Mobile Phone-Based Peer Support in the Prevention of Postpartum Depression Among Adolescent Mothers: A Pilot Randomized Controlled Trial

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy
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Abstract

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**Background:** Adolescent mothers are at three times greater risk for developing postpartum depression (PPD) compared to adult mothers. Lack of social support has been identified as a major risk factor for PPD among adolescent mothers. The objective of this parallel pilot randomized controlled trial was to evaluate the feasibility, acceptability and adherence of a mobile phone-based peer support intervention and obtain preliminary estimates of impact on clinical outcomes to inform a future definitive randomized controlled trial.

**Methods:** Pregnant adolescents 16-24 years old were recruited from the community in Toronto, Canada and randomly allocated into either a mobile phone-based peer support intervention group or a usual care control group using sequentially numbered, opaque, sealed envelopes. Participants in the intervention group received support from a trained peer mentor by mobile phone (voice calling or text messaging) during their last trimester of pregnancy and 12 weeks postpartum. Primary outcomes measured implementation (feasibility, acceptability and adherence). Secondary outcomes measured preliminary effectiveness (depressive
symptomatology, anxiety, social support and health service utilization). A research assistant blinded to group allocation collected outcome measures.

**Results:** Forty pregnant adolescents (mean age 21.6, SD 1.8 years) were recruited (intervention n=21, control n=19). *Primary outcomes:* 33 participants (82.5%) completed outcome measures. A total of 121 contacts were made between participants and peer mentors, with the majority of contacts made by text message (n= 112, 92.6%). Overall, 100% of participants agreed or strongly agreed that they were satisfied with their peer support experience. *Secondary outcomes:* After controlling for baseline depressive symptomatology, participants in the intervention group demonstrated lower mean depression scores at 12 weeks postpartum compared to participants in the control group ($F = 4.25, p = 0.048$). There were no group differences in anxiety, social support or health service utilization. No adverse events were reported.

**Discussion:** Mobile phone-based peer support may be a feasible and acceptable way to provide support to adolescents during pregnancy and in the postpartum period. Preliminary evidence suggests that the peer support intervention may be effective in preventing depressive symptomatology among adolescent mothers. A definitive randomized controlled trial with adequate sample size is warranted.
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Chapter 1
Introduction

Depression is the leading cause of disease burden worldwide for women in their childbearing years (World Health Organization, 2013). The peak period for emergent depression among women occurs during adolescence, between approximately 13-24 years of age (Costello & Angold, 2011). Over the past three decades, there has been a dramatic increase in research on depression generally, and postpartum depression (PPD) in particular (O’Hara, 2009). However, the majority of research on PPD has focussed on adult maternal populations, with less focus on the adolescent (15-19 year old) population (Dinwiddie, Schillerstrom, & Schillerstrom, 2017).

Postpartum depression is one of several postpartum mood disorders and is classified as a major depressive disorder (O’Hara, 2009). It has the highest inception rate during the first 12 weeks postpartum and is frequently comorbid with anxiety disorders or significant anxiety symptoms (Cooper & Murray, 1998; O’Hara, 2009). An extensive body of research indicates that PPD is the most frequent form of maternal morbidity following childbirth and has serious negative consequences including maternal suffering, impaired maternal-infant interactions, and cognitive, behavioural, and emotional problems in infants and children (O’Hara & McCabe, 2013). As a result of these negative consequences, PPD has been deemed a major public health concern warranting preventive intervention (O’Hara & McCabe, 2013). Adolescent mothers are a particularly vulnerable maternal population who are at approximately three times greater risk for developing postpartum depression (PPD) compared to adult mothers, with an estimated prevalence of 38% (Chen, 1996; Figueiredo, Pacheco, & Costa, 2007; Hudson, Elek, & Campbell-Grossman, 2000; Logsdon, Birkimer, Simpson, & Looney, 2005; Schmidt, Wiemann, Rickert, & Smith, 2006; Secco, Profit, Kennedy, Walsh, Letourneau, & Stewart, 2007). In 2016, over 50,000 live births were recorded to adolescents between 15-24 years of age in Canada.
(Statistics Canada, 2018), which represents a significant number of mothers at risk for developing PPD.

There are numerous reasons why adolescent mothers may be at increased risk for developing PPD. First, the prevalence of depression among girls increases sharply during adolescence, so by virtue of their age, an adolescent mother is at increased risk for developing a depressive disorder (Costello & Angold, 2011; Hodgkinson, Beers, Southammakosane, & Lewin, 2014). Second, while birth and the transition to motherhood can be a very stressful time for any mother, it may be a particularly difficult period for adolescent mothers, as they need to navigate the developmental roles of adolescence and motherhood simultaneously (Reid & Meadows-Oliver, 2007). This has been referred to as a dual developmental crisis, where the biological, cognitive, and psychosocial developmental challenges of adolescence intensify the stressors associated with the transition to motherhood (Sadler & Catrone, 1983). Moreover, adolescent mothers are more likely to have been raised in a high-risk environment, have lower educational attainment, have greater financial strain, have fewer life experiences of optimal caregiving to draw upon, and have less support resources available compared to adult mothers (Hodgkinson et al., 2014). Qualitative studies have described adolescent motherhood as a time when friendships in a mother’s natural network tend to dissolve due to lack of empathic understanding which can lead to social isolation and feelings of loneliness and desperation (Devito, 2010). As well, adolescent mothers have the added burden of contending with stigma and judgment from society at large as well as from health care professionals, since adolescent pregnancy has been historically viewed as a social problem (Smithbattle, 2009). As a result of these multiple stressors, the transition to parenting for adolescent mothers is typically characterized by higher rates of mental health difficulties, including depression and anxiety (Siegel & Brandon, 2014).
Several variables have been identified as predictors for PPD among adolescent mothers; however, the one predictor which has been consistently identified in studies is a lack of social support (Barnet, Joffe, Duggan, Wilson, & Repke, 1996; Birkeland, Thompson, & Phares, 2005; Nunes & Phipps, 2012; Reid & Meadows-Oliver, 2007). A detailed analysis of social support variables in predictive studies among adolescent mothers clearly identifies not having someone to talk with about their problems as a major deficiency in social support (Nunes & Phipps, 2012). These findings are not surprising as the relationship between lack of social support and reduced psychological well-being has been well established. Evidence shows that decreased social network size, fewer close relationships, and lower perceived adequacy of social support are all linked to depressive symptomatology (Barnett & Gotlib, 1988; Umberson, Crosnoe, & Reczek, 2010).

Peer to peer support, a form of social support, has been shown to improve health outcomes in various age groups (Dennis, 2003; Simoni, Franks, Lehavot, & Yard, 2011) including adolescents (Ahola Kohut, Stinson, van Wyk, Giosa, & Luca, 2014; Turner, 1999). For adolescents, peers are the biggest social factor predicting health behaviours, exerting greater influence than parents or healthcare providers (Boothroyd & Fisher, 2010; Umberson et al., 2010; Wysocki & Greco, 2006). Peers are lay individuals who have similar characteristics and experiences as a target population and can share pragmatic knowledge and empathic understanding. The provision of peer support includes (a) informational support (knowledge, facts, and suggestions), (b) emotional support (attentive listening, caring and reassurance) and (c) appraisal support (motivation, encouragement and positive communication) which is delivered by a peer (Dennis, 2003).

Dennis et al. (2009) conducted a multi-site randomized controlled trial (RCT) in Ontario, Canada of over 700 adult mothers who were identified as high risk for PPD (Edinburgh Postnatal
Depression Scale scores > 9) to evaluate the effectiveness of telephone-based peer support to prevent PPD. In this study, individualized, telephone-based peer (mother to mother) support was provided by a volunteer recruited from the community who 1) previously experienced and recovered from self-reported PPD and 2) attended a training session. Results from this study suggested that women who received the peer support intervention were at half the risk of developing depressive symptomatology at 12 weeks postpartum than those in the control group. Although Dennis’ (2009) peer support intervention has shown to be highly effective in preventing PPD among adult mothers, it is not known whether it is a feasible or acceptable solution for adolescent mothers. To date, only four studies have investigated the prevention of PPD among adolescent mothers (Barnet, Duggan, Devoe, & Burrell, 2002; Ginsburg et al., 2012; Logsdon et al., 2005; Phipps, Raker, Ware, & Zlotnick, 2013), however the results of each of these studies are questionable, either due to small sample sizes, high attrition rates, or theoretical weaknesses.

Therefore, this study adapted Dennis et al.’s (2009) study for an adolescent population. The telephone-based peer support intervention was modified to meet the needs of adolescent mothers by providing individualized peer support via mobile phones and text messaging rather than through land based telephones, since this is the preferred mode of communication among adolescents (Lenhart, 2012). Justification for a modification for Dr. Dennis’ trial was based on the fact that: 1) research on PPD preventative interventions for adolescent mothers was limited; 2) a Cochrane review by Dennis and Dowswell (2013) on psychological and psychosocial interventions to prevent PPD recommended targeting preventative interventions towards ‘at-risk’ mothers, since they may be more beneficial and feasible than interventions only targeting a general maternal population; 3) lack of social support in the early postpartum period was a key predictor of PPD among adolescents; 4) no trials have been conducted which attempt to prevent
PPD through the provision of peer support in adolescent mothers; and 5) Dennis’ telephone-based peer support intervention showed a 50% reduction in depressive symptomatology at 12 weeks postpartum in adult mothers (Dennis et al., 2009).

Based on the results of this study, new knowledge has been gained in relation to the provision of peer support among adolescent mothers using mobile technology. This trial provides valuable information to address a major public health concern (PPD) in a highly vulnerable population (adolescent mothers).

**Research Problem**

Due to the high prevalence and burden of disease of PPD for adolescent mothers, it is important to find effective, evidence-based PPD preventive interventions, which are acceptable to adolescent mothers. Even though a lack of social support has been identified as a key predictor for PPD in adolescent mothers, no effective interventions exist to date that specifically targets social support to prevent the development of PPD in this population. Therefore, this current research study examined a support resource using mobile phone-based peer support among pregnant adolescent mothers with the aim to prevent PPD among this vulnerable maternal population.

The overall purpose of this pilot RCT was to 1) examine the feasibility and acceptability of a mobile phone-based peer support intervention; 2) determine adherence to the trial protocol; and 3) determine preliminary estimates of intervention effectiveness on outcomes among participants receiving the peer support intervention versus standard care to inform the sample size calculation for a future definitive multi-site RCT.
Chapter 2
Literature Review and Conceptual Framework

This chapter provides a comprehensive overview of the literature related to adolescent development and adolescent pregnancy. Evidence will be reviewed in relation to PPD and social support theory to demonstrate that peer support is a modifiable variable that may be amenable to intervention to prevent PPD among adolescent mothers. An analysis of Dennis’ (2003) peer support conceptual framework will be presented and will serve as a guide for this study. The chapter concludes with this study’s research questions and hypotheses.

Adolescent Development

Adolescence is a transitional developmental stage that is typically described in terms of age and social roles. Worldwide, the identity of adolescence is rapidly changing, with the decreasing age at which puberty begins and increasing age at which mature social roles are achieved (Sawyer et al., 2012). Longitudinal neuroimaging studies have shown that the adolescent brain continues to develop well into the twenties, with links being made between brain development and the behaviours of adolescents (Johnson, Blum & Giedd, 2009). The combination of earlier onset of puberty and later adoption of characteristically adult roles has thus increased the length, and changed the shape of adolescence (Sawyer et al., 2012). These changes have important implications for the conceptualization of adolescence, which is now extending from the late teens through to the early to mid-twenties, thereby leading to a later transition into adulthood (Arnett, 2000; Moreno & Trainor, 2013; Sawyer, Azzopardi, Wickremathne & Patton, 2018).

Among different health organizations, there is considerable variability in definitions for the specific period and definition of adolescence. For example, the World Health Organization (WHO) defines ‘adolescents’ as individuals between the ages of 10-19 years,
‘youth’ as those between 15-24 years and ‘young people’ to cover those between 10-24 years (WHO, 2018). The Society for Adolescent Health and Medicine (SAHM) defines individuals between the ages of 18 to 25 years as ‘young adults’ (Society for Adolescent Health and Medicine, 2017). The Lancet Commission on Adolescent Health and Wellbeing chose to adopt the ages between 10 to 24 years as adolescence, arguing that the age range better corresponds to growth and developmental stages and provides a more developmentally appropriate basis for laws, social policies, and service systems (Patton et al., 2016; Sawyer et al., 2018). Understanding this expanded age definition of adolescence is important for researchers when they are designing studies. Similarly, an awareness of the developmental changes in this period (particularly cognitive and social changes) and the high level of vulnerability for depression among adolescent girls are other important considerations.

Developmental Changes in Adolescence

Adolescence is a unique period of development with distinct differences from childhood and adulthood. These differences are attributable to the fact that adolescence is one of the most critical transitions in the life span, characterized by tremendous growth and change, second only to that of infancy (WHO, 2014). The transition from adolescence to adulthood is an important, yet extremely challenging, developmental stage when young people are maturing biologically, cognitively, and psychosocially (Mulye, Park, Nelson, Adams, Irwin, & Brindis, 2009). Changes of adolescence include 1) biological changes such as sexual maturation and physical growth; 2) cognitive changes such as the growth of abstract thought and moral reasoning; and 3) psychosocial changes such as a sense of belonging, feelings of self-worth, the development of appropriate relationships, seeking independence from family, and moving away from relying on the judgment and authority of adult figures to that of peers (Butler-Jones, 2011; Sawyer et al., 2012; Turner, 1999). Biological changes of
adolescence are important because they are linked to the onset of sexual activity, however the role of cognitive and psychosocial developmental changes are also important since they influence sexual activity decision making in adolescents.

Cognitive development in adolescence is related to an increased vulnerability to engage in risky and impulsive behaviours, with links being made between brain development and the behaviours of adolescents (Johnson, Blum & Giedd, 2009). Studies into adolescent brain development have shown that these risky behaviours are associated with the immature development of the prefrontal cortex of the brain, which is the site of executive control functions, including planning, emotional regulation, decision making, multi-tasking, and self-awareness (Sawyer et al., 2012). As a result of the underdevelopment of the prefrontal cortex, adolescents are more limited in their understanding of complex concepts and the relationship between behaviour and consequence compared to adults (Moreno & Trainor, 2013; WHO, 2014). Adolescents who have a history of childhood abuse (sexual, physical or emotional) are at even greater risk for increased engagement in these risky behaviours since sexual abuse is linked to maladaptive attitudes about sex, thereby leading to increased risky behaviours (Jones et al., 2013; Trickett, Negriff, Ji, & Peckins, 2011). Negative outcomes related to these risky behaviours include unintentional injuries and violence, alcohol and drug abuse, sexually transmitted diseases and of particular importance to adolescent women, unintended pregnancy (Casey, Getz & Galvan, 2008).

Adolescence is a very delicate time for developing one’s sense of self, therefore psychosocial changes in adolescence can significantly impact the behaviours of adolescents. (Rubin, Bukowski, & Laursen, 2009). This is a period where adolescents seek independence, begin to distance themselves from their parents, and have an increased interest in sex (Sawyer et al., 2012). However, adolescent girls tend to face greater challenges related to adjustments to
body image and developing their own self-identity (Sawyer et al., 2012). This manifests as lower levels of self-esteem and higher levels of anxiety among adolescent girls (Perry & Pauletti, 2011). Socially, peers become the biggest factor predicting adolescent behavior and exert greater influence than parents or healthcare providers, especially with respect to emotional support (Boothroyd & Fisher, 2010; del Valle, Bravo, & Lopez, 2010; Umberson et al., 2010; Wysoci & Greco, 2006). For adolescent girls, same-sex friendships are characterized by positive factors such as intimacy, self-disclosure, validation, caring, and relationship repair, but also by negative factors such as co-rumination (sharing of woes) and jealousy (Perry & Pauletti, 2011). These negative factors may render girls more vulnerable to depression (Perry & Pauletti, 2011).

**Adolescence and Depression**

Adolescence is a particularly critical period for developing depression with a peak onset of 15-24 years (Strauman, Costanzo, & Garber, 2011). A robust epidemiological finding is the emergence of a strong female preponderance (approximately 2:1) in the prevalence of depression in adolescents after puberty, beginning at approximately 13 years of age (Costello & Angold, 2011; Strauman et al., 2011; Thapar, Collishaw, Pine, & Thapar, 2012). A large, population-based study in the United States estimated lifetime depression prevalence for adolescents age 15-24 years at 11% in males and 21% in females (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993). While the exact reason for this increased risk is not clear, it is believed to be multifactorial, involving a combination of biological factors (such as the hormonal influence of puberty in girls), genetic and familial factors, psychosocial factors (such as poor coping styles in girls) and stressors (such as the increased tendency for negative interpersonal life events in girls) (Strauman et al., 2011).

A population-based study in Canada showed that adolescents with major mental illness are at higher risk of becoming teenage parents compared to unaffected adolescents (Vigod,
Dennis, Kurdyak, Cairney, Guttmann, & Taylor, 2014). This study examined fertility rates among women aged 15 to 19 years in Ontario, Canada from 1999-2009 and determined that adolescent women with major mental illness diagnosed before pregnancy (defined as the presence of a psychotic, bipolar, or major depressive disorder in the five years preceding pregnancy) had fertility rates which were almost 3 times higher than among unaffected adolescents. The age-specific fertility rate for girls with major mental illness was 44.9 per 1000 (95% Confidence Interval [CI]: 43.3–46.7) compared with 15.2 per 1000 (95% CI: 15.1–15.3) in unaffected girls (rate ratio: 2.95; 95% CI: 2.84–3.07). The incidence of births to girls with major mental illness was 1 in 25. This study highlights that mental health considerations are very important for interventions targeting pregnant adolescents.

### Adolescent Development and Adolescent Pregnancy

Pregnancy and parenting during adolescence is challenging, since young mothers are forced to meet the developmental tasks of motherhood and adolescence simultaneously. Just as with adolescent development, the transition to motherhood is a pivotal time of psychological, developmental, and biological change in a mother’s life (Birkeland et al., 2005; Black, Fleming, & Rome, 2012). The intersection between adolescence and motherhood has been referred to as a ‘dual developmental crisis’ where parenting adolescents may struggle to navigate their own adolescent developmental changes and life roles (i.e.: as a teenager, daughter, student, or partner) with their new maternal role and responsibilities, often within the context of economic and social disadvantage (Birkeland et al., 2005; Hanna, 2001; Hodgkinson et al., 2014; Sadler & Catrone, 1983). Psychosocial challenges of adolescent pregnancy include school interruption, persistent poverty, limited vocational opportunities, and repeat pregnancy (Klein, 2006). Adolescent mothers may also face role conflict and confusion as a result of navigating the roles of adolescence and motherhood simultaneously (Birkeland et al., 2005). Such stressors may
contribute to a range of mental health problems that can adversely affect the functioning and parenting behaviour of adolescent mothers and increase the risk of behavioural problems in their infants (Hodgkinson et al., 2014). Moreover, since cognitive development is not yet complete, decision making by adolescent mothers can be impaired thus leading to a greater risk for negative outcomes for mothers and their infants (Hanna, 2001).

Similarly, social adjustments for pregnant adolescents are very difficult. A qualitative study by Devito (2010) highlighted the perceptions of adolescent mothers in becoming a parent and found that many adolescent mothers were unprepared for the multiple demands of motherhood. Mothers described feelings of “being caught between two worlds” which highlighted the role conflict and confusion experienced by being both an adolescent and a mother at the same time. They also expressed disconnected feelings in parenting expectations before and after having a baby after realizing their adolescent views of love, sex, romance, and life’s general demands were unlike the reality of being a new parent. As well, they often felt “alone and desperate”, explaining they no longer had anything in common with their previous peer group. A 16-year-old mother at 5 weeks postpartum describes her lack of support as follows:

“Everything is for the baby. . .this is how I spend my time. I never see my friends. . .I don’t hang out with them or talk on the cell [phone]. No one wants to hear how tired I am . . . they just don’t know. . .they just don’t get it” (Devito, 2010, p. 30).

For this reason, friendships became weaker and often dissolved completely. Overall, adolescent mothers in this study experienced role conflict, isolation, lack of support and feelings that no one listened or understood what they were going through (Devito, 2010).

