, 38.

Lorant, V., Croux, C., Weich, S., Deliege, D., Mackenbach, O., & Ansseau, M. (2007). Depression and socio-economic risk factors: 7-year longitudinal population study. *The British Journal of Psychiatry, 190*(4), 293-298.

Manuel, J. I., Martinson, M. L., Bledsoe-Mansori, S. E., & Bellamy, J. (2012). The influence of stress and social support on depressive symptoms in mothers with young children. *Social Science & Medicine, 75*, 2013-2020.

Mayberry, L. J., Horowitz, J. A., & Declercq, E. (2007). Depression symptom prevalence and demographic risk factors among U.S. women during the first 2 years postpartum. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 36*(6), 542-549.

Mitchell, C. U. (2002). Social capital and mental distress in an impoverished community. *City & Community, 1*(2), 99-222.

Mitchell, C. U., & LaGory, M. (2002). Social capital and mental distress in an impoverished community. *City & Community, 1*(2), 99-222.

Moak, Z. B., & Agrawal, A. (2009). The association between perceived interpersonal social support and physical and mental health: results from the national epidemiological survey on alcohol and related conditions. *Journal of Public Health, 32*(2), 191-201.

Moore, K. (2005). *Thinking about youth poverty through the lenses of chronic poverty, life-course poverty and intergenerational poverty.* Manchester, UK: Chronic Poverty Research Centre.

Moore, S., Bockenholt, U., Daniel, M., Frohlich, K., Kestens, Y., & Richard, L. (2011). Social capital and core network ties: A validation study of individual-level social capital measures and their association with extra- and intra-neighborhood ties, and self-rated health. *Health & Place, 17*, 536-544.

Nolen-Hoeksema, S., & Girgus, J. S. (1994). The emergence of gender differences in depression during adolescence. *Psychological Bulletin*, 424-443.

O'Hara, M. W. (2009). Chapter 1Postpartum depression: what we know Authors. *Clinical Psychology, 65*(12), 1258-1269.

Oshio, T., Inoue, A., & Tsutsumi, A. (2014). The mediating and moderating effects of workplace social capital on the associations between adverse work characteristics and psychological distress among Japanese workers. *Industrial Health, 52*, 313-323.

Pearlin, L. I. (1999). The stress proces revisited. In C. S. Aneshensel, & J. C. Phelan, *Handbook of the sociology of mental health* (pp. 395-415). New York, NY: Academic Plenum Publishers.

Pearlin, L. I., Menaghan, E. G., Lieberman, M. A., & Mullan, J. T. (1981). The stress process. *Journal of Health and Social Behavior, 22*(4), 337-356.

Pearson, C., Janz, T., & Ali, J. (2013). Mental and substance use disorders in Canada. *Health at a Glance, Statistics Canada*, 82-624-X.

Pfeiffer, P. N., Heisler, M., Piette, J. D., Rogers, M. A., & Valenstein, M. (2011). Efficacy of peer support interventions for depression: a meta analysis. *General Hospital Psychiatry, 33*, 29-36.

Pollack, J. M., Vanepps, E. M., & Hayes, A. F. (2012). The moderating role of social ties on entrepreneurs ' depressed affect and withdrawal intentions in response to economic stress. *Journal of Organizational Behavior, 33*, 789-810.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879-891.

Putnam, R. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*, 65-78.

Reid, K. M., & Taylor, M. G. (2015). Social support, stress, and maternal postpartum depression: A comparison of supportive relationships. *Social Science Research, 54*, 246-262.

Rich-Edwards, J. W., Kleinman, K., Abrams, A., Harlow, B. L., McLaughlin, T. J., Joffe, H., & Gillman, M. W. (2006). Sociodemographic predictors of antenatal and postpartum depressive symptoms among women in a medical group practice. *Journal of Epidemiology & Community, 60*, 221-227.

Rich-Edwards, J., Kleinman, K., Abrams, A., Harlow, B. L., McLaughlin, T. K., Joffe, H., & Gillman, M. W. (2006). Sociodemographic predictors of antenatal and postpartum depressive symptoms among women in a medical group practice . *Journal of Epidemiology & Community Health, 60*(3), 221-227.