In summary, pregnant adolescents find themselves at the juncture of two critical transitional periods simultaneously: adolescence and pregnancy. Consequently, when the stressors associated with the normal developmental stage of adolescence are compounded by the transitional stressors of pregnancy; pregnant adolescents may experience a time of emotional
crisis. Together with the increased predisposition to depression for female adolescents, it is evident that pregnant adolescents are at very high risk for mental health issues.

**Adolescent Pregnancy**

In this section, literature is explored within a Canadian context with respect to the prevalence of adolescent pregnancy and demographic characteristics of adolescent mothers. In addition, consequences of adolescent pregnancy for mothers and their infants are highlighted.

**Prevalence**

Since the 1970s, there has been a steady decline in adolescent pregnancy and birth rates in Canada; however, pregnancy in adolescence remains an important national health concern (Fleming et al., 2013; McKay, 2012). Between 1990 and 2010, the adolescent pregnancy rate (defined as birth rate plus abortion rate) in Canada for women age 15-19 years decreased from 44.9 per 1,000 in 1990 to 28.2 per 1,000 in 2010, indicating a decline of 37.2% (McKay, 2012). Moreover, the adolescent birth rate declined from 35.7 births per 1000 women in 1975 to 13.5 births per 1000 women in 2010 (Luong, 2008; McKay, 2012). This decline is attributable to the inclusion of sexual education programs in schools, increased awareness and use of contraception, and increased availability of abortion services (Dryburgh, 2000). In 2016, there were approximately 8,500 live births to adolescents age 15-19 years and approximately 45,000 live births to adolescents age 20-24 (Statistics Canada, 2018).

While there has been a significant downward trend in adolescent birth rates in Canada overall, recent statistics have shown that adolescent birth rates are on the rise in certain provinces. Between 2007 and 2010, adolescent birth rates increased by 28.2% in Newfoundland (from 17.0 to 21.8 per 1000), 16.6% in New Brunswick (from 19.9 to 23.2 per 1000), 15.7% in the Yukon (from 16.6 to 19.2 per 1000), and 8.5 % in Nova Scotia (from 16.5 to 17.9 per 1000) (McKay, 2012). In Ontario, the average adolescent birth rate has remained constant from 2007-
2010 at approximately 10.5 births per 1,000 women (McKay, 2013) however health units in Ontario have reported birth rates as high as 40 per 1,000 women (Toronto Public Health, 2013). The overall prevalence of adolescent births in Ontario is estimated to be 4.35% (Fleming et al., 2013). In Toronto, Ontario, the birth rate per 1,000 women in 2013 was 6, which has dropped from 11 births per 1,000 women in 2004 (Toronto Public Health, 2017; See Figure 1).

![Figure 1 – Teen Pregnancy, Therapeutic Abortion and Birth Rate, Toronto](image)

Source: Toronto Public Health (2017)

**Demographic Characteristics**

Adolescent mothers differ significantly in demographic composition compared to adult mothers. For the purpose of this study, the characteristics of adolescent mothers have been reviewed based solely on Canadian evidence. Articles included in the review include two recent population-based studies which provide a comparison of the characteristics between adolescent and adult mothers (Al-Sahab, Heifetz, Tamim, Bohr & Connolly, 2012; Fleming et al., 2013), one retrospective study which provides a description of the demographic characteristics and needs of urban adolescent mothers in Toronto (Thompson, Madigan, Wentzel, Dineley, Lorber, & Shouldice, 2015), one meta-analysis which explored the association between abuse history and adolescent pregnancy (Madigan, Wade, Tarabulsy, Jenkins, & Shouldice, 2014), one prospective
study which explored the risk for adolescent pregnancy and homelessness in Montreal (Haley, Roy, Leclerc, Boudreau, & Boivin, 2004), and one Toronto-based survey report which explored the sexual health needs of adolescents in Toronto (Toronto Teen Survey, 2009).

Al-Sahab et al. (2012) examined the prevalence and characteristics of adolescent mothers in Canada using data from the 2006 Maternity Experience Survey (MES). Of the 6,421 respondents, the proportion of adolescent mothers in the MES study was 2.9%, and their average age was 18.1 years (SD = 1.1). Socio-economic factors, demographic factors and pregnancy related factors were considered for adolescent mothers (< 20 years) and compared to average-aged mothers (>20 and <35 years) using logistic regression analysis reported with adjusted odds ratios (OR) and 95% Confidence Intervals (CI). Findings suggested that compared to average aged mothers, adolescent mothers were more likely to have an income less than $40,000 (OR = 6.66, 95% CI: 2.98–14.90), be non-immigrants (OR = 3.10, 95% CI: 1.14–8.42), have no partner (OR = 2.66, 95% CI: 1.69–4.18), live in the Western prairie provinces (OR = 1.64, 95 CI%: 1.05–2.56), have experienced physical or sexual abuse (OR = 2.24, 95% CI: 1.53–3.29), and would have wanted to become pregnant at a later age (OR = 4.49, 95% CI: 2.93–6.87).

Fleming et al. (2013) conducted a large retrospective population-based cohort study in Ontario between January 2006 and December 2010 using data from the singleton birth records of 551,079 women, of which 23,992 (4.35%) were identified as adolescent pregnancies. In this study, demographic information was stratified by adolescent pregnancies (< 20 years) and adult pregnancies (20-35 years). Mean maternal age for the adolescent group was 17.9 years (range 11 to 19) and 28.8 years (range 20-35 years) for the adult group. Outcomes for pregnant women < 20 years of age (adolescent) were compared with those of women 20 to 35 years old (adult). Overall, adolescent mothers had higher rates of smoking during pregnancy (38.8% vs. 11.9%; p < 0.001) and substance use (11.7% vs. 5.1%; p < 0.001). Substance use was defined as the use of
alcohol, cocaine, gas/glue sniffing, hallucinogens, marijuana, methadone treatment, narcotics, opioids, and any other substances. The adolescent group was also more likely to be in the lowest neighbourhood median family income quintile (42.1% vs. 24.5%, p < 0.001), to be in the lowest education neighbourhood quintile (40.1% vs. 20.1%; p < 0.001), and to be nulliparous (84.8% vs. 45.7%; p < 0.001).

Thompson et al. (2015) conducted a retrospective chart review of 116 adolescent mothers who attended an urban academic hospital-based outpatient clinic in Toronto, Canada from 2005 to 2009. Findings revealed a mean maternal age of 16.1 years and a mean education level of grade nine. Moreover, 99% of adolescent mothers were single, 47% had a history of child welfare involvement as a youth, 41% had child welfare involvement (voluntary or mandated) with their own child, 18% had previous involvement with the judicial system, and more than half reported a history of both maltreatment and substance abuse.

A history of sexual and physical abuse places female adolescents at increased risk of pregnancy. A meta-analysis of 38 independent studies by Madigan et al. (2014) revealed that both sexual and physical abuse were associated with an increased risk of adolescent pregnancy (sexual abuse OR: 2.06; 95% CI, 1.75 - 2.38 and physical abuse OR, 1.48; CI, 1.24-1.76) with the strongest effect for the co-occurrence of sexual and physical abuse (OR 3.83; CI: 2.96-4.97). Non-significant effect sizes were found for emotional abuse (OR: 1.01; CI: 0.70-1.47) and neglect (OR: 1.29; CI, 0.77-2.17) (Madigan et al., 2014).

The housing status of adolescent women is also an important factor which influences pregnancy, since homeless adolescent women tend to have higher pregnancy rates compared to adolescents with stable housing status (Haley et al., 2004). In a Canadian prospective cohort study from Montreal, Haley et al. (2004) compared data from homeless female adolescents who had a history of pregnancy with adolescents who had never been pregnant (n= 225, age 14–19
years). They found that 41.8% (n = 94) of participants reported a past or present pregnancy. Both groups reported a history of sexual abuse, but the prevalence of abuse was higher among adolescents who had a history of pregnancy (71.3% versus 56.5%) and the type of abuse reported was more severe. In Thompson et al.’s (2015) study (discussed above), housing status was assessed for adolescent mothers at the time of delivery. They found that 45% lived with their own parents, 31% lived in a maternity home, 13% lived with the baby’s father, 5% lived with friends, 3% lived independently, and 3% lived in other accommodation (such as a group home). These studies reveal the risk for unstable housing status among pregnant adolescents.

Finally, young parents and youth involved in pregnancy who identify as lesbian, gay, bisexual, transgender, and questioning (LGBTQ) have higher pregnancy rates compared to heterosexual youth (Toronto Teen Survey, 2009). These findings were based on a community-based research project led by Planned Parenthood Toronto, which collected over 1,200 surveys and conducted 118 interviews with youth (age 15-19 years) and their service providers between December, 2006 and November, 2009. Findings suggested that LGBTQ youth are three times more likely to be involved in a pregnancy than straight-identified youth. The major reasons cited by LGBTQ youth for their involvement in pregnancy included denial (i.e. a way to prove to themselves they are not gay or lesbian), pressure to be in a heterosexual relationship, and testing of their own sexuality. The survey also found that young parents faced high levels of stigma by health care professionals and the public, which prevented them from accessing health services. Thirteen percent of young parents and 17% of youth involved in pregnancies reported never visiting a clinic for any sexual health reason and for those who did access clinics, many noted negative experiences due to judgemental attitudes from service providers and other service users.

Overall, results from these studies suggest that pregnant and parenting adolescents in Canada are a highly vulnerable maternal population who tend to come from disadvantaged
circumstances characterized by a lower socioeconomic status and lower educational attainment as well as a history of sexual and/or physical abuse, substance use, and involvement with the child welfare system. In addition, sexual orientation and precarious housing status are also contributing factors to adolescent pregnancy.

**Consequences of Adolescent Pregnancy**

Adolescent pregnancy is associated with certain adverse maternal, obstetrical and neonatal outcomes. The largest Canadian retrospective cohort study to document pregnancy outcomes among adolescent mothers used a log binomial regression model to compute the adjusted relative risk (aRR) and 95% CIs to compare adolescent and adult maternal, obstetrical and neonatal outcomes after adjusting for known confounders such as smoking, parity, median family income and education (Fleming et al., 2013). Adolescent pregnancy was associated with poor maternal health behaviours such as lower rates of prenatal class attendance (aRR 0.87; 95% CI 0.85 - 0.91) and first prenatal visits after the first trimester of pregnancy care (aRR 0.53; 95% CI 0.51 - 0.59) which place them at an increased risk of poor outcomes. Notable results specific to maternal/obstetrical and neonatal outcomes are outlined below.

Adverse maternal and obstetrical outcomes are linked to adolescent pregnancy. Of significance, Fleming et al. (2013) found that adolescent mothers had a significantly higher risk of emergency caesarean section (CS) compared to adult mothers (aRR 1.31; 95% CI 1.20 to 1.43). The most common reasons for emergency CS among adolescent mothers were obstructed labor (50.3% adolescent versus 48.3% adult mothers, p = 0.03) and non-reassuring fetal status (36.6% adolescent versus 33.9% adult mothers p = 0.007). However, adolescent mothers also showed improved maternal outcomes compared to adult mothers such as decreased risk for: 1) gestational hypertension (aRR 0.73; 95% CI 0.68-0.79); 2) gestational diabetes (aRR 0.34; 95% CI 0.30-0.39); 3) premature rupture of the membranes (aRR 0.82; 95% CI 0.76 – 0.88); 4)
placental abruption (aRR 0.80; 95% CI 0.66-0.98); and 5) placenta previa (aRR 0.36; 95% CI 0.28-0.55).

Adolescent pregnancy also places infants at risk for specific negative outcomes. In particular, Fleming et al. (2013) found that compared to infants born to adult mothers, infants born to adolescent mothers were at increased risk for Neonatal Intensive Care Unit admission (aRR 1.08; 95% CI 1.02 to 1.14, p < 0.001) and very preterm birth < 32 weeks gestation (aRR 1.16; 95% CI 1.02 to 1.31, p < 0.001). These negative consequences were attributed to the fact that adolescent mothers were less likely to attend prenatal classes or attend an antenatal visit during the first trimester (Fleming et al., 2013). There was no statistically significant difference in risk of low birth weight (< 2500 grams), preterm birth (< 37 weeks gestation), small for gestational age (10th percentile), or fetal death.

Based on this review of the literature, it is apparent that adolescent mothers are a unique and highly vulnerable maternal population. The transition to motherhood and demanding nature of parenting is particularly challenging for an adolescent mother and places them at high risk for mental health difficulties, including depression and anxiety (Siegel & Brandon, 2014).

**Postpartum Depression**

Childbirth is typically viewed as a positive life event however, as previously discussed, the period following birth is a time of major transition for women, placing them at increased vulnerability for postpartum mood disorders (O’Hara & McCabe, 2013; Vesga-Lopez, Blanco, Keyes, Olfson, Grant, & Hasin, 2008). These mood disorders are the most frequent form of maternal morbidity following childbirth (Stocky & Lynch, 2000). Postpartum Depression (PPD) is one of several postpartum affective disorders ranging from the postpartum blues, a common and temporary state of emotional distress which typically resolves on its own within 10-14 days, to postpartum psychosis, a severe and debilitating disorder usually requiring hospitalization.
Characterized as a Major Depressive Disorder, PPD causes debilitating symptoms in mothers such as sleep disturbances, anxiety, insecurity, emotional instability, confusion, loss of self, guilt, and suicidal thoughts (Beck & Indman, 2005). PPD is not identified as a separate diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) but is captured under the general diagnosis of depressive disorders and assigned a “with peripartum onset” specifier for episodes occurring in the four weeks following childbirth (American Psychiatric Association [APA], 2013). However, clinicians and researchers generally define the postpartum period as lasting one year following childbirth (O’Hara & McCabe, 2013). According to the DSM-5, the diagnostic criteria for a major depressive disorder are five or more of the following symptoms for a minimum of two weeks, with at least one of the symptoms being either depressed mood or loss of interest or pleasure: 1) depressed mood; 2) loss of interest or pleasure (anhedonia); 3) feelings of worthlessness or guilt; 4) psychomotor agitation or retardation; 5) decreased concentration or indecisiveness; 6) changes in appetite or enjoyment of food; and 7) recurrent thoughts of death or suicide guilt (APA, 2013). While fatigue, sleep disturbances and weight loss/gain are also symptoms of a depressive disorder, these symptoms are very difficult to assess in new mothers whose weight and sleep patterns change after having a baby (Ross, Dennis, Blackmore, & Stewart, 2005). Women with a low mood or anhedonia and less than four other symptoms are classified as having minor depression (Ross et al., 2005).

**Comorbidity of PPD and Anxiety**

A consistent finding in the literature is the comorbidity of anxiety and depression (referred to as ‘anxious depression’), which has a high prevalence during pregnancy and the postpartum period (APA, 2013; Matthey, Barnett, Howie, & Kavanagh, 2003; Vesga-Lopez et al., 2008). A Canadian study examining anxiety and depression at 36 weeks gestation, 6 weeks postpartum and 16 weeks postpartum in 150 women found that nearly 50% of clinically
depressed women experienced comorbid anxiety (Ross et al., 2003). Ross et al. (2003) concluded that symptoms of anxiety are a significant feature of PPD for many women, possibly more so than in women experiencing depression outside of the perinatal period. Research also indicates that anxiety in late pregnancy predicts higher depressive symptoms in the first three months postpartum (Skouteris et al., 2009). While anxiety is a common feature of depression, some women with anxiety problems in the perinatal period exhibit only anxiety and do not experience the persistently low mood or loss of pleasure that typifies depression (Matthey et al., 2013; Ross et al., 2005).

Classification of an anxiety disorder is either 1) specific in nature such as a phobia, panic disorder or obsessive-compulsive disorder; or 2) generalized, meaning there is no one source or situation that causes the anxiety (Ross et al., 2005). This is true for anxiety in the postpartum period. Postpartum anxiety for some mothers may be general, but for others it may be specific (such as fear of bathing their baby), and typically manifests as constant or excessive worry, fear or apprehension (Ross et al., 2005). Physical symptoms are common with anxiety and include sweating, palpitations, nausea, faintness or an overwhelming urge to run away (Ross et al., 2005).

Several studies have highlighted the importance of measuring anxiety concurrently with depression during the perinatal and postpartum period (Fisher, Wynter, & Rowe, 2010; Giakoumaki et al., 2009; Matthey, 2004; Matthey et al., 2013; Skouteris, et al., 2009). However, until recently, maternal anxiety has received little attention in the empirical literature (Goodman et al., 2014). A systematic review of 57 studies investigating perinatal anxiety revealed the majority of studies (n = 46) were published in the last decade (Goodman et al., 2014). Twenty studies in Goodman et al.’s review examined the prevalence of anxiety disorders in pregnancy and found a considerable amount of variability in prevalence estimates, ranging from 4.4 % to
A large UK, community based study (n = 8,323) found that 13% of women reported anxiety symptoms at either eight weeks or eight months postpartum and of these two-thirds had experienced anxiety in pregnancy (Heron, O’Connor, Evans, Golding, Glover, & The ALSPAC Study Team, 2004).

Although research in the adolescent population is limited, two US studies suggest that pregnant adolescents also have high levels of anxiety (de Anda, Darroch, & Davidson, 1992; McCool, Dorn, & Susman, 1994). In de Anda, Darroch and Davidson’s (1992) study, the anxiety levels of 120 pregnant adolescents (mean age 16 years) were examined in their second trimester of pregnancy using the State-Trait Anxiety Inventory (STAI). The mean anxiety trait scores for participants in this study were 44.9 (SD 10.5) and mean anxiety state scores were 43.6 (SD 11.5). A cut off score of 39-40 has been suggested to detect clinically significant symptoms for the state-trait anxiety scale (Julian, 2011). In de Anda et al.’s (1992) study, factors contributing to the high levels of anxiety among participants included pregnancy and delivery (39.2%), disagreements with parents (35.9%), expectations to act like an adult but being treated as a child (33.4%) and financial concerns (33.3%). Individuals who contributed to high levels of anxiety included the father of the baby (43.3%), participant’s mother (19.2%), siblings (13.3%) and the participant’s father (11.7%). In the second study by McCool et al. (1994), the anxiety level of 38 primiparous adolescents (mean age 17 years) was assessed using the STAI scale at 32-36 weeks gestation. Results revealed mean state anxiety scores of 45.03 (SD 9.93).

**PPD Prevalence among Adult and Adolescent Mothers**

There is a great deal of variance in prevalence estimates for PPD because of differences in diagnostic criteria, timing of assessment, and population being studied (O’Hara & McCabe, 2013). Among adult mothers, a highly cited meta-analysis of 59 studies reported a prevalence of PPD at approximately 13% (O’Hara & Swain, 1996). A more recent systematic review of
postpartum depression, which used only interview-based assessments of PPD, found a period prevalence for major and minor depression to be 19.2% in the first 12 weeks postnatally, with a period prevalence for major depression of 7.1% (Gavin et al., 2005). The inception rate for PPD is highest in the first three months postpartum (Cooper & Murray, 1998).

A review of the literature on PPD prevalence among adolescent mothers revealed there is a much higher risk for developing PPD compared to adult mothers with prevalence ranging from 14% to 61% (Table 1). Studies included in this review met the following criteria: 1) they utilized a validated depression scales with an established cut off such as the Beck Depression Inventory (regular form) cut off ≥ 10 (BDI; Beck & Steer, 1993), BDI (short form) cut off ≥ 8 (Volk, Pace & Parchman, 1993); the Center for Epidemiological Studies of Depression Scale cut off ≥ 16 (CES-D; Radloff, 1977), the Center for Epidemiological Studies of Depression - Children's Scale cut off ≥ 16 (CES-DC; Weissman, Orvaschel, & Padian, 1980) or the Edinburgh Postnatal Depression Scale cut off ≥ 13 (EPDS; Cox, Holden & Sagovsky, 1987); 2) included an adolescent population (defined as ≤ 24 years); 3) were available in English and 4) depression was assessed after at least 2 weeks postpartum (to avoid confounding of postpartum blues). In total, 10 studies met the eligibility criteria for this review and are listed in Table 1. Findings from the largest and most significant studies are highlighted below in detail.
Table 1 - Prevalence of Postpartum Depression Among Adolescent Mothers

<table>
<thead>
<tr>
<th>Author, year (Study Design*)</th>
<th>Country</th>
<th>Sample Size (age range)</th>
<th>Instrument</th>
<th>Timing of Instrument Postpartum</th>
<th>Cutoff Score</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beck Depression Inventory (BDI)</strong></td>
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<tr>
<td>Chen, 1996 (CS)</td>
<td>Taiwan</td>
<td>77 (15-20 yrs)</td>
<td>BDI</td>
<td>6 weeks</td>
<td>≥ 10</td>
<td>61%</td>
</tr>
<tr>
<td>Panzarine et al., 1995 (CS)</td>
<td>USA</td>
<td>50 (13-18 yrs)</td>
<td>BDI</td>
<td>6 months</td>
<td>≥ 10</td>
<td>44%</td>
</tr>
<tr>
<td>Schmidt et al., 2006 (PC)</td>
<td>USA</td>
<td>623 (13-18 yrs)</td>
<td>BDI (short)</td>
<td>3 months</td>
<td>≥ 8</td>
<td>36.7%</td>
</tr>
<tr>
<td>Secco et al., 2007 (PC)</td>
<td>Canada</td>
<td>78 (mean 16.79 yrs)</td>
<td>BDI</td>
<td>4 weeks</td>
<td>≥ 10</td>
<td>43.5%</td>
</tr>
<tr>
<td><strong>Center for Epidemiological Studies of Depression (CES-D), Children's Scale (CES-DC)</strong></td>
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<tr>
<td>Hudson et al., 2000 (CS)</td>
<td>USA</td>
<td>21 (15-19 yrs)</td>
<td>CES-DC</td>
<td>3 months</td>
<td>&gt; 15</td>
<td>53%</td>
</tr>
<tr>
<td>Logsdon et al., 2005 (PC)</td>
<td>USA</td>
<td>128 (13-18 yrs)</td>
<td>CES-D</td>
<td>6 weeks</td>
<td>≥ 16</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Edinburgh Postnatal Depression Scale (EPDS)</strong></td>
<td></td>
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<tr>
<td>Birkeland et al., 2005 (CS)</td>
<td>USA</td>
<td>149 (15-19 yrs)</td>
<td>EPDS</td>
<td>3-12 months</td>
<td>≥ 13</td>
<td>29%</td>
</tr>
<tr>
<td>DeCastro et al., 2011 (CS)</td>
<td>Mexico</td>
<td>81 (14-19 yrs)</td>
<td>EPDS</td>
<td>&lt; 9 months</td>
<td>≥ 13</td>
<td>16.05%</td>
</tr>
<tr>
<td>Figueiredo et al., 2007 (PC)</td>
<td>Portugal</td>
<td>54 (14-18 yrs)</td>
<td>EPDS</td>
<td>2-3 months</td>
<td>&gt; 12</td>
<td>25.9%</td>
</tr>
<tr>
<td>Kingston et al., 2012 (RC)</td>
<td>Canada</td>
<td>167 (15-19 yrs)</td>
<td>EPDS</td>
<td>5-14 months</td>
<td>≥ 13</td>
<td>14%</td>
</tr>
</tbody>
</table>

*Study Design: CS= Cross-sectional Study; PC = Prospective Cohort Study; RC = Retrospective Cohort Study*

Of the four studies using the BDI to measure depression (Chen, 1996; Panzarine et al., 1995; Schmidt et al., 2006; Secco et al., 2007), Schmidt et al. (2006) conducted the largest study where they followed 623 mothers in the US from pregnancy to four years postpartum.

Participants self-identified as Caucasian (n=182), African-American (n=213), or Mexican-
American (n= 228). Prevalence was reported as a proportion of subjects who had moderate to severe depressive symptoms, defined as a BDI (short form) score of $\geq 8$. Three month point prevalence for all participants was 36.7% (43.1% for Caucasian mothers, 37% for Mexican-American mothers, and 30.9% for African-Americans mothers). Twelve month point prevalence for all participants was 28.4% (29.3% for Caucasian mothers, 32.4% for Mexican-American mothers, and 23.4% for African-Americans mothers).

In another study using the BDI, Chen (1996) reported the highest prevalence of PPD among adolescent mothers. In this study, 77 adolescent mothers and 151 adult mothers were recruited from postnatal clinics at two teaching hospitals and a private clinic in Kaohsiung, Taiwan. The mothers were assessed for depressive symptoms using the Beck Depression Inventory (BDI - Chinese Version) at six weeks postpartum. Findings concluded that 61.1% of the adolescent mothers had a BDI cut off score of $\geq 10$ (33.8% had a BDI score of 10-18 representing mild to moderate depression, 16.9% had a BDI score 19-29 representing moderate to severe depression and 10.4% had a BDI score of $\geq 30$ representing severe depression).

A large scale Canadian population-based study suggested that adolescent mothers are at higher risk for developing postpartum depressive symptomatology compared to adult mothers (Kingston, Heaman, Fell & Chalmers, 2012). Kingston et al. (2012) used data from the Maternity Experiences Survey (MES) of the Public Health Agency of Canada to provide insight into Canadian women’s knowledge, experiences, and practices during pregnancy, birth, and the early postpartum period. The sampling comprised 58,972 women who had completed the 2006 Canadian Census of Population and were $> 15$ years of age; had delivered a live, singleton infant in the 3 months before the census; and were living with their infant at the time of the interview. From this group, a stratified random sample of 8542 women was drawn. The overall response rate was 78% ($n = 6421$), which included 167 adolescent and 6254 non-adolescent mothers. The
majority of mothers (96.9%) were interviewed between 5 and 9 months’ postpartum. Kingston et al. (2012) found that 14% of adolescent mothers aged 15-19 years had an Edinburgh Postnatal Depression Scale (EPDS) score $\geq 13$ compared to 9.3% of young adults aged 20-24 years and 6.9% of adult women 25 years or older. These figures are much lower than other reported PPD prevalence rates mentioned earlier. A possible reason for the lower prevalence rates in the MES could be due to the timing of the EPDS survey since it was administered between 5-14 months postpartum. With this wide time period, it is possible that depressive symptoms could have resolved on their own by the time the participants were surveyed (Lanes, Kuk, & Tamim, 2011).

In summary, this review found that adolescent mothers have a higher prevalence of PPD compared to adult mothers. The mean prevalence of PPD for all 10 studies included in this review was 33.3 % (calculated by dividing the number of all postpartum depressed women by the total number of subjects across all studies). However, timing of depression measurement was not consistent in all studies and this is an important consideration, since differences can lead to significant variance in prevalence estimates (O’Hara & McCabe, 2013). Although clinicians and researchers define PPD as any depressive episode, which occurs within the first 12 months postpartum (O’Hara & McCabe, 2013), the inception rate is highest in the first three months postpartum (Cooper & Murray, 1998). As well, the baby blues typically lasts for the first 2 weeks postpartum, therefore it would reason that the ideal time for measuring PPD prevalence is sometime after 2 weeks postpartum up until 12 weeks postpartum. When the mean prevalence is re-calculated to include only the 6 studies (n = 981) in this review, which measured depression scores after 2 weeks and up to 12 week postpartum (Chen, 1996; Figueiredo et al., 2007; Hudson et al., 2000; Logsdon et al, 2005; Schmidt et al., 2006; Secco et al, 2007), prevalence estimates increased to 37.8% (95% confidence interval 34.3% - 40.3%). While this calculation is not as robust as the study by O’Hara & Swain (1996), which calculated the mean prevalence for 12,810
adult mothers at 13%, it does provide a starting point with which to estimate PPD prevalence among adolescent mothers and demonstrates that adolescent mothers are at almost three times greater risk for developing PPD compared to adult mothers.

**Predictors of PPD among Adult and Adolescent Mothers**

While the exact etiology of PPD is not known, it appears to be multifactorial in nature, involving a combination of variables. Two meta-analyses among adult mothers revealed the importance of psychosocial variables such as life stress, childcare stress, marital conflict, maternal self-esteem, and the lack of social support as risk factors for PPD (Beck, 2001; O’Hara & Swain, 1996). Results from Beck’s (2001) meta-analysis revealed the same predictors as O’Hara and Swain’s (1996) meta-analysis plus four new predictors (self-esteem, marital status, socioeconomic status, and unplanned/unwanted pregnancy). Results will therefore only be reported from Beck’s (2001) meta-analysis.

Beck’s (2001) meta-analysis of 84 studies revealed 13 significant predictors of PPD using the definitions of small, medium, and large effect sizes to interpret the findings ($r = .10$, small effect size, $r = .30$, medium effect size, and $r = .50$, large effect size). Ten of the 13 risk factors had moderate effect sizes with mean effect size indicator ranges for each risk factor as follows: prenatal depression (.44 to .46), low self-esteem (.45 to .47), childcare stress (.45 to .46), prenatal anxiety (.41 to .45), life stress (.38 to .40), low social support (.36 to .41), marital relationship (.38 to .39), history of previous depression (.38 to .39), infant temperament (.33 to .34) and maternity blues (.25 to .31). Three of the 13 risk factors had small effect sizes with mean effect sizes: marital status (.21 to .35), socioeconomic status (.19 to .22), and unplanned/unwanted pregnancy (.14 to .17).
Adolescent Specific Predictors

Among adolescent mothers, a meta-analysis of predictors of PPD has not been conducted, however, several studies have addressed predictors for PPD, which are specific to the adolescent population (Barnet et al., 1996; Birkeland et al., 2005; Kingston, Heaman, Fell & Chalmers, 2012; Nunes & Phipps, 2012; Reid & Meadows-Oliver, 2007; Tzilos, Zlotnick, Rake, Kuo & Phipps, 2012). Overall, these studies revealed that the following eight variables were predictors of PPD among adolescent mothers: 1) history of previous depression (Nunes & Phipps, 2012); 2) low social support (Barnet et al., 1996; Birkeland et al., 2005; Nunes & Phipps, 2012); 3) life stress (Nune & Phipps, 2012; 4) history of physical or sexual abuse (Kingston et al., 2012; Tzilos et al., 2012); 5) weight/shape disturbances (Birkeland et al., 2005); 6) low maternal self-efficacy (Birkeland et al., 2005); 7) pre-pregnancy alcohol use (Nunes & Phipps, 2012); and 8) pre-pregnancy smoking (Nunes & Phipps, 2012). Details of these studies are described below.

A large US retrospective cohort study assessed whether postpartum depression risk factors differed between adolescent and adult mothers (Nunes & Phipps, 2012). This study used data from the Rhode Island Pregnancy Risk Assessment Monitoring System (RI PRAMS) between 2004 and 2008 from mothers age 15–19 years (n = 676), 20–24 years (n= 1387), 25–29 years (n = 1735), and over the age of 30 years (n = 3161). On average, respondents completed the survey by 4 months postpartum (range from 21 days postpartum to 10 months postpartum). The RI PRAMS survey assessed symptoms of postpartum depression from a modified version of the Patient Health Questionnaire (a previously validated questionnaire). Maternal age specific risk factors were identified using weighted logistic regression and predictive models were developed using a forward selected weighted logistic regression. The four variables which were found to be associated with an increased risk of depressive symptoms among mothers 15-19 years and 20-24 years included: 1) reporting six or more stressors (OR 15-19 years: 9.5; 95% CI:
2.08-43.41; OR 20-24 years: 28.93; 95% CI: 9.25-90.44); 2) prior depression (OR 15-19 years: 3.38; 95% CI: 1.39-8.23; OR 20-24 years: 3.30; 95% CI: 1.60-6.80); 3) alcohol use prior to pregnancy (OR 15-19 years: 2.04; 95% CI: 1.08-3.86; OR 20-24 years: 2.12; 95% CI: 1.32-3.41); and 4) smoking prior to pregnancy (OR 15-19 years: 2.01; 95% CI: 1.03-3.93; OR 20-24 years: 1.73; 95% CI: 1.10-2.74). The one variable associated with a decreased risk of depressive symptoms was the presence of social support, specifically: 1) having someone to talk to (OR 15-19 years: 0.24; 95% CI: 0.11-0.50; OR 20-24 years: 0.21; 95% CI: 1.60-6.80); 2) having someone to help take care of baby (OR 15-19 years: 0.29; 95% CI: 0.12-0.67; OR 20-24 years: 0.17; 95% CI: 0.10-0.30); and 3) financial assistance (OR 15-19 years: 0.49; 95% CI: 0.25-0.95; OR 20-24 years: 0.44; 95% CI: 0.26-0.74).

A US cross-sectional study (n = 149; age 15-19 years) examined the relationship among depression, role restriction, social isolation, maternal self-efficacy, and weight/shape disturbance among adolescent mothers who participated in a school-based teen parenting program (Birkeland et al., 2005). An EPDS score with a cut off ≥ 13 was used to define depression. Multiple regression analysis was conducted with three significant predictors of depression being revealed, namely: 1) social isolation (β = 0.44, p < .001); 2) weight/shape disturbance (β= 0.20, p = .004); and 3) low maternal self-efficacy (β = 0.168, p = .047). Of these three variables, social isolation was the strongest predictor of depression. This is the only study to examine body image and postpartum appearance as a factor for depression among adolescent mothers. This is an important consideration since the period from puberty to late adolescence is a critical time for the formation of body image, with approximately 40% to 60% of adolescent girls expressing dissatisfaction with some aspect of their appearance (Thompson, 2004).

A history of physical or sexual abuse has also been associated with an increased prevalence of PPD among adolescent mothers (Kingston et al., 2012; Tzilos et al., 2012). In
Kingston et al.’s (2012) Canadian study (previously described on page 23), findings revealed that rates of physical abuse in the previous two years were significantly higher in adolescents (41.0%) and young adults (21.8%) compared with adult women (8.2%). All 3 groups identified the primary source of abuse as the partner. In addition, adolescents were almost 6 times as likely to report that they had been abused by a family member. Another US cross-sectional study explored the relationships among the independent histories of alcohol use, drug use, depression, and abuse (physical or sexual) on depression severity in a diverse group of 116 pregnant adolescents (mean age = 16) who attended an urban prenatal clinic (Tzilos et al., 2012). Depression severity was assessed using the Children's Depression Rating Scale-Revised. Findings revealed that a history of abuse was associated with a significant 4.3-point higher mean depression score and remained a statistically significant predictor of more severe depressive symptoms after adjusting for history of alcohol use, history of drug use, and history of depression.

Building on the findings from Nunes and Phipps (2012) and Birkeland et al. (2005), one other study noted low social support as a predictor of postpartum depression among adolescent mothers (Barnet et al., 1996). This US prospective cohort study of adolescent mothers (n = 125, age 12-18 years) explored the roles of stress and social support as influencing factors for PPD, using a CES-DC (children’s scale) cut off of ≥ 21 to define depression (which indicates moderate to severe depression). Findings revealed that social support was negatively associated with depressive symptoms, especially in those adolescents who were highly stressed. Stress levels of adolescent mothers increased significantly from the third trimester (OR 2.29, 95% CI 1.05-5.04, p < .05) to the postpartum period (OR 3.58, 95% CI 1.39-9.11, p < .005) and were positively associated with depressive symptoms. The presence of social support was associated with a decreased likelihood of depressive symptoms. For example, among highly stressed
adolescents in the third trimester of pregnancy, those who reported low levels of social support were more likely to be depressed than those who reported high levels of social support (64% versus 32%, p < 0.05). However, adolescents who received material support from the infant's father in the third trimester were more likely to be depressed compared to those who did not receive material support (49% versus 27%, p < 0.05). Moreover, 87% of participants listed their mother and 77% listed their infant's father as providers of at least one type of support during the prenatal period; however by 4 months postpartum, significantly fewer adolescent mothers continued to name their mother (79%) or their infant's father (67%) among their social support network. These last two finding require elaboration. More than 75% of pregnant adolescents who reported receiving material support from their infant's father also reported high levels of interpersonal conflict with him. It was postulated that the manner in which the material support was provided by the infant’s father was counterproductive, resulting in negative effects on the adolescent's well-being. As well, even though receiving support from their mother and infant’s father was a positive source of support prenatally, both of these figures were also noted to be sources of conflict, therefore it was postulated that these once supportive sources of support ended up becoming negative sources of support in the postpartum period.

In summary, based on this literature review, eight variables have been identified as predictors of depression among adolescent mothers. Of these eight variables, a lack of social support is the one variable, which has been consistently cited in the literature (Barnet et al, 1996; Birkeland et al., 2005; Nunes & Phipps, 2012). This finding is consistent with results from a narrative literature review of postpartum depression among adolescent mothers by Reid and Meadows-Oliver (2007), which included 10 observational studies and two quasi-experimental studies. In this review, a descriptive analysis was performed and results suggested that stressors (family conflict), fewer social supports, and low self-efficacy/self-esteem all were associated
with increased rates of depressive symptoms in adolescent mothers during the first postpartum year (Reid & Meadows Oliver, 2007). Based on this evidence, it is apparent that lack of social support is likely a major predictor of PPD among adolescent mothers.

Consequences of Postpartum Depression

Postpartum depression has negative consequences for both mothers and their infants. Since a mother has a responsibility for caring for her infant, depression can interfere with effective parenting and is associated with a variety of negative child outcomes (Field, 2010). Both maternal and infant consequences of PPD are outlined below, however, it is important to note that reported studies are based on adult literature since adolescent literature is very limited. For example, a recent meta-analysis of 193 studies revealed that there were insufficient samples of adolescent mothers to test for an association between maternal depression and adverse child outcomes however, the authors anticipated that similar patterns with adult mothers would exist with adolescent mothers (Goodman, Rouse, Connell, Broth, Hall, & Heyward, 2011). For this reason, it is assumed that adolescent mothers with PPD would be exposed to similar negative consequences of PPD as adult mothers with PPD.

Maternal Consequences

PPD creates personal suffering, inhibits a woman’s ability to function effectively in many aspects of her life, and is likely to be associated with recurrent depressive episodes (O’Hara and McCabe, 2013). Research among depressed adult mothers suggests that mothers have increased levels of negative emotions and decreased levels of positive emotions which lead to negative perceptions of themselves and in turn negatively impacts maternal caretaking behaviours (Dietz, Jennings, Kelley & Marshall, 2009; Field, 2010; Goodman et al., 2011). Maternal depression is associated with hostile and negative parenting as well as a disengaged parenting style (England & Sim, 2009). A meta-analysis of 46 observational studies, which investigated the association
between PPD and parenting behaviours during their infants’ first three months of life, concluded that depressed mothers were more irritable, less engaged, exhibited less emotion and warmth, and played less with their infants (Lovejoy, Graczyk, O’Hare, & Neuman, 2000). As a result, depressed mothers were often unable to respond to their infant’s cues such as crying and positive or negative facial expressions (Field, 2010). Infant care giving activities which are compromised in mothers with PPD include early discontinuation of breastfeeding, the establishment of undesirable sleep routines, being less likely to attend well-child visits or obtain vaccinations for children, and being less likely to implement safety measures in the home (Field, 2010). The impaired interactions of depressed mothers and their infants appear to be universal across different cultures and socioeconomic status groups (Field, 2010). As well, depressive symptoms such as a lack of energy, fatigue, and feelings of incompetence, worthlessness, and helplessness can alienate mothers and place them at increased risk for social isolation (Letourneau et al., 2012).

Infant Consequences

Postpartum depression occurs at a time when an infant is most dependent on parental care and is highly sensitive to the quality of maternal-infant interactions (O’Hara & McCabe, 2013). Due to impaired maternal-infant interactions, infants of depressed mothers are at risk for poor physical health and impaired cognitive, behavioural, and emotional development, which are particularly detrimental if infants are exposed to maternal depression at an early age (O’Hara & McCabe, 2013; Stein et al., 2014). It has been suggested that the mechanism of risk transmission from depressed mothers to infants includes 1) maternal modelling of depressed affect, cognitions, and behaviours; 2) reduced positive reinforcement for the child and inconsistent discipline practices; 3) the development of insecure child attachment, and 4) an indirect influence
on maternal depression through its detrimental effects on the marital relationship and family functioning (Rishel, 2012).

**Physical Health:** As a result of maladaptive maternal caretaking behaviours, an infant’s health may suffer. For example, a UK population-based cohort study of 107,587 primiparous women reported that children of mothers with a diagnosis of depression at any point from pregnancy through six months postpartum had significantly higher rates of gastrointestinal infections and lower respiratory tract infections (Ban, Gibson, West, & Tata, 2010).

**Cognitive Development:** Maternal depression is associated with poorer language development in children across childhood and adolescence (Brand & Brennan, 2009, England & Sim, 2009; Righetti-Veltema, Bousquet & Manzano, 2003). For example, 18-month old infants of depressed mothers had less verbal interaction, less playing interaction, performed less well on object concept tasks (such as object permanence), and were more often insecurely attached to their mothers (Righetti-Veltema et al., 2003). In addition, infants and children of depressed mothers showed lower cognitive/intellectual/academic performance, cognitive vulnerabilities to depression (more self-blame, more negative attributional style, lower self-worth); poorer interpersonal functioning; and poorer functioning stress response systems (England & Sim, 2009).