Scott, K. M., Wells, J. E., Angermeyer, M., Brugha, T. S., Bromet, E., Demyttenaere, K., . . . Kessler, R. C. (2010). Gender and the relationship between marital status and first onset of mood, anxiety and substance use disorders. *Psychological Medicine, 40*(9), 1495-1505.

Segre, L. S., O'Hara, M. W., Arndt, S., & Stuart, S. (2007). The prevalence of postpartum depression: The relative significance of three social status indices. *Social Psychiatry and Psychiatric Epidemiology, 42*(4), 316-321.

Strange, C., Bremner, A., Fisher, C., Howat, P., & Wood, L. (2016). Mothers' group participation: associations with social capital, social support and mental well-being. *Journal of Advanced Nursing, 72*(1), 85-98.

Strange, C., Fisher, C., Howat, P., & Wood, L. (2014). Fostering supportive community connections through mothers' groups and playgroups. *Journal of Advanced Nursing, 70*(12), 2835-2846.

Takizawa, T., Kondo, T., Sakihara, S., Ariizumi, M., Watanabe, N., & Oyama, H. (2006). Stress buffering effects of social support on depressive symptoms in middle age: reciprocity and community mental health. *Psychiatry and Clinical Neurosciences, 61*(3), 336-337.

Thoits, P. A. (1995). Stress, coping, and social support processes: where are we? what next? *Journal of Health and Social Behavior*, 53-79.

Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior, 52*(2), 145-161.

Thomason, E., Volling, B. L., Flynn, H. A., McDonald, S. C., Marcus, S. M., Lopez, J. F., & Vazquez, D. M. (2014). Parenting stress and depressive symptoms in postpartum mothers: bidirectional or unidirectional effects. *Infant Behavior & Development, 37*, 406-415.

Valencia-Garcia, D., Simoni, J. M., Alegria, M., & Takeuchi, D. T. (2012). Social capital, acculturation, mental health, and perceived access to servies among Mexican American women. *Journal of Consulting and Clinical Psychology, 80*(2), 177-185.

van der Waerden, J., Hoefnagels, C., Hosman, C. M., Souren, P. M., & Jansen , M. W. (2013). A randomized controlled trial of combined exercise and psycho-education for low-SES women: short- and long-term outcomes in the reduction of stress and depressive symptoms. *Social Science & Medicine, 91*, 84-93.

Venkatesh, K. K., Phipps, M. G., Triche, E. W., & Zlotnick, C. (2014). The relationship between parental stress and postpartum depression among adolescent mothers enrolled in a randomized controlled prevention trial. *Maternal and Child Health Journal, 18*, 1532-1539.

Wang, X., Cai, L., Qian, J., & Peng, J. (2014). Social support moderates stress effects on depression. *International Journal of Mental Health Systems, 8*, 41.

Wang, X., Cai, L., Qian, J., & Peng, J. (2014). Social support moderates stress effects on depression. *International Journal of Mental Health Systems, 8*, 41.

Webber, M., Huxley, P., & Harris, T. (2011). Social capital and the course of depression: six-month prospective cohort study. *Journal of Affective Disorders, 129*, 149-157.

Wilson, A. E., & Etherington, N. (2016). Poverty, income, and wealth across the life course. In M. Harrington Meyer, & E. A. Daniele, *Gerontology: changes, challenges, and solutions* (pp. 137-160). Santa Barbara, CA: ABC-CLIO.

Table 1. Sample characteristics of Montreal mothers from the MAVAN study (n=101).

Characteristics	**Mean (standard deviation)**
Depressive symptoms (scale range: 0-60)	10.07 (8.63)
Parental stress (scale range: 1-5)	1.68 (0.44)
Social support needed (scale score range: 0-5)	2.61 (1.33)
Social capital (scale score range: 0-10)	5.44 (1.94)
	Frequency (percentage)
Presence of partner: *No*	13 (12.75)
Yes	89 (87.25)
Mother's education level during pregnancy: *High school or less*	8 (7.84)
Some college	6 (5.88)
Completed college or some university	32 (31.37)
Completed university	56 (54.90)
Household income (total gross household income): *<$20,000*	7 (6.93)
$20,000 - $39,999	12 (11.88)
$40,000 - $59,999	20 (19.80)
$60,000 - $79,999	15 (14.85)
$80,000 - $99,999	15 (14.85)
$100,000 and higher	32 (31.68)
Mother's race: *White*	83 (82.18%)
Asian	1 (0.99)
Black	2 (1.98)
Hispanic	3 (2.97)
Other race	12 (11.88)

Table 2. Direct effects of primary stressors on depressive symptoms and indirect effect of parental stress on the association between primary stressors and depressive symptoms, GSEM models with 5000 bootstrap replications, Montreal MAVAN mothers (n=101).