**Behavioural Issues:** Goodman et al.’s (2011) meta-analysis demonstrated an association between maternal depression (not restricted to the postnatal period) and a range of child behavioural outcomes including externalizing psychopathology. Externalizing disorders have many negative social consequences including aggression and disobedience but also more severe conditions such as attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder (Stein et al., 2014)
Emotional Development: Goodman et al.’s (2011) meta-analysis also linked depressive symptoms in mothers to negative emotional outcomes such as higher levels of internalizing behaviour (e.g. withdrawn behaviour) and negative emotionality (e.g. infants that are more fussy and less able to be soothed). Internalizing difficulties include symptoms or diagnoses of depression and anxiety (e.g. separation anxiety and phobias) (Stein et al., 2014).

Overall, maternal depressive symptoms experienced during the first six months postpartum are associated with behavioural problems from early childhood to adolescence (Murray, Arteche, Fearon, Halligan, Goodyer, & Cooper, 2011). Both the severity and chronicity of maternal depressive symptoms predict future child behavioural problems (Brand & Brennan 2009). Results from these studies highlight the severity of PPD as a major public health concern requiring preventive intervention.

Prevention of Postpartum Depression

This section will first highlight prevention PPD trials among adult mothers and then emphasize prevention interventions for adolescent mothers. A Cochrane review of 28 randomized controlled trials (including almost 17,000 women) sought to examine the effect of psychosocial and psychological interventions to reduce the risk of postpartum depression compared to usual care (Dennis & Dowswell, 2013). They determined that overall, women who received a psychosocial or psychological intervention were significantly less likely to develop postpartum depression compared with those receiving standard care (average risk reduction [RR] 0.78, 95% CI 0.66 to 0.93; 20 trials, 14,727 women). Promising interventions included: 1) the provision of intensive, individualized postpartum home visits by public health nurses or midwives (RR 0.56, 95% CI 0.43 to 0.73; two trials, 1262 women); 2) lay (peer)-based telephone support (RR 0.54, 95% CI 0.38 to 0.77; one trial, 612 women); and 3) interpersonal psychotherapy (standardized mean difference -0.27, 95% CI -0.52 to -0.01; five trials, 366...
women). They also found that both professional and lay-based interventions were effective in reducing the risk to develop symptoms of depression. Interventions that were initiated in the postpartum period significantly reduced the risk to develop depressive symptomatology (RR 0.73, 95% CI 0.59 to 0.90; 12 trials, 12,786 women). One recommendation from Dennis and Dowswell’s (2013) review was to target future interventions towards ‘at-risk’ mothers since this approach has been shown to be more beneficial and feasible compared to interventions, which only target a general maternal population. Since adolescent mothers are at high risk for PPD, prevention interventions specifically targeting this population are needed.

**Postpartum Prevention Trials Among Adolescent Mothers**

Despite the promising findings in Dennis and Dowswell’s (2013) review, none of the interventions specifically targeted adolescent mothers, therefore it is not known if any of these interventions are feasible or acceptable for this ‘at risk’ subgroup. Moreover, no systematic reviews of PPD prevention interventions have been conducted among the adolescent population. To date, three randomized controlled trials (RCT) (Barnet et al., 2002; Ginsburg et al., 2012; Phipps et al., 2013) and one quasi-experimental study (Logsdon et al., 2005) have been published investigating the prevention of depressive symptoms in the postpartum period among adolescent mothers (see Appendix A). These studies are summarized below, with attention to their strengths and weaknesses.

Two out of four trials focused on professionally led antenatal groups using either interpersonal therapy (Phipps et al., 2013) or cognitive behavioural therapy (Ginsburg et al., 2012). In Phipps et al.’s (2013) US pilot RCT, 106 pregnant primiparous adolescents (≤ 17 years old at their first prenatal visit) were randomly assigned to either the REACH (Relaxation, Encouragement, Appreciation, Communication, and Helpfulness) intervention arm (n= 54) or the attention and dose-matched control arm (n=52) which only focused on prenatal education.
Participants were stratified into groups based on prior history of depression using multiple block randomization lengths. The REACH program intervention was an adaptation of an interpersonal therapy–based prevention intervention, which was found to reduce PPD in pregnant adults on public assistance (Zlotnick, Miller, Pearlstein, Howard, & Sweeney, 2006). Both the intervention and control groups received 5 prenatal sessions and one postpartum booster session delivered in hospital after delivery. Outcome measures for depressive symptomatology were assessed using the Structured Clinical Interview for DSM-IV– Childhood Diagnosis (SCID-KID) at 6 weeks, 3 months, and 6 months postpartum. Results of this study showed a reduction in PPD depressive symptomatology determining that the overall rate of depression in the intervention group (12.5%) was lower than the control group (25%) with a hazard rate ratio of 0.44 at 6 months after delivery; however the confidence interval results were not statistically significant (95% CI: 0.17-1.15). An important finding in this trial was the fact that participants in the intervention group preferred individual as opposed to group sessions, which resulted in accommodations being made to deliver the sessions individually. Overall, the study was methodologically strong in terms of randomization procedures (allocation concealment and sequence generation), blinding of outcome assessment, handling of data (including performing a sensitivity analysis for missing data), using a standardized definition / measurement tool for PPD and measuring outcomes within the first 3 months postpartum. As well, attrition rates were low (11% for the intervention group and 6% for the control group). Methodologically and theoretically this study was strong, however the major limitation was the small sample size which was underpowered to detect a statistically significant difference between the study groups, thus rendering these results questionable.

In Ginsburg et al.’s (2012) US pilot RCT study, 47 pregnant American Indian (AI) adolescent mothers (15-19 years; mean age = 18.15) were recruited and randomly assigned to
either the Living in Harmony (LIH) intervention group (n= 22) or to the education support control group (n=25). Outcome measures included both the CES-D and EPDS administered at baseline, at post-intervention, and at 4, 12, and 24 weeks postpartum. Participants in the LIH program intervention group received eight weekly 30–60-minute in-home (or in-office) sessions initiated prior to 29 weeks gestation and three monthly booster sessions. Intervention sessions included psychoeducation, identification of depressive cognitions and behaviours, problem-solving skills, enhancing social supports and planning for the future. Participants in the Educational–Support (ES) program control group received eight weekly, 30–60-minute in-home or office sessions (initiated prior to 29 weeks gestation) and three booster sessions. The interventionists were AI paraprofessionals trained as Family Health Educators who had an Associates or Bachelors Degree. FHEs completed extensive training (duration not reported) and at least one pilot case prior to enrolling participants in the study. Each Family Health Educator delivered both ES and LIH programs in order to protect against the threat to internal validity (i.e., that improvements in one group would be due to interventionist characteristics). At each post intervention assessment (4, 12, and 24 weeks), mothers in both groups showed similar depression scores (mean 12 week EPDS score: 6.38, SD 5.64 in LIH group and 5.43, SD 4.23 in ES group). There were no changes in either group with respect to social support. This study had a number of limitations including small sample size, high attrition rate of participants (32% in LIH, 24% in ES), a lack of definition of PPD (CES-D and EPDS cut off measures not identified), and unreported randomization / blinding procedures. This study was not only methodologically weak, but it was also theoretically weak. A potential reason this study did not succeed in preventing PPD could be the use of health paraprofessionals as the source of support. Although the paraprofessionals were able to naturally navigate preferred cultural styles and expected ways to relate to participants, they were professionalized with respect to their qualifications. Dennis
(2003) explains that professionalization shifts the accountability of paraprofessionals from the target population to the health-care system, which in turn diminishes their mutual identification, credibility, and commonality with participants.

Another RCT (Barnet et al., 2002) evaluated the effect of a volunteer model home visitation program on adolescent parenting outcomes. In this US study, 232 adolescents were eligible if they were in their third trimester of pregnancy or had delivered a baby in the previous 6 months. Participants were randomized to either a home visitation program by lay volunteers (n=118) or a usual care control group (n=114). Depression was measured using the Mental Health Inventory 5 using a validated cut off score to define poor mental health at the 15 month follow-up point (equivalent to 12-21 months postpartum depending at which stage of pregnancy or parenting the participant was recruited). Of the 118 participants assigned to the intervention group, 37 were never matched with a home visitor since they were either not able to be located or were no longer interested in the study. For participants in the intervention group, one and a half hour home visits were provided weekly by female lay volunteers older than 21 years of age who were recruited from the local community. Lay volunteers completed an extensive screening process (including assessment of their motivation and background criminal checks) and received 16 hours of training in the intervention curriculum, which focused on theories of human ecology, attachment, and social support emphasizing positive child development and promotion of empathetic parenting. A licensed social worker met with the adolescent mother and lay volunteer during monthly group parenting classes. Data were collected at baseline and 15 months. Results suggested that at 15 months postpartum, contrary to their hypothesis, participants in the intervention group showed higher levels of poor mental health (56%) compared to the control group (48%). The study was also methodologically and theoretically weak. Methodological weaknesses included high attrition rates in both the control (39%) and intervention groups (34%)
due to inability to locate the adolescent mother at follow-up, inadequate randomization procedures (concealment of randomization sequence not specified) and inadequate timing of outcome measure (after 3 months postpartum). Theoretical weaknesses potentially account for the failure of this trial to impact mental health outcomes since the intervention was delivered by a lay volunteer from the community who did not necessarily share similar life experiences (i.e. adolescent pregnancy) and therefore may not have been able to understand and relate to the target population (Dennis, 2003).

In the last study, Logsdon et al. (2005) conducted a repeat measures study to determine the effectiveness of a social support intervention delivered to pregnant adolescent girls between 32 and 36 weeks of gestation in preventing symptoms of depression at 6 weeks postpartum. Participants were randomly assigned to one of three intervention groups (pamphlet, video, or pamphlet plus video) or a control group. The content of the intervention was based on a synthesis of the literature describing social support needed and desired by postpartum adolescents. Results revealed that there were no significant differences in the Center for Epidemiological Studies of Depression instrument scores (cut off score ≥ 16) among the groups at 6 weeks postpartum. This study had both methodological and theoretical weaknesses. Methodologically, the study was weakened due to the study design which did not have randomized assignment of participants and the high potential for contamination of the control group. It was postulated that the lack of difference in depression scores could have been due to contamination where adolescents in the intervention group could have shared information about the interventions with the control group. When a path analysis was done, the authors found that a predictor of depression at 6 weeks postpartum was in fact receiving more support from friends and family. This is an important finding which indicates that the support provided may not have matched the needs and expectations of the pregnant and parenting mothers. Too much support could have led to feelings
of inadequacy and incompetence in the adolescent mother (Logsdon et al., 2005). From a theoretical perspective, this could be due to the multidimensional nature of supportive interactions, where the positive influence of health outcomes depends on the formulation of specific predictions to determine which supportive functions will be the most effective for a particular type of stressor (Wills & Shinar, 2000). This is referred to as the “matching hypothesis” which reasons that the support desired by an individual has to match the support given to him or her. Moreover, social interactions are not always positive. Negative interactions can potentially cause conflict and burden leading to decreased psychological well-being rather than increased psychological well-being (Wills & Shinar, 2000). These concepts will be explored further under the following section on social support.

Overall, findings from these RCT and quasi-experimental studies suggest that all available studies to date on the prevention of PPD among adolescent mothers demonstrated methodological or theoretical limitations and that further research is warranted. In addition to the methodological gaps already mentioned, a synthesis of the specific theoretical gaps in these studies were related to 1) the source of support provided, which was either by paraprofessionals who were overly professionalized or by lay volunteers who were not experientially similar to the target population as the sources of support; or 2) a mismatch in the provision of support (where the amount of support provided did not match the support desired to be received). In order to address these gaps, it is proposed that PPD prevention interventions for adolescent mothers utilize a solid theoretical framework, such as Dennis’s (2003) peer support conceptual analysis, which is theoretically embedded in the social support literature. In order to delineate the salient concepts of peer support, a comprehensive review of social support literature will be provided, followed by a review of peer support literature.
Social Support

The origins of social support research dates back to 1897 when French sociologist Emile Durkheim observed an increased prevalence of suicide among people with fewer social connections compared to those with greater social connections (Durkheim, 1897/1951). Since that time there has been a growing interest in the association between social relationships and psychological well-being, with a notable surge in research in the late 1970s and early 1980s when researchers such as Cassel (1976), Cobb (1976) and Cohen and Wills (1985) determined that social support can protect individuals from the detrimental physical and mental effects of stress. Today, literature on the concept of social support is immense, spanning the disciplines of psychology, psychiatry, medicine, nursing, social work, sociology, and communications. Based on numerous research studies, substantial evidence has accumulated which concludes that social ties and social support are positively and causally related to mental health (Kawachi & Berkman, 2001; Lakey & Cronin, 2008), physical health (Uchino, 2004; Uchino, 2006) and longevity (Holt-Lunstad, Smith, & Layton, 2010). Both the World Health Organization (Commission on Social Determinants of Health, 2008) and the Public Health Agency of Canada (Butler-Jones, 2008) recognize the salient role of social support and social networks as a key determinant of health.

Some of the most compelling evidence to date about the significance of social support comes from Holt-Lundstad et al.’s (2010) meta-analysis of 148 independent studies (308,849 participants) which found that individuals with adequate social relationships have a 50% greater likelihood of survival compared to those with poor or insufficient social relationships. (OR = 1.50, 95% CI 1.42 to 1.59). These findings indicate that the influence of social relationships on mortality is comparable to other well-established risk factors for mortality such as smoking, alcohol consumption, obesity and physical inactivity (Holt-Lundstad et al., 2010).
Conceptualization and Measurement of Social Support

A clear understanding of the impact of social support on health status and health behaviours is needed in order to design effective health promotion interventions. In the broadest sense, social support refers to the extent of a person’s integration in their social network as well as the resources provided by others which can help a person cope with problems (Wills & Ainette, 2012). Two major approaches to conceptualizing social variables related to health are described in the literature on social support: the structural approach and the functional approach (Wills & Ainette, 2007).

Structural approach

This approach considers the total number and pattern of direct and indirect social connections that a person has in a community (Heaney & Israel, 2008; Wills & Ainette, 2007) and considers how relationships are patterned or organized (Thoits, 2011). Heaney and Israel (2008) describe eight key dyadic characteristics, which constitute the structure of social networks. These dyadic characteristics refer to the specific relationships between an individual and another member of his or her social network including 1) reciprocity or the extent that support and resources are both given and received within a relationship, 2) intensity or strength or the extent of emotional closeness in a relationship 3) formality or the extent to which a relationship is embedded in a formal organizations or institutional structure, 4) complexity or the extent to which relationships serve a variety of functions, 5) homogeneity or the extent to which members are demographically similar with respect to age, race and / or socioeconomic status, 6) geographic dispersion or the extent to which people live in close proximity to each other, 7) directionality or the extent to which two people in a network share equal power and influence and 8) network density or the extent to which people in a social network know and interact with one another.
Functional approach

This approach considers the various kinds of resources available through social networks, which are provided to an individual regardless of the number of connections available (Gottlieb & Bergen, 2010; Wills & Ainette, 2012). Social support resources can be provided by any number of people, both within an individual’s informal network (such as family, friends or coworkers) or formal network (such as healthcare professionals) (Heaney & Israel, 2008).

Functional support assumes that social relationships are able to provide supportive functions and that the quality of this support is important to the individual receiving it (Wills & Ainette, 2012). This is referred to as perceived support (support which is believed to be available if needed) and received support (support which has been recently provided to an individual) (Wills & Shinar, 2000).

Functional support is multidimensional, including different types of supportive functions which can be provided by different people within a social network, depending upon the exact nature of an individual’s problem or stressor (Wills & Shinar, 2000). Based on the seminal work of House (1981), functional support distinguishes between four types of supportive behaviours: emotional, instrumental, informational, and appraisal. Emotional support is associated with expressions of empathy, love, trust, caring, and sharing of life experiences. Instrumental support involves the provision of tangible aid and services which can directly assist a person in need. Informational support involves the provision of advice, suggestions, and information that a person can use to address problems. Appraisal support involves the provision of information that is useful for self-evaluation purposes such as constructive feedback, affirmation, and social comparison (Heany and Israel, 2008).

It is important to note that scores on structural and functional measures are not highly correlated (Wills & Ainette, 2012). In other words, the number of people one knows is not
strongly related to the availability of emotional and other types of support. This implies that the structural and functional aspects of social support contribute to health outcomes through different mechanisms (Wills & Ainette, 2012). Theoretical explanations have been developed to try to explain these differences.

**Theoretical Perspectives on Social Support**

Social support interventions must be guided by theories, which explain how social relationships influence health and well-being. Three theoretical perspectives on social support dominate the literature (Lakey & Cohen, 2000). These include 1) the stress and coping perspective (which suggests that social support improves health by protecting individuals from harmful effects of stress known as stress buffering); 2) the social constructionist perspective (which suggests that support directly improves health by increasing an individual’s self-esteem and self-regulation, whether or not stress is present in the environment); and 3) the relationship perspective (which presumes that relationship processes such as companionship, intimacy, social conflict and attachment style are strongly intertwined with our social environment). This study will be guided by the stress and coping perspective since the transitional periods of adolescence and motherhood encompass multiple stressors. As well, nearly all research on social support is guided by the assumption that social support’s link to mental health reflects stress buffering (Lakey & Orehek, 2011). Stress buffering theory was initially proposed by Cassel and Cobb in 1976 but many scholars have contributed to its development such as Barrera (1986), Cohen and Wills (1985), and Thoits (1986). This perspective is strongly related to stress and coping theory of Lazarus (1966) and Lazarus and Folkman (1984).

According to Lakey and Cohen (2000), the stress and coping perspective suggests that social support improves health by buffering individuals from stress (stress buffering hypothesis). Within this perspective, there are two main components, which confer protection from stress:
Supportive actions and appraisal. Supportive actions operate by promoting coping and can reduce the effects of a stressor as long as the form of assistance matches the demands of the stressor. Appraisal allows individuals to have less negative self-thoughts and interpret stressful situations less negatively (Lakey, Orehek, Hain, & Van Vleet, 2010). The stress-buffering hypothesis is based on the premise that support protects individuals from stress either through the provision of supportive actions such as giving advice and emotional reassurance (received support) or through the belief that support will be available if needed (perceived support) (Lakey & Cohen, 2000; Cohen, 2004; Lakey & Orehek, 2011). Both received support and perceived support are believed to enhance coping performance (Lakey and Orehek, 2011). Thoits (2011) explains that most stressors evoke needs for both emotional reassurance and coping performance, and that support providers typically deliver both types of supportive actions.

Negative Aspects of Social Support and Matching Hypothesis

Although the majority of research on social support focuses on its positive aspects, there are also negative aspects of social relationships, which must be considered (Uchnio, 2013). A literature review of 19 social support studies identified that negative social interactions may cause distress (e.g., resentment, sadness, shame) and therefore have a deleterious impact on mental health (Lincoln, 2000). It is posited that negative social interactions may include discouraging the expression of feelings, making critical remarks, invading another’s privacy, interfering in another’s affairs, or failing to provide promised help. Moreover, Lincoln’s review found that negative interactions actually have more potent effects on wellbeing than positive interactions, possibly because negative interactions may erode feelings of personal control or self-esteem, decrease motivation to engage in positive health behaviours, or cause adverse physiological responses (Lincoln, 2000).
The matching hypothesis, as described earlier, suggests that different network members provide different types of support based on their relationship to an individual, their available resources, and their life experiences (Gottlieb, 2000). Some of these relationships contribute to meeting an individual’s emotional needs, some for satisfying informational needs and some for providing tangible support, such as financial services. It is postulated that certain dimensions of stress stimulate particular supportive needs whose satisfaction results in improved health outcomes (Gottlieb, 2000). For instance, it has been determined that uncontrollable events generally require an increase in emotional support whereas controllable events stimulate needs for instrumental support. When social support interventions are created, it is important to consider whether those providing support will be from within or outside an individual’s natural network. If the existing natural network lacks experiential knowledge, it cannot offer empathic understanding; therefore these types of situations require the introduction of newly created sources of emotional support (Gottlieb, 2000). Both the negative aspects of support and effective matching need to be taken into account when designing social support interventions.

**Peer support**

Peer support is theoretically embedded within the concept of social support and is a beneficial way of promoting health across a variety of populations, including adolescents (Dennis, 2003). Health promoting interventions extend beyond the traditional health care system and are the foundation of Primary Healthcare (PHC; Health Canada, 2012). The World Health Organization (2008) describes PHC as both a philosophy and a model of improving healthcare. It focuses on individual and community strengths and needs, involves the entire community in healthcare; includes all relevant sectors but tries to avoid duplicating services; and uses only health technologies that are accessible, acceptable, affordable, and appropriate. PHC has been
internationally accepted as being the most effective way to meet the health needs of all people in the world (WHO, 2008).

Within a healthcare context, peer support is defined as a multifaceted form of social support which incorporates the provision of (a) informational support (knowledge, facts, and suggestions), (b) emotional support (attentive listening, caring, and reassurance) and (c) appraisal support (motivation, encouragement, and positive communication) which is delivered by a person who has similar characteristics or health conditions (Dennis, 2003). Instrumental support (the provision of tangible aid) is not a defining attribute of peer support. Dennis (2003) explains that peer support predominately occurs without the provision of instrumental support.

Peers with similar backgrounds are able to understand a target population’s situation in a way that family, friends, or healthcare professionals may not (Dennis, 2003). These similarities include but are not limited to age, ethnicity, socio-economic status and disease condition (Dennis, 2003). Friends, family members, and neighbours are referred to as natural lay helpers and while they are able to provide social support, they do not have the same characteristics as a peer since they have not necessarily experienced the same health condition or situation as the person requiring assistance (Dennis, 2003). The provision of peer support usually needs to extend beyond a natural or embedded support network into a newly created network where experientially similar others can be found (Thoits, 2011). A newly created peer can provide coping assistance (such as advice and encouragement), which directly protects physical and psychological well-being and indirectly fosters a sense of control (Taylor and Stanton 2007). This coping assistance can diminish the harmful physical and psychological consequences of stress (Taylor and Stanton 2007).

It is believed that individuals who share similar perceptions of, and emotional reactions to, another’s circumstances (or who can do so vicariously due to previous experience) are more
likely to be sources of effective support and coping assistance (Thoits, 1986). However, individuals must perceive empathic understanding in others before coping assistance can be sought and accepted, and those who are experientially similar to a distressed individual are most likely to be perceived (and to be) empathic (Thoits, 1986). Similar others can also be role models, influencing by example, the individual’s coping strategies and sense of personal control (Thoits, 2011). When peer support is provided by people with similar health experiences, it has been shown to produce positive psychological outcomes including increased self-worth, confidence, and sense of purpose (Dennis, 2003). Training is typically provided to peer volunteers on listening skills, basic counseling skills, confidentiality, recognizing potential for self-harm, and information about referral services if additional support is required (Dennis, 2003; Turner, 1999). Careful attention must be made not to over-train peers thereby creating paraprofessionals who are no longer similar to the target population. As mentioned previously, when peers become paraprofessionals, their accountability can shift to the healthcare system which reduces credibility and commonality with the target population (Dennis, 2003).

Trends in adolescent health are increasingly focused on the importance of peers to establish and maintain healthy behaviours (Umberson et al., 2010). Peers are the biggest social factor predicting adolescent health behaviour (Umberson et al., 2010; Wysoci & Greco, 2006) exerting greater influence than parents (del Valle, Bravo, & Lopez, 2010) or healthcare providers (Boothroyd & Fisher, 2010) especially with respect to emotional support (del Valle et al., 2010). Since peer friendships in an adolescent’s natural social support network may dissolve, it is important to consider how newly created peer networks can be developed. It is possible that the provision of support by a mother who has a similar experience (i.e., being an adolescent parent) could fill the void for adolescent mothers of not having someone who understands and decrease levels of depression, loneliness, and anxiety. While the involvement of peers is an important
developmental aspect of adolescence, there is the risk that peer friendships may have negative influences or they may disappear when an adolescent becomes a mother (Devito, 2010; Perry & Pauletti, 2011). As such, social support and supportive relationships can become an important protective factor for pregnant adolescents to assist them with their transition to motherhood (Logsdon, Birkimer, Ratterman, Cahill, & Cahill, 2002).

**Mechanism of Action**

Peer support can influence health outcomes through a variety of mechanisms such as direct, buffering or mediating effect models (Dennis, 2003). Each of these mechanisms will be described below.

The direct effect model can influence health outcomes *directly* by reducing social isolation and feelings of loneliness, swaying health practices and deterring maladaptive behaviours or responses, promoting positive psychological states and individual motivation, providing information (such as access to medical services) or preventing the risk for, progression of, and recovery from physical illness (Dennis, 2003).

The moderating effect model can influence health outcomes *buffering* the influence of stress on health through reducing potential for harm posed by a stressor, broadening the number of coping resources, discussing coping strategies, encouraging problem-solving techniques, inhibiting maladaptive responses and counteracting the tendency to blame (Dennis, 2003).

The mediating effect model can influence health outcomes *indirectly* by increasing self-esteem through the provision of positive reinforcement, vicarious experiences through role modeling and verbal persuasion (encouragement), social comparison to promote motivation and self-evaluation, the promotion of positive coping strategies, assistance to positively interpret emotional feelings and encourage cognitive restructuring (Dennis, 2003).
Peer Support Interventions

The number of interventions provided by peers is increasing rapidly (Simoni, Franks, Lehavot & Yard, 2011). With this rapid expansion, it is important be able to distinguish salient concepts utilized in these interventions. Simoni et al. (2011) describe three traditions by which community-based lay support currently operates. The first tradition is lay healing, which incorporates spiritual understandings of heath and the provision of social support to improve health outcomes. The provision of emotional support dominates this tradition. The second tradition is peer education where students teach other students as a form of participatory learning. These types of interventions typically involve adolescents and are used in many school-based chronic disease prevention programs. The main focus of these interventions is the provision of informational support. The third tradition is mutual aid for recovery which is primarily utilized within the mental health and addictions informal system of care, playing a large role to alleviate stigmatization and discrimination. The provision of appraisal support dominates mutual aid interventions.

However, peer support is a multifaceted concept and when applied to complex situations in adolescent populations, all three components of peer support (emotional, informational and appraisal support) are most beneficial and should be integrated into the intervention (Dennis, 2003; Rubin, Bukowski, & Laursen, 2009). Rubin et al. (2009) explain that the following points should be carefully considered when planning peer support interventions for adolescent population: 1) the significance of peer relations in human development which is derived from the equal status of participants (such as chronological age, cognitive capacities or social experience); 2) the unique significance of peer relations for children and adolescents stems from the fact that the individuals involved are not mature adults; and 3) the notion of reciprocity or mutual
exchange is a key aspect in peer relations. These theoretical viewpoints which are specific to the adolescent population are consistent with Dennis’ (2003) concept analysis of peer support.

A systematic review of 11 peer support studies for adolescents with chronic illness found that peer support interventions showed improvements in adolescents’ behavioural and emotional symptoms (Ahola Kohut et al., 2014). Of the 11 studies, two were RCT’s, two were clustered RCTs, one was of clustered design without randomization, two were qualitative designs, one study contained both quantitative and qualitative designs and three studies were prospective pre-post designs. The methodological quality of the studies in the review ranged from poor to fair with the majority of studies being conducted face-to-face (7 out of 11 studies) and involving some type of training for peer mentors (6 out of 11 studies). The length of training for peer mentors varied between 4.5 hours to 3 weeks. Results of one cluster RCT study in Jordan of an asthma intervention found clinically significant improvements in health related quality of life (mean difference: 1.35; 95% CI: 1.04 – 1.76), self-efficacy to resist negative health behaviour (mean difference: 4.63; 95% CI: 2.93 – 6.35) and self-management knowledge (mean difference: 1.62; 95% CI: 1.15-2.19) compared with the control group. Another non-randomized cluster design study from Australia of an asthma intervention found that their intervention program led to a significant improvement in disease knowledge in the intervention group only (14.38, SD = 4.01, p < 0.0001). A third Canadian mixed-methods study of an asthma intervention did not have significant differences between pre and post-intervention with respect to self-reported coping however it did report significant findings such as decreased loneliness and social isolation (26.5, SD = 5.54, p = .009). Finally, in a prospective pre-post study from Norway of a diabetes peer support intervention, significant results were found in a reduction of HbA1c (glycated hemoglobin) among girls only (p = 0.039). Overall, conclusions of the review demonstrated there were significant improvements in outcomes with respect to social engagement, school
attendance, disease knowledge, health related quality of life, attitudes towards illness, adherence and retention in care. A recommendation for future studies was to explore online interventions in order to improve accessibility of services for adolescents who may have limited resources and services. The authors also recommended incorporating formal peer mentor training, having older youth or young adults serve as peer mentors and meeting mentors in person on a weekly or biweekly basis to provide support and coaching.

In a qualitative study from the United Kingdom, Boath, Henshaw, and Bradley (2013) explored the experiences of 15 adolescent mothers with postpartum depression, focusing on their experiences of being a young mother and their support needs. Results from the study showed that the greatest impact on the adolescent mothers was the real and perceived stigma they experienced as young mothers, the lack of informal support networks, and the unavailability of relevant and appropriate information targeted at teenage mothers. These young mothers felt stigmatized by older mothers and preferred if support was provided by a mother who was only slightly older, so she could better understand the circumstances of being a young mother. Barriers to receiving support included transport issues, which highlights the need for more innovative and convenient types of support which can be offered via telephones and cell phones. Teen mothers also lacked awareness and knowledge of PPD.

Telephone Based Peer Support Interventions

A 2009 Cochrane review of seven studies involving 2492 participants showed that peer support telephone interventions were associated with an increase in mammography screening, increase in dietary changes for myocardial infarction patients, greater continuation of breastfeeding in mothers at 3 months postpartum, and reduced depressive symptomatology postpartum (Dale, Caramlau, Lindenmeyer, & Williams, 2009). However, no studies in this
review were conducted in the adolescent population and none utilized mobile phone based support.

Telephone-based peer support has been shown to be a promising and cost effective intervention among adult mothers in preventing PPD (Dennis et al., 2009) and may prove to be a successful option for the adolescent population as well. In this multisite randomized controlled trial (RCT) of 701 adult mothers (349 in the intervention group, 352 in the control group), proactive individualised telephone-based peer (mother to mother) support was initiated within 48-72 hours of randomisation and provided by a volunteer recruited from the community who had previously experienced and recovered from self-reported postnatal depression and had attended a four hour training session. Outcomes measured included depression (using the EPDS and structured clinical interview), anxiety, loneliness and use of health services at 12 and 24 weeks postpartum. During routine postpartum phone calls, (initiated between 24-48 hours post hospital discharge) public health nurses administered the EPDS and those women scoring > 9 and deemed to be high risk to develop postpartum depression were referred to the study. Women were excluded if they were taking antidepressant or antipsychotic drugs at the time of recruitment. Participants were eligible for the study if they were 2 weeks postpartum or less, aged 18 years or more, able to speak English, had a live birth and were discharged home with their baby. Participants in the intervention group received standard community postpartum care plus telephone-based peer support from a mother with a history and recovery from postpartum depression. The training session for the peer volunteers focussed on developing the skills required to provide effective telephone-based support and to make referrals to health professionals as necessary; role-playing was an important training strategy. A take home 121 page training manual was developed and distributed to all new peer volunteers to guide the training session and intervention. Demographics characteristic of peer volunteers indicated most
were married (82%), were educated beyond high school (91%), had had more than one pregnancy (61%), and self-reported their ethnicity as non-Canadian (54%). Peer volunteers were asked to make a minimum of four contacts with each mother with telephone contact being initiated within 48-72 hours of randomisation. On average each peer supported 2 women (range 1-7); made 8.8 contacts (SD 6.0) with each contact lasting 14.1 minutes (SD 18.5). Participants in the control group received standard community postpartum care including access to services from public health nurses and other providers (mother initiated) and drop in centres. Research nurses blinded to group allocation telephoned all participants at 12 and 24 weeks postpartum to assess trial outcomes. At 12 weeks participants in the intervention group and peer volunteers completed questionnaires about their perceptions of the peer support intervention. Results revealed that women in the intervention group were significantly less likely to have symptoms of postnatal depression at the 12 week assessment than those in the control group (OR 2.1, 95% CI: 1.38 to 3.20). Specifically, 14% of women in the intervention group had an EPDS score >12 compared with 25% in the control group ($\chi^2=12.5$, $p < 0.001$; number need to treat 8.8, 95% CI: 5.9 to 19.6; relative risk reduction 0.46, 95% CI: 0.24 to 0.62) suggesting that women who received the peer support intervention were at half the risk of developing postnatal depression at 12 weeks postpartum compared to those in the control group. Also, there was a positive trend in favour of the intervention group for maternal anxiety (21% intervention group had a score > 44 on the State-Trait Anxiety Inventory compared with 27% in the control group; results not statistically significant), but not loneliness or use of health services. For ethical reasons, participants identified with clinical depression at 12 weeks were referred for treatment, resulting in no differences between groups at 24 weeks. Of the 221 women in the intervention group who received and evaluated their experience of peer support, over 80% were satisfied and would recommend this support to a friend (Dennis, 2010). The majority of peer volunteers felt
that the training session had prepared them for their role (94.2%), that volunteering did not interfere with their lives (81.8%) and that providing support helped them grow as individuals (87.8%). Over 90% stated that they would become a peer volunteer again if given the opportunity (Dennis, 2013). Although Dennis et al.’s (2009) peer support showed that telephone-based peer support is a promising intervention to prevent postnatal depression among women at high risk, mothers under 18 years of age were not included in the study, therefore it is not known if this is an effective intervention for younger mothers.

In terms of an adolescent population, a US RCT evaluated the effect of telephone-based peer support on breastfeeding duration for 78 adolescent mothers, with 38 mothers assigned to the intervention group and 40 mothers to the control group (Meglio, McDermott, & Klein, 2010). The intervention was based on a breastfeeding promotion program where adult mothers who had breastfeeding experience were recruited, trained, and remunerated to provide support to new breastfeeding mothers (this study differed in that teen mothers were recruited as support persons). The intervention consisted of delivering peer support by telephone to a new adolescent mother by a peer mentor at 2, 4, and 7 days post discharge and then at 2, 3, 4, and 5 weeks post-discharge. Peer mentors were adolescent mothers who had previous experience with breastfeeding (i.e.: breastfed their infant for > 4 weeks) and completed a breastfeeding peer counsellor-training program consisting of ten, 2-hour sessions, which were delivered by La Leche League leaders. No specific discussion topics were assigned for peer mentors to discuss; they only needed to introduce themselves and ask about the new mother’s breastfeeding experience. Peer mentor recruitment and retention was highly problematic in this study. Twenty-four adolescents were approached to become peer support persons, 15 agreed to participate and five completed the breastfeeding peer counsellor-training program. Peer mentors who completed the training sessions were all between the ages of 17 and 19 years and had children between 10-
39 months old. Of the five adolescents who completed peer support training, three were unreliable at making the prescribed telephone contacts and were excluded after the first few peer assignments, one dropped out after 4 months, and one remained involved for the entire duration of the study. Peer mentors were supported throughout the study by the principle investigator. Attrition rates for participants were very high (42% for the intervention group and 40% for the control group). Overall, this study did not demonstrate a significant effect of peer support on “any breastfeeding” duration. However, among the 13 intervention and 11 control mothers who were exclusively breastfeeding at the time of hospital discharge, the duration of exclusive breastfeeding was increased in the intervention group (median 35 days vs. 10 days; p = 0.004).

This study highlights the challenges of recruiting and retaining both peer mentors and participants who are young mothers in a research study. Meglio et al. (2010) concluded that teen mothers experience multiple competing priorities, sparse social supports, and responsibilities out of proportion to their developmental stage which may make it difficult to sustain long-term commitment to a project. Specific recommendations from this study included exploring innovative strategies and alternatives to the telephone and engaging in new technology and social networking strategies.

Both Dennis et al.’s (2009) study and Meglio et al.’s (2010) study intervention utilized land telephone lines as opposed to mobile health (mHealth) technology such as cellular phones and text-messaging, which is the preferred method of communication among youth for health promotion interventions (Buhi, Trudnak, Martinasek, Oberne, Fuhrmann, & McDermott, 2012). The advantages of using mHealth technology for adolescent populations will be explored in the following section.
Mobile Health (mHealth)

The utilization of new communication technologies in health care and public health is growing quickly and interventions have shown promise to promote health behaviour change in a cost-effective format, regardless of geography (Abroms, Padmanabhan, & Evans, 2012; Buhi et al., 2012; Free et al., 2013). Mobile Health (mHealth) is defined as health-related services delivered via mobile communication devices (Free et al., 2013). Mobile phones are increasingly being used as people’s primary phones with 85.6% of Canadian households reporting mobile phone usage (Canadian Radio-television and Telecommunication Commission, 2016).

The two main uses of a mobile phone are voice calling and text messaging. Voice calling on a mobile phone is the same as a landline phone except portability is possible since calls can be made from any location, which has cellular coverage (Abroms et al., 2012). Text messaging (also known as Short Message Service or SMS) is defined as the nearly immediate delivery of synchronous short messages up to 160 characters maximum (Buhi et al., 2012). Text messages, which are longer than 160 characters, can still be delivered but are automatically split at the 160-character point into multiple messages (Rogers Communications, 2015). In addition to improving healthcare outcomes, mHealth technology may help to remove disparities since this is the first technology to be used equally by people from both lower and higher socio-economic backgrounds (Krishna, Boren, & Balas, 2009). This increases the likelihood of successfully delivering health improvement interventions to traditionally hard-to-reach populations.

Adolescents and Mobile Phone Use

Over 88% of American adolescents between the ages of 13 to 17 have, or have access to, a mobile phone of some kind (Lenhart, 2015). This is a dramatic increase from 2004, which found that only 45% of teens in 2004 had access to a mobile phone (Lenhart, 2012). In 2011, the
Pew Research Center’s Internet and American Life Project conducted a survey of a nationally representative sample of 799 adolescents between 12 to 17 years of age, which specifically focused on mobile phone use (Lenhart, 2012). The survey determined that voice calling on both mobile phones and landlines is becoming less popular with only 39% of adolescents reporting that they talk to people they know on a mobile phone every day. Landlines are being used even less frequently with just under 1 in 5 (19%) of adolescents indicating they talk to people daily on a landline phone (Lenhart, 2012). Text messaging is a dominant daily mode of communication between adolescents with 90% of adolescents reporting they exchange text-messages (Lenhart, 2015). On average, a typical teen exchanges up to 30 text messages per day (Lenhart, 2015). Overall these findings reveal that mobile phone communication is a common mode of communication for all adolescents with text messaging being a highly desired communication method.

**Mobile Phone Interventions**

A meta-review of 11 systematic reviews was conducted to evaluate the current evidence regarding mobile phone and SMS use to deliver self-management interventions for chronic conditions since self-management programs and interventions are increasingly being delivered using technological devices rather than face-to-face meetings (Jones, Lekhak, & Kaewluang, 2014). Of the 11 systematic reviews that were included in this meta-review, 4 were Cochrane reviews and considered high quality. The number of research studies included in each review ranged from 2 to 25 and number of subjects ranged from 421 to 38,060. Four of the systematic reviews included only RCTs, three included RCTs and quasi-experimental studies, and the remaining four included RCTs, pre–post designs and descriptive studies. The number and type of outcomes that were assessed varied including clinical, process, and behavioral measures, as well as satisfaction and costs. The majority of underlying studies were conducted in countries other
than the United States. Interventions ranged from simple (one reminder to keep an appointment) to complex (a multifaceted self-management program). The strongest evidence from these reviews supports the use of mobile phones and text messaging to improve adherence to appointments and medication, self-management of asthma and diabetes, and short-term smoking cessation. Recommendations from this meta-review indicate that interventions should provide personally tailored (individualized) messages and have bi-directional interactive capability since interventions that rely on unidirectional communication alone (i.e., from provider to patient only) are not as effective as interventions that are interactional between the provider and the patient. Lack of tailoring and interactivity were associated with higher attrition rates in the underlying studies. As well, it was recommended that mHealth interventions should consider the potential complications and technical issues that might arise using this technology (e.g., loss of data due to lost messages, misinterpretation of the information being sent, or mobile phone numbers which frequently change and render the provider unable to verify whether the message was delivered to the correct person). These technical issues have been observed in studies with adolescent mothers where mobile phones were used as the main method of communication. Two studies described a high degree of instability in communication with participants since mothers changed carriers frequently since it was typical for mothers to have prepaid or pay-as-you-go phones on which the numbers changed each time a new phone was purchased (Seed, Juarez, & Alnatour, 2009; South-Paul et al., 2014).