	Total effects		***Direct effects***		***Indirect effects***	
Independent variable	**Beta coefficient (95% CIs)**	**Bootstrapped standard error**	**Beta coefficient (95% CIs)**	**Bootstrapped standard error**	**Beta coefficient (95% CIs)**	**Bootstrapped standard error**
Household income	-0.15 (-0.27 - -0.03)*	0.06	-0.08 (-0.21 - 0.05)	0.06	-0.09 (-0.15 – -0.03)**	0.03
Mother's education level during pregnancy	-0.10 (-0.29 – 0.10)	0.10	-0.13 (-0.33 – 0.07)	0.10	0.06 (-0.07 – 0.19)	0.06
Parental stress			0.62 (0.28-0.95)***	0.18	--	--

*$p < 0.05$; ** $p < 0.01$; ***$p < 0.001$

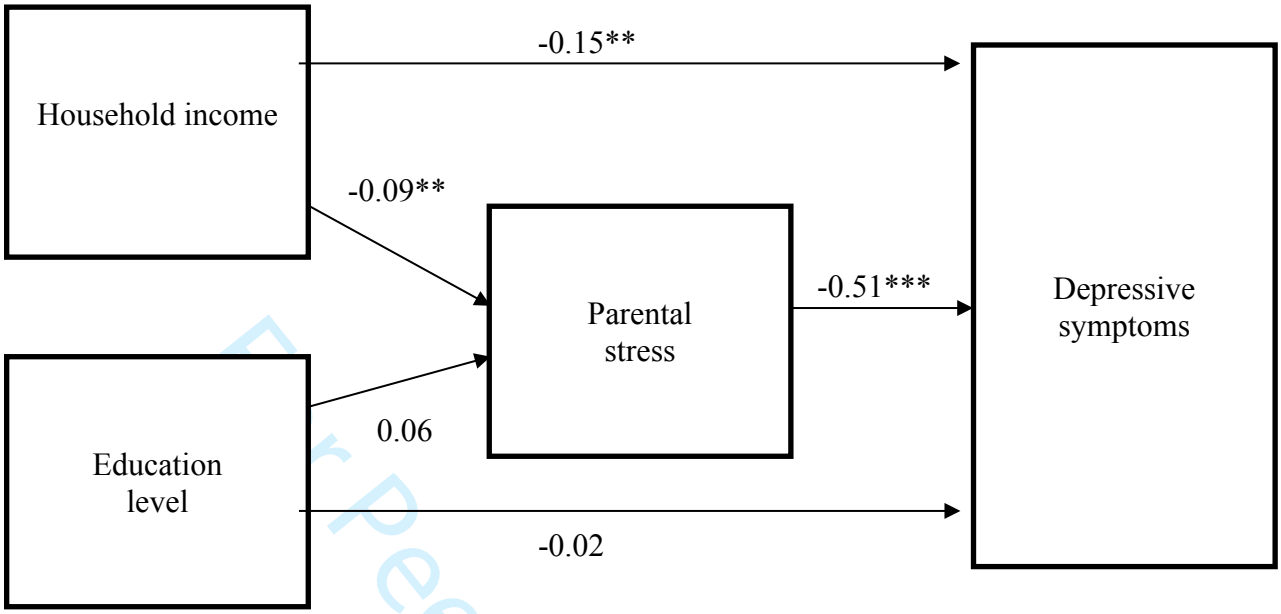
Table 3. GSEM examining moderation effects of network diversity on the mediating pathway between household income and depressive symptoms, controlling for covariates, Montreal MAVAN mothers (n=101).