The use of SMS technology in research studies appears to be acceptable to adolescent populations. For example, a study by Schnall et al. (2013) sought to understand the everyday health information needs of adolescents in New York City, United States by assessing how they met their health information needs. Smartphones with pre-installed applications related to asthma, obesity, human immunodeficiency virus, and diet were given to 60 adolescents with unlimited text messaging and data for 30 days. Findings suggested that SMS technology is a
useful tool for assessing adolescents’ health behaviour in real-time and that they are willing to use text messaging to report health information.

Summary of Literature Review

Studies evaluating adolescent development, adolescent pregnancy and postpartum depression among adolescent mothers confirm that this highly vulnerable population is at significantly greater risk of developing PPD compared to adult mothers. A review of PPD prevalence studies among adolescent mothers using studies with a valid cut off measured after 2 weeks and up to 12 weeks postpartum estimated an average prevalence of 37.8%, which is almost three times higher than the 13% prevalence of PPD among adult mothers. The review suggests this increased risk stems from a high level of stressors during pregnancy and in the early postpartum period as a result of their challenge of meeting the developmental tasks of motherhood and adolescence simultaneously. As well, the predisposition for depression among adolescent girls may be a contributing factor. Relevant demographic characteristics of adolescent mothers were identified, including lower socioeconomic status and lower educational attainment as well as a history of sexual and/or physical abuse, substance use, and involvement with the child welfare system. Also, sexual orientation, precarious housing status, and a history of major mental illness before pregnancy were identified as contributing factors to adolescent pregnancy.

A review of predictive studies revealed that the following variables were predictors of PPD among adolescent mothers: history of prior depression, lack of social support / social isolation, life stressors, history of physical or sexual abuse, weight/shape disturbance, low maternal self-efficacy, and pre-pregnancy alcohol use. A lack of social support was consistently reported as a major risk factor for PPD among adolescent mothers. As such, social support was identified as an important and potentially modifiable variable predictive of depressive symptomatology in the postpartum period for these young mothers.
A review of RCT and quasi-experimental studies on PPD prevention among adolescent mothers suggest that all available studies to date demonstrate methodological and/or theoretical limitations, warranting further research. Theoretical gaps were related to 1) the use of either paraprofessionals or lay volunteers who were not experientially similar to the target population as the sources of support; or 2) a mismatch in the provision of support. It was determined that PPD prevention interventions should utilize a solid theoretical framework, such as Dennis’s (2003) peer support conceptual analysis, which is theoretically embedded in the social support literature. Literature related to social support theory posits that support must be provided by either someone from within a natural network or from a newly created network, depending on situational needs and individual desires (known as the matching hypothesis; Gottlieb, 2000). A review of peer support literature describes the components of peer support, which is defined as the provision of emotional, informational and appraisal support from an individual that is experientially similar to the target population in order to increase psychological well-being. As well, mechanisms of action are highlighted in order to guide a future full RCT.

Systematic reviews have confirmed the beneficial effects of peer support on health. A systematic review provided evidence that telephone-based peer support interventions can be effective for certain health related concerns. In particular, telephone-based peer support has been shown to reduce depressive symptomatology in adult mothers who are at high risk for PPD (Dennis et al., 2009). However two major gaps exist with respect to telephone-based peer support for the prevention of PPD. First, the intervention has not been tested with an adolescent population, therefore it is not known if this is a feasible and acceptable solution for adolescent mothers. Second, the intervention only used landline telephones, which are not the preferred mode of communication among adolescents. Studies have shown that the utilization rate of mHealth technology among adolescents is very high (particularly among adolescent girls) and
mHealth technology appears to be acceptable as a mode of communication in this population, therefore interventions should consider using mobile phones as opposed to landlines in future studies. No study to date has evaluated mobile phone-based peer support in any population.

Finally, evidence from previous studies suggests that peer support interventions need to be flexible and individualized to meet the needs of the participants. Considerations for peer mentor training sessions are important in order to ensure that excessive training does not lead to the creation of paraprofessionals. Training sessions should incorporate role-playing to assist the peer mentor with decision making. Ongoing support should be provided to peer mentors and retention strategies should be implemented for participants and peer mentors to try to avoid high attrition rates. As well, technical issues related to the use of mHealth technology in interventions (such as the potential for lost messages, misinterpretation of the information, or unreliability of communication due to frequently changing mobile phone numbers) should be considered in the design of the intervention with any technical difficulties collected and analyzed in the data.

**Definition of Terms**

The following definitions are key terms used in the conceptual framework and research questions for this study:

**Acceptability**: Acceptability is defined as the viewpoints of participants regarding the intervention which can positively or negatively influence the uptake, implementation, adherence and consequently effects on outcomes (Sidani & Braden, 2011). In this study, acceptability refers to the maternal perspectives of the mobile phone-based peer support intervention.

**Adherence**: Adherence refers to the degree to which the trial protocol is followed. This includes the process involved in the delivery of the mobile phone-based peer support intervention and any deviations from the proposed protocol (Sidani & Braden, 2011).
Adolescent: An adolescent is defined as an individual between 10 - 24 years of age (Sawyer et al., 2018). For the purpose of this study, a pregnant adolescent is defined as a woman between 16-24 years of age. Pregnant girls under the age of 15 are not included in this definition since live births in this age group are rare and pose additional obstetrical health risks (Dillon & Cherry, 2014).

Feasibility: Feasibility refers to the practicality of implementing an intervention (Sidani & Braden, 2011). In this study, feasibility refers to how well the mobile phone-based peer support intervention is implemented.

Peer Mentor: A peer mentor is a lay individual with similar characteristics and experiences as the target population (Dennis, 2003). In this study, peer mentors are women who are between the ages of 15-24 years and have experienced adolescent pregnancy.

Peer support: Peer support is defined as “the provision of emotional, appraisal, and informational assistance by a created social network member who possesses experiential knowledge of a specific behaviour or stressor and similar characteristics as the target population, to address a health-related issue of a potentially or actually stressed focal person” (Dennis, 2003, p. 329).

Perceived support: Perceived support refers to support, which is believed to be available if needed (Wills & Shinar, 2000).

Received support: Received support refers to support which has been recently provided to an individual (Wills & Shinar, 2000).

Reciprocity: Reciprocity describes the extent that support and resources are both given and received within a relationship and the bi-directional nature of support, which is exchanged back and forth between two people (Thoits, 2011).
Social support: Social support is defined as “the social resources that persons perceive to be available or that are actually provided to them by non-professionals in the context of both formal support groups and informal helping relationships” (Gottlieb & Bergen, 2010, p. 512).
Conceptual Framework

The associations between social support and health are complex, requiring solid theoretical grounding to guide the development of interventions (Cohen, Underwood, & Gottlieb, 2000). It is crucial to understand intervening mechanisms as well as the relative impact of each of those mechanisms on health outcomes (Thoits, 2011). For this reason, Dennis’s (2003) peer support conceptual framework has been used to guide the development of this study (Appendix B). A modified version of Dennis’ (2003) peer support conceptual framework is proposed for this study (Figure 2). The preceding literature review highlighted the theoretical origins of social support and peer support, provided a detailed outline of the components of peer support, and delineated the mechanism of effect of peer support.

Social support theory as applied to depression can be summarized as follows: 1) that life events are stressful to the extent that people perceive the events as threats and perceive themselves as lacking adequate responses; 2) that certain events increase a person’s risk for poor mental health depending their coping skills (which involves a wide range of deliberate thought and action, including problem solving, reappraisal, avoidance, and support seeking); 3) that social support buffers stress, primarily by influencing appraisal and coping; 4) that social support includes what friends and family say and do regarding stressful events (i.e., enacted support), as well as recipients’ perceptions that quality enacted support is available (i.e., perceived support). Perceived support is based on a person’s history of receiving effective enacted support; and 5) that social support is effective in buffering stress when the support specifically meets the demands of the stressor (Lakey & Orehek, 2011).

There are three components to the proposed peer support conceptual framework: 1) the antecedents; 2) the defining attributes; and 3) the potential health outcomes. The antecedent to peer support is a peer mentor who is an “experientially similar other” (in this case, a young
mother who has experienced adolescent motherhood. Since peer friendships in an adolescent mother’s natural social support network may dissolve, newly created peer networks can serve as sources of support. It is possible that the provision of support by a mother who has a similar experience (i.e., being an adolescent parent) could fill a void for adolescent mothers if they do not have someone in their natural network who understands, and can be empathic to, their situation.

The defining attributes of the peer support intervention include 1) informational support, where information and resources can be shared with the new mother), 2) emotional support, where attentive listening, caring and reassurance are provided and 3) appraisal support, where mothers are given encouragement and positive communication. The potential health outcomes are increased social support, improved relationships within the social network, promotion of more positive self-appraisal (social comparison), reduction in barriers to care and improvement in help-seeking behaviours. It is hypothesized that the provision of mobile phone-based peer support will reduce depressive symptomatology and anxiety among adolescent mothers.

**Figure 2 - Conceptual Framework of Peer Support (adapted from Dennis, 2003)**
In this study, pregnant adolescents who are 16-24 years old, will be linked with a peer mentor during the last trimester of pregnancy. Peer mentors will be of similar age to the new mother, have experienced adolescent motherhood and have participated in a 12-hour training program. Training will include the components of peer support (emotional, informational, and appraisal support) as well as positive and negative aspects of support to ensure peer mentors focus on positive aspects, yet avoid negative aspects. The two young mothers will enter into a relationship and through this relationship, the peer mentor will provide individualized emotional, informational and appraisal support via mobile phone (using both voice calling and text-messaging) which matches the needs of the pregnant adolescent. The relationship will entail supportive functions including perceived support (support which is believed to be available to the new mother if needed) and received support (actual support which has been provided to the new mother). Reciprocity, which includes the bi-directional nature of support and resources exchanged back and forth between the new mother and the peer mentor, will be a key component in the relationship. Through this support, the peer mentor aids the mother to increase her coping behaviours, have less negative appraisals about stress, increase her self-esteem, improve existing relationships within her social network, promote more positive self-appraisal, and improve help-seeking behaviours. If the peer mentor believes professional support is required, she will refer the mother to appropriate resources. If there are any issues related to safety, safety protocols will be implemented (Appendix Z).

**Purpose of the Pilot Study**

The main purpose of this pilot study is to examine the procedures for a larger, multi-site trial. In particular, the feasibility, acceptability, and adherence with the trial protocol will be examined, including (a) the rate of participant and peer mentor recruitment and reasons for non-participation; (b) the randomization procedure; (c) the acceptability of the intervention in terms
of the timing, dosage, and satisfaction; (d) the appropriateness of recruitment forms, data
collection questionnaires and safety protocols; and (e) the suitability of using the chosen
outcome measures with the patient population at 12 weeks postpartum. Data analysis will be
conducted to determine if there are any trends among the participants receiving the mobile
phone-based peer support intervention versus usual care on postpartum depression and anxiety.
Estimates of the proportion of depressed participants in the control group will be determined to
inform a sample size calculation for the main trial.

Research Questions

Primary Research Questions:

Feasibility (Peer Mentors)
1. What is the feasibility of a mobile phone-based peer support (MPPS) intervention for peer
   mentors as measured by:
   a) Recruitment procedures for peer mentors (effectiveness of recruitment approaches
      recruitment rate and reasons for non-participation).
   b) Screening rate and reasons for non-participation for peer mentors.
   c) Appropriateness of peer mentor eligibility criteria.

Acceptability (Peer Mentors)
2. What are the peer mentors’ perceptions of the training session and intervention?

Adherence (Peer Mentors)
3. What is the adherence of peer mentors with the trial protocol as measured by:
   a) Peer mentor retention rate (outcomes completion rate) and reasons for drop-out.
   b) Completion of activity logs.
   c) Number of participants matched to each peer mentor.
d) Average duration of each contact per mentor.

e) Ability for peer mentor to deal with any issues related to participant safety.

f) Number of technical issues encountered with mobile phone App.

**Feasibility (Participants)**

4. What is the feasibility of a mobile phone-based peer support (MPPS) intervention for adolescent mothers as measured by:

   a) Recruitment procedures for participants (effectiveness of recruitment strategies, recruitment rate, enrollment rate, and reasons for non-participation).

   b) Screening rate and reasons for non-participation for participants.

   c) Appropriateness of participant inclusion and exclusion criteria.

**Acceptability (Participants)**

5. What are the maternal perceptions of the MPPS intervention?

**Adherence (Participants)**

6. What is the adherence of participants with the trial protocol as measured by:

   a) Participant retention rate (outcomes completion rate) and reasons for drop-out.

   b) Percentage of first contacts initiated by the Principal Investigator (PI) between the participant and the peer mentor within 72 hours post-randomization.

   c) Initiation of contact (whether by peer mentor or participant).

   d) Dosage of peer support (number of voice calls, text messages and face to face meetings; duration of contact between peer mentor and participant).

   e) Type of support provided (emotional, informational or appraisal support).

   f) Total number of contacts by peer mentor to each participant.
Secondary Research Questions:

Four secondary research questions will be investigated for the purpose of examining trends of effect sizes and variance measures/standard deviations in order to inform a sample size calculation for a larger multi-centered RCT.

1. Among adolescent mothers, what is the effect of the mobile phone-based peer support intervention on depressive symptomatology at 12 weeks postpartum compared to usual care?

   Hypothesis: Participants who receive mobile phone-based peer support will have lower depressive symptomatology at 12 weeks postpartum compared to those who received usual care.

2. Among adolescent mothers, what is the effect of the mobile phone-based peer support intervention on anxiety at 12 weeks postpartum compared to usual care?

   Hypothesis: Participants who receive mobile phone-based peer support will have lower anxiety at 12 weeks postpartum compared to those who received usual care.

3. Among adolescent mothers, what is the effect of the mobile phone-based peer support intervention on social support at 12 weeks postpartum compared to usual care? Hypothesis:

   Participants who receive mobile phone-based peer support will have increased social support at 12 weeks postpartum compared to those who received usual care.

4. Among adolescent mothers, what is the effect of the mobile phone-based peer support intervention on health service utilization at 12 weeks postpartum compared to usual care?

   Hypothesis: Participants who receive mobile phone-based peer support will have increased health service utilization at 12 weeks postpartum compared to those who received usual care.
Chapter 3
Methods

In this chapter, the research design, eligibility criteria, trial procedures, outcome measures, data analysis and data management procedures are described. A discussion regarding ethical considerations for the study and recruitment / retention strategies will be presented. Finally, a priori criteria for success measures are outlined to determine the feasibility of continuing onto a definitive, multi-center randomized controlled trial to evaluate the effectiveness of mobile phone-based peer support on postpartum depression among adolescent mothers.

Study Design and Setting

This was a community-based, two-arm, parallel-group, usual care controlled, 1:1 allocation pilot randomized controlled trial to test the feasibility of a mobile phone-based peer support intervention among adolescent mothers (see Figure 3 for CONSORT trial schema, Moher et al., 2010). Outcome data were collected by a research assistant blinded to group allocation. The study was conducted at community-based young parent agencies located in the Greater Toronto Area (GTA) which includes the City of Toronto and the four regional municipalities of Durham, Halton, Peel, and York.

Eligibility Criteria

To be included in the study, women had to meet the following eligibility criteria at the time of enrollment: 1) pregnant and aged ≥ 16 years and ≤ 24 years; 2) ≥ 28 weeks gestation (third trimester of pregnancy); 3) singleton pregnancy; and 4) able to speak, read and understand English. The rationale for the 28 week gestation inclusion criterion was based on research which confirmed that the majority of adolescents have unplanned pregnancies and are more likely to
Referrals During Prenatal Period
Self-referrals from advertising flyers, from GTA Young Parent Centers (upon consent) or after group presentation

Eligibility Assessment and Obtain Consent

Complete Baseline (T₁) Measures

1:1 Randomization

Experimental Group
*Standard Prenatal and Postpartum Care plus Mobile Phone Based Peer Support*
Received peer support (n = )
Did not receive peer support (n = )
Give reasons

Control Group
*Standard Prenatal and Postpartum Care*
Received standard care (n = )
Did not receive standard care (n = )
Give reasons

Loss to follow-up (n = )

Outcome Measures by Research Assistant (blinded) at 12 Weeks Postpartum (T₂)
Analyzed (n = )

Outcome Measures by Research Assistant (blinded) at 12 Weeks Postpartum (T₂)
Analyzed (n = )

Excluded (n= )
Ineligible (n = )
Refused (n = )
Other reasons (n= )

Figure 3 - Trial schema
access prenatal care after their first trimester of pregnancy (Kingston et al., 2012). For this reason, it was believed that the last trimester of pregnancy was the most feasible time for recruiting participants. In addition, it was believed that it would be difficult to recruit participants immediately after delivery when these young mothers are facing numerous life stressors.

The exclusion criteria for the trial were 1) Edinburgh Postnatal Depression Scale (EPDS) score > 12; 2) high risk pregnancy (such as placenta previa, placental abruption, unmanaged pre-eclampsia, intrauterine growth restriction, or known fetal abnormality); 3) current substance use during pregnancy (such as alcohol, cocaine, hallucinogens, marijuana, methadone treatment, narcotics, opioids, etc); or 4) active psychosis, schizophrenia, or bipolar disorder. The rationale for excluding pregnant adolescents with an EPDS score of > 12 was because this was the published recommended cut-off score which indicates that a mother could be suffering from a depressive illness of varying severity (Cox, Holden & Sagovsky, 1987). Since this was a prevention trial, which was not designed to treat depressive symptomatology, mothers with positive scores of > 12 were referred to a public health nurse or family physician for follow-up. Adolescents who had a high risk pregnancy, current substance use disorder, or active psychiatric condition were excluded because it was felt that they would require greater prenatal and postpartum support which would over burden the peer mentor.

Procedures

Recruitment Procedures

Following Research Ethics Board approval, participants were recruited from the Young Parents No Fixed Address (YPNFA) network in Toronto and young mother agencies in the four regional municipalities of the GTA. YPNFA is an inter-agency network that was convened in 1997 by Toronto Public Health and currently has over 30 member agencies, which provide services and supports to young pregnant and parenting women in the City of Toronto. The
purpose of the YPNFA network is to connect young mothers to prenatal and postpartum services and ensure effective coordination of services in order to provide the best possible future for their babies. YPNFA engages in and supports research initiatives that focus on the needs and experiences of young parents. They offer researchers contact with network agencies serving young families across Toronto which include almost 100 front line service providers as well as the clients that they serve. The Lawrence S. Bloomberg Faculty of Nursing (LSBFON) is a member agency of YPNFA and has received support with the recruitment of adolescent mothers in previous research projects (Nelson, Thach & Zhang, 2014). The principal investigator (PI) is a PhD student at the LSBFON and has been an active member of YPNFA since 2011 with well-established relationships to YPNFA member agencies.

In order to facilitate and achieve adequate participant enrollment, three different recruitment methods were used. First, the PI gave a 15-30 minute oral presentation to YPNFA agency staff (during one of the regularly scheduled monthly YPNFA meetings) to explain the study and how staff could refer potential participants (see Appendix C for Letter of Explanation to Young Parent Agencies). Staff from young parent agencies were asked to approach potential participants using a standardized script to determine if they would be willing to be contacted by the PI (see Appendix D for Permission to Approach Potential Participants Form). Hard copies of the recruitment flyer (Appendix E) were provided to YPNFA staff in attendance at the meeting. These flyers instructed potential participants to contact the PI by telephone for further information on the research study. Previous research with adolescent mothers suggested that advertisement flyers were a successful strategy to recruit participants (South-Paul, Ncube, Lin, Nowalk, & Kagwima, 2014). Second, for those agencies not in attendance at the YPNFA meeting, an explanation of the study, recruitment flyer and standardized script were emailed to the YPNFA network listserv (representing more than 100 individuals). Third, the PI gave a 10-15
minute oral presentations to pregnant adolescents after a regularly scheduled prenatal class at key
young parent agencies in the GTA to explain the research study (key agencies included the
Brampton Life Center, Covenant House, Evergreen, Humewood House, Jessie’s Young Women
Center, Massey Center, Rosalie Hall, Rose of Durham, Rose of Sharon and Shifra House). After
the presentation, the PI was available to discuss the study with interested adolescents.

For all interested participants, the PI arranged a face-to-face meeting (either immediately
after the presentation in a private room or at a time and location most convenient for the potential
participant) in order to provide a detailed explanation of the study and determine eligibility. The
PI tracked non-participants on a log sheet (Appendix F) and if possible, obtained reasons for
refusal. Once eligibility was confirmed, informed consent (Appendix G) was obtained by the PI
as well as participant contact information (Appendix H) and demographic information
(Appendix I). A hard copy of the consent form was given to the participant.

Randomization / Allocation Procedures

Eligible, consenting participants were randomized into either the experimental (mobile
phone-based peer support) group or control (standard care) group. To conceal the randomization
sequence, consecutively numbered, sealed, opaque envelopes constructed by a research assistant
(RA) not otherwise involved in the study was generated using blocks of 4 and 6, stratified by one
factor (prior history of depression). Immediately after confirmation of eligibility, consent and
completion of baseline (T₁) information, the PI and the participant opened the sealed envelope to
reveal the group allocation. To ensure the availability of an audit trail, the envelope number was
recorded on the contact information sheet (Appendix H) that included the participant’s name,
telephone number, group assignment, and trial enrollment date. Following group allocation, the
PI arranged a follow-up in-person meeting with a trained RA at a time and location convenient
for the participant to receive their mobile phone and technical instructions on the use of the phone.

**Experimental Group**

Adolescents allocated to the experimental group had access to all standard prenatal and postpartum community supports. In addition, mobile phone-based peer support (MPPS), which consisted of support provided by a peer mentor via mobile phone (with both voice calling and Short Message Service text message capabilities) was provided during pregnancy and for 12 weeks postpartum. Peer support was defined as a specific type of social support (informational, appraisal, and emotional support) that is provided by a peer mentor who possesses experiential knowledge of adolescent motherhood and is of similar age to the participant.

The MPPS intervention is an adaption of Dennis et al.’s (2009) mother-to-mother telephone-based support program entitled “Mothers Helping Mothers with Postpartum Depression.” In Dennis et al.’s trial, individualized, telephone-based, mother-to-mother support was initiated within 48–72 hours of randomization and provided by a volunteer recruited from the community. Modifications to Dennis et al.’s peer support intervention were made to in order to meet the unique needs of an adolescent maternal sample (see Appendix J for list of modifications and rationale). Apart from these modifications, all other aspects of Dennis et al.’s (2009) peer support intervention remained the same.

Immediately after group allocation, the PI matched the participant with a peer mentor based on peer mentor availability and age (if possible). The PI provided participants in the experimental group and peer mentors with a mobile phone, which was specifically adapted to accommodate secure communication (via a password protected application installed onto the mobile phone) between the peer mentor and participant. These mobile phones were only used for the duration of the study and collected by the PI at 12 weeks postpartum. Detailed instructions on
how to use the phone were provided to both the participant and peer mentor. Mobile phone contact was initiated by the PI between the peer mentor and the participant within 72 hours post randomization via a three-way call. As with Dennis et al.’s trial, this peer support intervention was standardized in that the peer mentors received specific training and the duration and intensity of the intervention was individualized based upon maternal need and desire (i.e., mobile phone contact between the participant and the peer mentor was made as frequently as the dyad deemed necessary).

For the purposes of this study, one contact was defined as a single mobile phone call or series of text messages, which comprised a single conversation between the participant and the peer mentor. Based on prior research (Dennis et al., 2009), frequency and duration of peer contact was most beneficial when it was individualized to the needs of study participants, however a minimum number of contacts was recommended as it related to maternal satisfaction. In this study, peer mentors were asked to initiate a minimum of ten contacts with study participants. The specific duration and intensity of the intervention and nature of the interactions were documented by the peer mentors until 12 weeks postpartum on electronic versions of the Activity Log (Appendix K). These Activity Logs were able to be completed directly on the mobile phone device and automatically uploaded onto a secure (encrypted) Internet research server which was accessed by the PI. Calls and text messages between the peer mentor and participant were also recorded and uploaded onto the secure (encrypted) Internet server. The recorded calls and text messages were reviewed by the PI within 24 hours to track 1) fidelity of the intervention (e.g. to determine if peer support and Activity Logs were being completed accurately) and 2) safety of participants (e.g.: to determine if the peer mentor missed any issues of safety during their phone or text-message conversation). When reviewing each contact, the PI documented findings on a hard copy of an Activity Log and then compared it with the peer
mentor’s electronic Activity Log to determine congruence in documentation. Any issues of lack of congruence were followed up with the peer mentor by the PI. The PI checked-in with peer mentors on a regular basis and the peer mentors were encouraged to contact the PI anytime they required assistance or support from the PI. The PI provided additional training on the provision of peer support and problem-solving techniques during these check-in sessions as needed based on a review of text message and phone call recordings. There were no issues regarding participant safety. Further discussion on these safety protocols is outlined in the section ‘Risk to Participants’.

As this is an individualized intervention, no formal intervention end-point was established. However, based on results from Dennis’ original trial, it was anticipated that some relationships could end by 12 weeks postpartum but some participants and peer mentors would become friends and mutually agree to continue contact past the 12-week postpartum period. Mobile phones provided to the participant and peer mentor for use during the study were collected by the PI at 12 weeks postpartum, therefore contact beyond this time continued on the participant’s and peer mentor’s private telephone or mobile phone lines. Face to face contact was allowed and tracked if mutually agreed upon between the peer mentor and participant. Peer mentors were trained how to effectively end a relationship with termination being determined mutually between the participant and the peer mentor. Any relationship that continued past this time, was noted on the Activity Log.

**Peer Mentor Recruitment**

Peer mentor recruitment commenced 6 months prior to participant recruitment though referrals from young parent agencies in the GTA (see Figure 4, Schema for Peer Mentors). A total of 10 peer mentors were recruited and trained for this study. Prior to the start of peer mentor recruitment, the YPNFA network identified 6 potential adolescents who they felt would be
suitable peer mentor candidates. Specific peer mentor eligibility criteria was established which included the following: 1) recommendation from a YPNFA agency staff based on the following qualities: reliability, maturity, and ability to communicate effectively with staff and peers; 2) aged 16 to 24 years; 3) experience as an adolescent (16-24 year) mother; 4) ability to speak, read and understand English; 5) not currently experiencing depression or anxiety (as evidenced by an EPDS < 10 and STAI state < 40); 6) self-reported confidence in their ability to parent their child; and 7) willingness to commit to a 12 hour training program and mentor at least 2 participants over a period of 5-6 months (see Appendix L). These criteria were based on previous successful peer support studies with adolescents (Stinson et al., 2016) and postpartum women (Dennis et al., 2009) and were established to ensure peer mentors had the required characteristics to provide suitable peer support and increase the probability of peer mentor retention in the study. It was anticipated that each peer mentor would work with at least two participants at any given time for the duration of the study and to the extent possible, peer mentors and participants were matched according to age. The PI used judgment to determine the ability of a peer mentor to work with more than two participants at time (eg: in situations where a peer mentor relationship with a participant was close to ending).
Referral of peer mentors through Young Parent Agency network

Interested peer mentors contact Principal Investigator (PI) by phone.

Peer mentor role outlined by PI
Eligibility confirmed and verbal consent given to attend training

Excluded (n= )
Ineligible (n = )
Refused (n = )

PEER MENTOR TRAINING SESSION (12 hours)

Matching of Participant and Peer Mentor
Matching based on peer mentor availability and age

Await next Match

Within 72 hours Post Matching
PI initiates contact with participant.

Refused further matches / end of the trial: Complete Peer Mentor Experiences Questionnaire

Day of First Contact to 12 Weeks Postpartum
Individualized peer support provided by peer mentor to participant via mobile phone (voice calling and text message)

Activity Log returned to PI

Figure 4 - Schema for Peer Mentors
Peer Mentor Training

Peer mentor consent (Appendix M) was obtained prior to the training session. All peer mentors received 12 hours of training with the PI (see Appendix N for an outline of the peer mentor training program). Content of the training was based on Dennis’ (2009) original trial and “Mothers Helping Mothers with Postpartum Depression” Peer Support Manual, with modifications to ensure training was relevant for an adolescent population (see Appendix J for list of modifications and rationale). The aim of the training program was to develop the skills required to provide effective mobile phone-based peer support and make appropriate referrals to health professionals as necessary. Training sessions were held over weekends and weekdays, depending on the peer mentor schedules. Weekends were included for the training, since it was anticipated that a large portion of the peer mentors would be in school during the week, completing requirements for high school credits. To the extent possible, peer mentor schedules were taken into account when determining training time. All peer mentors received a 90 page Peer Mentor Training Workbook, which was an adaption of the peer support manual used in Dennis et al.’s 2009 trial. Peer mentors used this workbook during the training and for reference once they begin providing peer support (see Appendix O for the table of contents of the training manual). Peer mentors were instructed to call the PI about concerns, which required immediate follow-up by the PI, using the Peer Mentor Concerns Checklist (see Appendix Z - Safety Protocols). Role playing and strategizing were important components in the training. Childcare was provided (as needed) in a room separate from the training room. Peer mentor demographic information (Appendix P) and evaluation of the training program (Appendix R) was obtained at the end of the training session.
Control Group

Participants allocated to the usual care group did not receive the peer support intervention but had access to all standard community prenatal and postpartum support services such as 1) the Canada Prenatal Nutrition Program; 2) postpartum home visits / telephone support from a public health nurse; 3) postpartum appointments with midwives, obstetricians, family physicians, and / or pediatricians, and 4) prenatal and postpartum support as needed from psychiatrists, psychologists, social workers, breastfeeding clinics, and community resources.

Both Groups

Both groups completed baseline (T1) measures prior to randomization. At 12 weeks postpartum (T2), a RA blinded to group allocation collected outcome measures by telephone.

Primary Outcome Measures

The primary outcomes of this study focused on feasibility, acceptability and adherence.

Feasibility

Feasibility describes how well the mobile phone-based peer support intervention was able to be implemented. The Participant Eligibility Assessment Form (Appendix Q) was completed by the PI and used to determine 1) recruitment procedures (effectiveness of recruitment approaches, recruitment rate, and reasons for non-participation) and 2) screening procedures (appropriateness of inclusion and exclusion criteria). The Activity Log (Appendix K) was used to determine 1) type of support strategies implemented (informational, emotional or appraisal support); 2) type of contact (text-message, voice-call or face-to-face meeting); 3) dosage (number of voice calls and text messages; duration of contact with peer mentor); 4) technical issues related to the mobile phones and data plans; 5) issues related to participant safety; and 6) whether calls/texts were initiated by the participant or peer mentor. Peer mentors completed an electronic Activity Log on their mobile phones following every contact with a participant. These
Activity Logs were uploaded every 24 hours onto a secure (encrypted) Internet-based server for review by the PI.

Acceptability

Acceptability describes the peer mentor perspectives of the training session and intervention as well as the maternal perspectives of the MPPS intervention. In order to evaluate the peer mentor training program, a hard copy of the Peer Mentor Experience Questionnaire - Part A (PMEQ-Part A; Appendix R) was given to each peer mentor to complete at the end the training session. The PMEQ – Part A was used to determine likes/dislikes of the training session and recommendations for changes to the training session. The PMEQ included both closed- and open-ended questions and was developed and used in previous peer support studies (Dennis et al., 2002; Dennis, 2003b; Dennis et al., 2009). The Peer Mentor Experience Questionnaire - Part B (PMEQ-Part B; Appendix R) was used to evaluate the peer mentor experience with the peer support program and was completed in person with the PI, once monitoring of the peer support intervention ended.

Acceptability of the intervention by participants was assessed at 12 weeks postpartum using the validated Peer Support Evaluation Inventory (PSEI; Appendix S; Dennis et al., 2009), a 4-subscale self-report instrument designed to measure an individual’s perception of support received from a peer. The first subscale assessed 15 items related to supportive interactions (e.g., emotional, appraisal, and informational support). The second subscale assessed 30 items related to relationship qualities (e.g., perceived peer responsiveness, extent of interdependence, perceived peer qualities, and sentiment). The original PSEI subscale for relationship qualities had 31 items, however one item related to intimacy (I knew that whatever I said was just between us) was removed because the phone and text conversations would be monitored by the PI. The third subscale assessed 27 items related to perceived benefits (e.g., stress and coping, social
integration, and social construction). The fourth subscale assessed 14 items related to satisfaction with support (e.g., perceived quality, convenience, access, and general satisfaction). All subscale items were rated on a 5-point Likert-type scale (1 = *strongly disagree* and 5 = *strongly agree*) to produce a summative score for each subscale, with higher scores indicating higher levels of supportive interactions, positive relationship qualities, perceived benefits, and satisfaction. The PSEI was developed based on a peer support concept analysis by Dennis (2003). The Cronbach’s alpha coefficients for the subscales were: supportive functions = 0.91; relationship qualities = 0.93; perceived benefits = 0.97; and satisfaction = 0.94 (Dennis et al., 2009). Four semi-structured interview questions allowed participants to comment on their likes and dislikes of the MPPS and make recommendations for changes to the MPPS intervention.

**Adherence**

Adherence is the degree to which the trial protocol is followed. Adherence-related measures include 1) the number of first contacts (three-way contact) initiated by the PI between the participant and the peer mentor within 72 hours post randomization; 2) the number of Activity Logs completed electronically by the peer mentor compared to the number of contacts made between the peer mentor and the participant; 3) the degree of intervention fidelity measured by the number of Activity Logs completed in congruence between the PI and peer mentors and 4) the number of participants who complete outcomes measures at 12 weeks postpartum.

**Secondary Outcome Measures**

**Depressive Symptomatology**

Depressive symptomatology was measured using the Edinburgh Postnatal Depression Scale (EPDS; Appendix T), a 10-item self-report instrument which takes approximately 5 minutes to complete (Cox et al., 1987). Items are rated on a 4-point Likert scale to produce a
summative score ranging from 0 to 30, with higher scores indicating lower maternal mood. The EPDS was developed in the United Kingdom to specifically screen women for depressive symptoms in the postpartum period (Cox et al., 1987) and is the most frequently used instrument to assess for postpartum depressive symptomatology (O’Hara & McCabe, 2013). However, it is important to note that the EPDS does not diagnose postpartum depression (Cox et al., 1987). The EPDS has been validated by standardized psychiatric interviews with large samples and has well-documented reliability and validity internationally (McBride, Wiens, McDonald, Cox & Chan, 2014). In addition, the EPDS has the advantages of being a) easy to administer, b) acceptable to women of diverse cultures, c) applicable to a clinical setting and d) free and widely available (Registered Nurses Association of Ontario, 2005).

Logsdon, Usui and Nering (2009) validated the psychometric properties of the EPDS in a sample of adolescent mothers (n=149) at 4-6 weeks postpartum in a southern, urban area of the United States. The mean EPDS score in Logdson’s et al.’s (2009) sample was 7.37 (SD = 6.08) with 25.5 % of the sample having EPDS scores greater than 12 at 4-6 weeks postpartum indicating significant symptoms of depression. Logsdon et al.’s (2009) mean EPDS score was similar to other studies conducted with adolescent mothers, where the mean EPDS was 7.3 (Birkeland et al., 2005).

When used with adult mothers, the EPDS has good sensitivity (86%) and specificity (78%) as an indicator of depressive symptoms when the published recommended EPDS cut-off score of > 12 is used (Cox et al., 1987). Subsequent studies have found similar sensitivity and specificity estimates (Boyd, Le & Somberg, 2005). Thus, in this study, a score of > 12 was used to examine depressive symptomatology for adolescent mothers. Any mother who scored positive (1, 2, or 3) on self-harm item # 10 on the EPDS was assessed using the Self Harm
Documentation Form in the safety protocol. The EPDS-questionnaire was administered at baseline and at 12 weeks postpartum.

Of importance, evidence suggests that three EPDS items load onto an anxiety factor in both the antenatal and postnatal periods (Matthey, 2008; Matthey, Fisher & Rowe, 2013). These include EPDS item 3 (‘‘I have blamed myself unnecessarily when things went wrong’’), item 4 (‘‘I have been anxious or worried for no good reason’’), and item 5 (‘‘I have felt scared or panicky for no very good reason’’). While the EPDS can detect clinically significant symptoms of anxiety and anxiety disorders, there is less agreement about the capacity of the EPDS anxiety subscale to reliably distinguish anxious from depressive disorders (Matthey et al., 2013).

Anxiety

Since the EPDS cannot distinguish anxious from depressive disorders reliably, anxiety was measured using the State-Trait Anxiety Inventory (STAI). The STAI has 2 subscales: 1) the state subscale (STAI-S), which measures current anxiety related to a specific situation or time period; and 2) the trait subscale (STAI-T), which measures relatively stable individual tendency to elevated anxiety (Meades & Ayers, 2011). Although the STAI-T has adequate reliability, it has been criticized for poor discriminant validity since it has been reported to be more strongly correlated with measures of depression than with measures of anxiety (Elwood, Wolitzky-Taylor, & Olatunji, 2012; Julian, 2011). In addition, the intent of the STAI-T is to characterize a longstanding trait and is not intended to detect change in anxiety over a relatively short period of time (Julian, 2011). For this reason, many researchers have chosen to solely use the STAI-S for the detection of longitudinal change (Julian, 2011). In this study, only the STAI-S portion of the STAI was used in order to detect changes in anxiety levels between baseline and 12 weeks postpartum.
The STAI-S (see Appendix U) is a 20-item self-report instrument developed to assess levels of relatively transient situation-related (state) anxiety in both adolescents and adults including apprehension, tension, and worry that vary in intensity and fluctuate over time (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Items are rated on a 4-point Likert-type scale ranging from 0 = Almost Never to 3 = Almost Always to produce a summative score ranging from 20 to 80, with higher scores indicating higher levels of current state anxiety. A cut off score of 39-40 has been suggested to detect clinically significant symptoms for the S-Anxiety scale (Julian, 2011). In this study, a cut off of 40 was used to examine symptoms of state anxiety. A systematic review of self-report anxiety measures used in perinatal populations determined that the STAI 1) is a robust and specific measure of anxiety that has been validated against clinical interview; 2) shows discriminant and predictive validity in perinatal samples; and 3) may be most useful for research purposes as a specific measure of anxiety (Meades & Ayers, 2011). Internal consistency of the STAI-S is good, ranging from 0.91 to 0.95 (Meades & Ayers, 2011). In this study, the STAI-S questionnaire was administered at baseline and at 12 weeks postpartum.

Social Support

The Social Support Questionnaire Short Form (SSQ6; Sarason, Sarason, Shearin, & Pierce, 1987) measured perceived support satisfaction (SSQS) ranging from 1 (very dissatisfied) to 6 (very satisfied) and the perceived size of the available social support network (SSQN) ranging from 0 to 9. The score of the SSQ6 is calculated by taking the average of the number of support persons to get the SSQN score, which ranges from 0 to 9, and the average of the satisfaction score (SSQS), which ranges from 1 to 6. The SSQ6 was developed using samples of older adolescents and young adults. Sarason et al. (1987) suggested the use of the short form of the (SSQ6) to lessen the burden on subjects when time constraints are an issue for subjects and
for researchers. Psychometric properties for the SSQ6 short version are rated as similar to the full 27-item version. Test-retest reliability for the full 27-item version of SSQN and SSQS (four-week interval) is .83 and .90, respectively, and internal consistency (Cronbach’s alpha) is .94 and .97, respectively (Sarason, Levine, Basham, & Sarason, 1983). The SSQ6 has been used in studies of adolescents 14 and 16 years old (Dumont & Provost, 1999) with reported internal consistency above .90 for both scales, and in studies of children and adolescents.

Health Service Utilization

Health service utilization was defined as any health services used by participants in the postpartum period. This variable was measured using the Health Service Utilization Questionnaire (Appendix W), which was modified from the Health Service Utilization Questionnaire used previously in Ontario with a perinatal population (Dennis, Hodnett, Gallop, & Chalmers, 2002). Participants were asked to identify what types of health services they have used since they delivered their baby until the time they completed the questionnaire. These health services could have been received in the participant’s home, in an office, community center or a hospital. The number of times each health was used and the perceived benefit of each health service were also measured.