Outcome variable	Independent variable	Beta coefficient (95% confidence interval)	Standard error
Parental stress	Household income	-0.06 (-0.21 – 0.09)	0.08
	Network diversity	0.04 (-0.08 – 0.15)	0.05
	Household income X Network diversity	-0.00 (-0.03 – 0.02)	0.01
Depressive symptoms	Household income	0.01 (-0.24 – 0.27)	0.13
	Parental stress	1.92 (0.93 – 2.91)***	0.51
	Network diversity	0.51 (0.13 – 0.89)*	0.19
	Parental stress X Network diversity	-0.25 (-0.42 - -0.09)**	0.09
	Household income X Network diversity	-0.03 (-0.07 – 0.01)	0.02
	Social support (covariate)	0.22 (0.12 – 0.31)***	0.05

*$p < 0.05$; ** $p < 0.01$; ***$p < 0.001$

Table 4. Bootstrapped GSEM with 5000 resamples, investigating the conditional indirect effect of household income on depressive symptoms at different levels of network diversity and social support, Montreal MAVAN mothers (n=101).

Moderator	Moderator level	Beta coefficient (95% CIs)	Bootstrap SE
Network diversity	Low diversity (1 SD < mean)	-0.07 (-0.14 – -0.004)*	0.04
	Medium diversity (mean)	-0.04 (-0.08 – -0.01)*	0.02
	High diversity (1 SD > mean)	-0.00 (-0.04 – 0.04)	0.02
Social support	Low social support (1 SD < mean)	-0.06 (-0.13-0.01)	0.03
	Medium social support (mean)	-0.04 (-0.08 - -0.01)*	0.02
	High social support (1 SD > mean)	-0.03 (-0.07 – 0.01)	0.02
Presence of a partner	No partner	-0.04 (-0.26 – 0.18)	0.11
	Partner	-0.03 (-0.07 – 0.00)	0.02



*$p < 0.05$; ** $p < 0.01$; ***$p < 0.001$

Figure 1. Results from the GSEM examining mediating effects of parental stress between primary stressors and depressive symptoms, controlling for social support, Montreal MAVAN mothers (n=101).

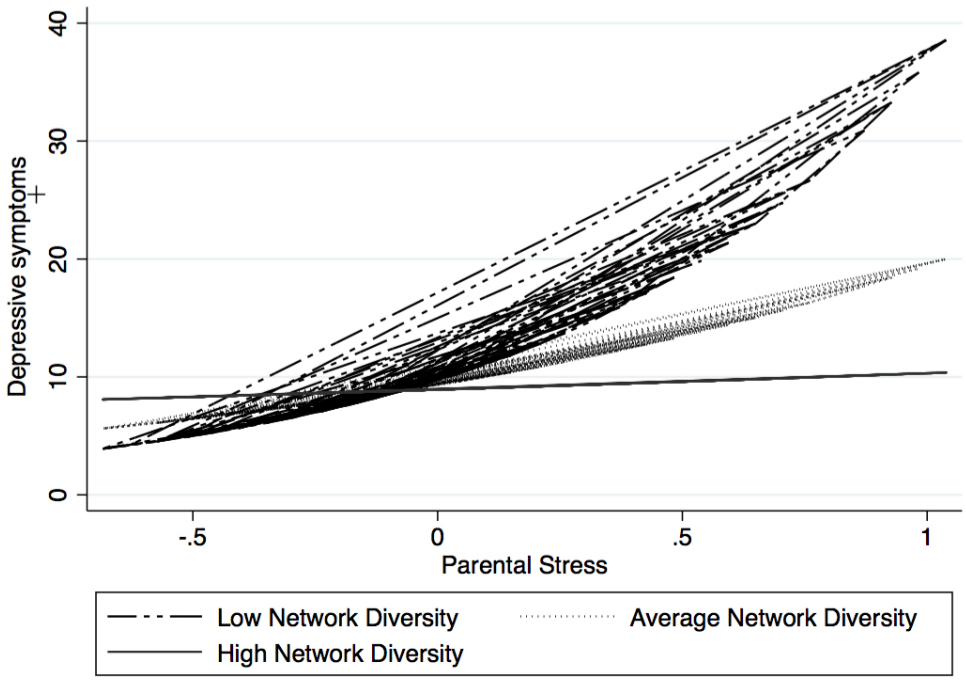


Figure 2

375x273mm (72 x 72 DPI)