Data Management Plan

The PI was responsible for all participant recruitment activities and the collection of baseline data prior to randomization. Potentially eligible pregnant adolescents who were willing to hear more about the study received a detailed explanation, including risks and benefits of participation by the PI. Potential participants were assessed for eligibility using the eligibility assessment form (Appendix Q). If the participant answered ‘yes’ to all questions in Part A and ‘no’ to all answers in Part B, the PI proceeded to complete an Edinburgh Postnatal Depression
Scale (EPDS) screening. Since an EPDS score of $>12$ was an exclusion criteria, verbal consent was obtained from potential participants before administering the EPDS screening. Immediately following confirmation of eligibility, baseline data from participants was collected by the PI. Outcome data at 12 weeks postpartum (EPDS, STAI-State, SSQ6 and Health Service Utilization) were collected from participants by phone by a trained RA (Research Assistant) blinded to group allocation.

Data were entered onto a Microsoft Excel® database. Logic and range checks verified the accuracy of the data. All hard-copy, trial-related materials were stored in a locked filing cabinet at the research office. Any identifying participant information, such as consent forms and contact sheets, were stored in a separate locked filing cabinet to protect participant confidentiality. QoC Health, a digital health company based in Toronto, ensured data security and privacy of electronic and mobile phone data, adhering to HIPAA and PHIPA security standards including:

- An exclusive private wireless APN providing secure encrypted VPN tunnels from mobile devices to the QoC network over the carrier cellular network.
- In transit data encryption using 256 bit SSL/TLS encryption with 2048 bit encryption keys to secure data while in transit.
- Database server encryption using AES 256 bit encryption for sensitive healthcare records and information.
- Patient mobile device encryption using AES 128 bit encryption for sensitive healthcare records and information.
• Each user is assigned their own unique encryption secret and session token. Patients must successfully authenticate to retrieve their encryption secret and session tokens from the QoC servers.

• Submitted data is SHA256 encrypted into a checksum signature, which is validated at the server to ensure data has not been modified while in transit and has not been parameter stacked.

• Credentials are one-way encrypted incorporating unique hash salt to protect against rainbow table attacks, leveraging an adaptive function where over-time, the iteration count can be increased to make it slower, so it remains resistant to brute force search attacks even with increasing computation power.

• Unique per application AP key management for granular control of application access to API resources and data.

In addition, participants and peer mentors accessed voice calls and text messaging on their mobile phones (provided by the PI) through password protected applications installed directly onto the mobile phones. These applications allowed for the secure (encrypted) recording of all voice calls and text messages, which, upon completion of the call or text message, were uploaded onto a secure (encrypted) Internet-based server for access only by the PI.

Data Analysis

The primary focus of data analysis was on examining the feasibility and acceptability of the intervention and adherence with the trial protocol. Data were analyzed using SPSS (Version 24) software. Analyses was based on an intention-to-treat principle, which requires all participants to be included in the analysis in the groups to which they were randomized, regardless of any protocol violations (White, Horton, Carpenter, & Pocock, 2011).
Demographic Data

Baseline demographic data for participants and peer mentors as well as participant 12 weeks postpartum questionnaires was described using means and standard deviations for continuous variables (such as age, weeks gestation, etc) and frequencies and percentages for categorical variables (such as marital status, education level, pregnancy complications, etc).

Primary Outcomes

Descriptive statistics (frequencies and percentages) were used to analyze the feasibility and adherence questions, such as recruitment rates, attrition / retention rates, follow-up rates, rate of adherence to protocol, etc. Descriptive statistics (means and standard deviations) were also used to calculate the acceptability of the intervention from Likert-type scale responses for maternal satisfaction (using the PSEI) and peer mentor satisfaction (using the PMEQ). Frequencies were calculated for dichotomous yes or no responses. For the open-ended questions of the PSEI and PMEQ, simple descriptive content analysis was completed independently by both the PI and the RA to determine common themes.

Secondary Outcomes

Data regarding depressive symptomatology and anxiety was assessed as both continuous and dichotomous measures. As defined under outcome measures, the cut off value for depression was defined as an EPDS score above 12 and the cut off value for anxiety as a STAI score above 40. For continuous measures, an independent two-sample t test (or the non-parametric equivalent Mann-Whitney test if assumptions of normality are violated) was used to assess for differences between the intervention group and the control group at 12 weeks postpartum. For dichotomous measures, the chi square test or binary logistic regression was used to compare proportions between the two groups.
Sample Size

There is no universally accepted method for calculating sample sizes for pilot studies (Feeley et al., 2009), however, undertaking a priori sample size calculations enhances the utility of a pilot study (Cocks & Torgerson, 2013). A confidence interval (CI) approach to pilot study sample size calculation has been recommended by a number of researchers in order to provide reasonable certainty for definitive trial decision making (Cocks & Torgerson, 2013; Hertzog, 2008). Of these approaches, Cocks & Torgerson (2013) recommend using an 80% one-sided CI to estimate the effect size for a larger trial, which requires the pilot trial to have a sample size of at least 9% of the main planned trial. An 80% confidence interval (which excludes the minimally important clinical effect size) would satisfy the need with reasonable certainty for trial decision-making, but would be small enough to deliver a study within a reasonable budget and timeframe (Cocks & Torgerson, 2013). The rationale for a one-sided CI follows the assumption that the decision to proceed with a main trial will only be made if there is some evidence of effectiveness (Cocks & Torgerson, 2013).

Calculations provided by Cocks and Torgerson (2013) are based on 80% power, alpha of 0.05 and a one sided 80% CI (see Table 2). Using these calculations for two independent proportions, a total pilot sample size of 28 allowed for the detection of a 15% difference in depression scores (30% depression rate in the control group and 15% in the experimental group). However, these calculations make no allowance for attrition, therefore a total pilot sample size of 40 (20 per group) was used to allow for a 30% loss to follow-up. This sample size was in line with Hertzog’s (2008) recommendation of 20 participants per group for pilot studies in order to examine overall feasibility.
Table 2 - Recommended Pilot Sample Size for Binary Outcomes

<table>
<thead>
<tr>
<th>Control group proportion</th>
<th>Difference to be detected (%)</th>
<th>Sample size for main trial</th>
<th>Pilot sample size (80% level)</th>
<th>Upper one-sided 80% confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30</td>
<td>10%</td>
<td>712</td>
<td>60</td>
<td>0.0996</td>
</tr>
<tr>
<td>0.30</td>
<td>15%</td>
<td>324</td>
<td>28</td>
<td>0.1458</td>
</tr>
</tbody>
</table>

(Data retrieved from Cocks & Torgerson, 2013, p. 201)

Feasibility

The total number of live births to adolescent mothers age 15-19 years in the GTA per year is approximately 1100 births per year, with 559 births per year in the City of Toronto (Toronto Public Health, 2013) and a combined total of 577 births per year in Durham, Peel and York regions (Durham Public Health 2013; Halton Public Health, 2010; Peel Public Health, 2014; & York Region Public Health, 2014). Since agencies affiliated with the YPNFA network service the majority of pregnant adolescents in Toronto, it was expected that at least 500 (90%) pregnant adolescents in Toronto will receive information about the trial, which is equivalent to approximately 42 referrals per months. Even with a low acceptance rate of 7 (20%) pregnant adolescents per month only in Toronto, it would take approximately 6 months to recruit 40 participants.

Recruitment and Retention Strategies

Recruiting and retaining adolescent mothers into research studies can be challenging, therefore several effective recruitment and retention strategies, based on previous studies with adolescent mothers, were implemented (Logsdon & Gohmann, 2008; Pinto-Foltz, Logsdon & Derrick, 2011; Seed et al., 2009; South-Paul et al., 2014). Recruitment strategies included 1) involving key stakeholders to facilitate the recruitment of participants, 2) conducting recruitment face-to-face rather than over the telephone and 3) providing gift cards to participants as compensation for completing baseline questionnaires. Skepticism and low levels of trust among pregnant adolescents are barriers to recruitment, therefore involving young parent agencies as
stakeholders was a key strategy to improving recruitment success since staff at these agencies have established relationships with the adolescents (Logsdon & Gohmann, 2008; Pinto-Foltz, Logsdon, & Derrick, 2011; South-Paul et al., 2014). As well, in-person recruitment was a recommended strategy in order to build rapport and trust with researchers (Pinto-Foltz et al., 2011; Seed et al., 2009). Finally, in Pinto-Foltz et al.’s (2011) study, adolescent mothers frequently described stress related to inadequate financial resources, therefore gift cards were given to participants as a form of compensation for their time. In this study, all participants (control and experimental group) received a $15 gift card to Walmart once eligibility was confirmed and consent and baseline measures were obtained. This served as a token of appreciation for their time to complete the baseline questionnaires.

Retention strategies for participants included: 1) contacting participants in the control group at 4 and 8 weeks postpartum by telephone to determine if their contact information had changed and reminding them that they would be contacted again at 12 weeks postpartum to complete outcome measures and 2) providing a total of $35 in Walmart gift cards by mail to all participants who completed outcome measures at 12 weeks postpartum, as a token of appreciation for their participation in the study and compensation for their time. The reason the compensation was higher for the outcome data collection was because there were multiple questionnaires, which took longer to complete compared to the baseline questionnaires.

Retention strategies for peer mentors included: 1) offering peer mentors the ability to participate in monthly conference calls with the PI. The purpose of these calls was to provide support to each other and confidentially discuss strategies for supporting new mothers and 2) providing a $50 honorarium for completing the training session and $50 for each participant the peer mentor supported (to be given to the peer mentor upon completion of support for each participant).
Ethical Considerations / Risks to Participants

Mothers in both the control and experimental groups had access to all standard prenatal and postpartum care / services. No treatment or supportive interventions were withheld from either group of participants. A comprehensive 21-page safety protocol was developed for this study (Appendix Z). Content for this safety protocol was adapted from a previous trial by Dr. Dennis which evaluated the effect of telephone-based interpersonal therapy for the treatment of postpartum depression among adult mothers. The protocols clearly guide the peer mentors, research assistants, PI (Barbara Chyzzy), PhD research supervisor (Dr. Cindy-Lee Dennis) and PhD committee members (Dr. LaRon Nelson, Dr. Jennifer Stinson, and Dr. Simone Vigod) on the action to take in the event of an urgent or non-urgent safety concern for a participant or their infant. All phone calls and text messages between the peer mentor and mothers in the experimental group were recorded on a secure (encrypted) Internet-based server and reviewed by the PI within 24 hours to ensure safety concerns were not missed by the peer mentor and to ensure fidelity of the peer support intervention. The peer mentors were trained to call the PI immediately regarding any concerns and record these concerns on the Activity Log.

Since adolescent mothers have a prevalence of postpartum depression of approximately 38% (based on findings in the literature review), it was anticipated that the administration of the EPDS would identify a certain percentage of mothers suffering from depressive symptoms who would require referral for treatment. In addition, because Question 10 on the EPDS asked about self-harm, individuals may identify themselves as having suicidal ideation. Therefore, if a participant had a positive score (1, 2, or 3) on Question 10 or was identified as having an EPDS score > 12, the appropriate protocol was implemented to ensure that the mothers with depressive symptoms were referred to and had access to treatment. In addition, for ethical reasons, public health nurses were notified of all women scoring > 12 on any EPDS assessment or > 40 on an
STAI-S assessment (baseline or 12 weeks postpartum). Non-urgent depression referrals could also be made to the Reproductive Life Stages Program, at Women’s College Hospital, where there are child and adolescent psychiatrists embedded into the perinatal psychiatry team. Although there is no specific question on the EPDS related to infant harm, if a mother indicated at any time that she may harm her infant, the infant harm protocol would have been implemented by the research assistant collecting the data. For situations involving immediate danger to mother, infant or others, 911 would have been called as per the safety protocol. For situations, which do not involve an immediate danger, a referral to a public health nurse (PHN) in the Healthy Babies, Healthy Children program was offered to participants, since this is a free, voluntary program for pregnant women and families with children up to the age of six years. The PHN determined treatment options and referrals to agencies. Non-urgent depression referrals could also be made to the Reproductive Life Stages Program, at Women’s College Hospital, where there are child and adolescent psychiatrists embedded into the perinatal psychiatry team. Other potential organizations for referrals include young parent agencies and community mental health programs.

A potential risk to participants in the experimental group is conflict in the relationship with their peer mentor. Based on a peer support trial with adult mothers, conflict occurred rarely but 9.6% of mothers noted that their peer volunteer minimized their problems (Dennis, 2010). In order to lessen this risk, peer mentor training sessions focused on role-playing scenarios, which highlighted alternative strategies to minimizing a mother’s problems (for example, by allowing mother to express her difficulties while providing reassurance and understanding). A take-home manual was provided to guide the peer mentor. Regular check-in calls to the peer mentor were made by the PI to determine if assistance or support were needed.
All peer mentors providing the trial intervention signed a consent form for study participation and completed a training session that included clear guidelines regarding self-harm thoughts and when to refer mothers to professional health services. Peer mentors were requested to maintain confidentiality about the participants they were mentoring. Finally, negative intervention effects were assessed through maternal and peer mentor evaluations.

According to Ontario’s Health Care Consent Act (HCCA) consent must be relevant, informed, given voluntarily, and not be obtained through misrepresentation or fraud (Government of Ontario, 1996). The person must also be capable of consenting to treatment. According to the HCCA, a person is capable of making a treatment decision if he or she understands the nature and purpose of the treatment and the consequences of giving or refusing consent. Since there is no age of consent in Ontario, consent was obtained directly from participant and peer mentors as long as they could understand the information and appreciate the relevance of the decision being made. This procedure was in line with a recent study conducted with adolescent mothers in Toronto, Canada (Madigan, Vaillancourt, McKibbon, & Benoit, 2015).

The final ethical consideration was with respect to compensation for participants. To ensure voluntariness and that participants were not unduly influenced into consenting to participate, the PI formulated the compensation amounts for this study based on compensation amounts from previous US studies with adolescent mothers, (e.g: $45 per participant in Pinto-Foltz et al.’s 2011 study; and $110 per participant in South-Paul et al.’s, 2014 study) as well as a recent study in Toronto, Canada by Madigan et al. (2015) with adolescent mothers who received weekly trauma-focused cognitive behavioural (CBT) therapy sessions for 12 weeks. Participants were reimbursed $15 for each CBT session, plus between $25-35 for follow-up visits to complete data collection measures.
Contamination and Co-intervention

Participants recruited to both the intervention and control groups were met individually in a private room with the PI to collect baseline information prior to randomization. Contamination between the participants in the intervention group and control group was unlikely since the mothers in the control group did not have access to the active ingredients of peer support from peer mentors. Following randomization, participants accepted their group allocation. The major threat to adherence was the delivery of the peer support intervention by the peer mentors. Adolescent mothers were able to use standard prenatal and postpartum community supports once discharged from the hospital. It was expected that any community support services accessed post-discharge would occur similarly for participants in either the control or intervention group.

Criteria for Success Measures

The following a priori criteria for success measures outlined in Table 4 needed to be met in order to consider it feasible to proceed to a larger, future trial. These criteria were based on the PI’s opinion as to acceptable measures for the study timeline (eg: recruitment rate), intervention protocol adherence and retention rates. Although the literature review in Chapter 2 reports attrition rates between 30-40% or higher in studies conducted with adolescent mothers, the PI would only proceed with a future trial if attrition rates for participants and peer mentors in this study were lower than 20%. Acceptability criteria were based upon results from Dennis et al.’s (2009) peer support study.
Table 3: Criteria for Success Measures

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantification</th>
<th>Criteria for Success</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility</td>
<td>Participant recruitment rate</td>
<td>At least 6 participants will be recruited per month</td>
<td>Participant Eligibility Assessment Form</td>
</tr>
<tr>
<td>Acceptability</td>
<td>Percentage of participants satisfied with peer support</td>
<td>At least 80% of participants will agree or strongly agree that they were satisfied with their peer support experience</td>
<td>Peer Support Evaluation Inventory (Question 15, Part 4)</td>
</tr>
<tr>
<td>Adherence</td>
<td>Intervention protocol adherence</td>
<td>At least 90% of peer mentors will deliver peer support as trained.</td>
<td>Verification of Activity Logs with tape recordings</td>
</tr>
<tr>
<td></td>
<td>Participant retention rate</td>
<td>At least 80% of participants will complete outcome questionnaires at 12 weeks</td>
<td>Percentage of completed final outcome questionnaires</td>
</tr>
</tbody>
</table>
Chapter 4

Results

This chapter describes the results for the peer mentors and participants enrolled in this study. For the peer mentors, results include (a) feasibility of the recruitment process; (b) socio-demographic characteristics; (c) acceptability of the training and intervention; and (d) adherence to the trial protocol. For the participants, results include (a) feasibility of the recruitment process; (b) socio-demographic characteristics; (c) acceptability of the intervention (participant perceptions); and (d) adherence to the trial protocol. This chapter also reports the preliminary results related to the effects of the intervention on participant depression, anxiety, social support and health service utilization.

Demographic Characteristics and Primary Outcomes

Feasibility: Peer Mentor Recruitment

Peer mentors eligible for this study were young mothers between the ages of 16-24. Between January 19 and March 30, 2016, a total of 14 young mothers were recommended to the PI from various YPNFA network agencies in Toronto, Ontario (See Figure 5: Flow of Peer Mentors Through the study). These young mothers were either currently or previously involved in a young parent agency program and were recommended based on their ability to communicate effectively and their overall reliability. There were no young mothers recruited who declined to be screened. After screening, 12 young mothers were eligible to participate as peer mentors (see Appendix L for Eligibility Assessment Criteria). Two young mothers were excluded because they were over the age of 24 (both turned 25 shortly before the recruitment process began). Thus, the peer mentor recruitment rate (defined as the number of young mothers recruited per month) was about 6 peer mentors per month. All eligible young mothers enrolled; therefore the acceptance rate for enrollment (defined as the percentage of young mothers enrolled in the study
among eligible individuals) was 100%. The most frequently cited reason for peer mentors wanting to participate in this research study was a strong desire to share their knowledge and to support other young mothers (n = 9, 90%). One peer mentor indicated that her reason for participation in the study was to build skills for future employment in the social service sector. Many peer mentors (n=7, 70%) commented they wished a peer support program had been available when they were pregnant.

Figure 5: Flow of Peer Mentors Through Study
Peer Mentor Characteristics

The mean age of the peer mentors was 21.3 years (SD 1.8) with a range from 19 to 24 years. Table 4 lists demographic characteristics of the peer mentors. All peer mentors born outside of Canada were from Caribbean countries, including Jamaica (n = 2, 40%), St. Lucia (n = 2, 40%) and St. Vincent (n = 1, 20%). Of those peer mentors who had experienced homelessness, most were born outside of Canada (n = 4, 66.7%). The mean EPDS score for all mentors was 6.7 (SD 3.2) and the mean STAI score was 26.8 (SD 5.1).

Table 4: Demographic Characteristics of Peer Mentors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>N = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in Canada</td>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lives with</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Alone with their child/children</td>
<td>100.0</td>
</tr>
<tr>
<td>Ever been homeless</td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Not married</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Has more than 1 child</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td>Heterosexual</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Bisexual</td>
<td>1</td>
</tr>
<tr>
<td>Highest education level</td>
<td>Grade 12</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Some College or University</td>
<td>8</td>
</tr>
<tr>
<td>Currently in School or Working</td>
<td>Full-time in school, not working</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Full-time in school, working part-time</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Part-time in school, working part-time</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Not in school, working full-time</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Not in school, working part-time</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Not in school, looking for employment</td>
<td>1</td>
</tr>
</tbody>
</table>

Acceptability: Evaluation of the Peer Mentor Training

Peer mentor training began in April, 2016. Although a variety of training dates were offered in an attempt to accommodate peer mentor schedules, 2 out of the 12 eligible peer mentors were unable to attend any of the scheduled training dates due to their work commitments. Ten peer mentors underwent 12 hours of training between April 23 and June 3, 2016. By June 3, 2016, all 10 peer mentors successfully completed the 12-hour training program.
The majority of the training was scheduled on weekends at a community church or a public library or weekdays at a young parent agency. Lunch was provided for all mentors during training sessions. Most mentors (n=6) required childcare, which was provided on-site by experienced childcare workers. Training was divided into three 4-hour sessions, as opposed to the originally planned two 6-hour sessions, in order to accommodate the schedules of the peer mentors. This allowed the training to be completed in as short a time as possible because it would have taken longer to identify dates in which peer mentors could attend two 6-hour training sessions.

Part A of the Peer Mentor Experience Questionnaire (Appendix R) was completed at the end of the training session (n=10). Results indicated that all peer mentors (n=10, 100%) felt the training sessions helped prepare them for their mentoring role. In particular, the comprehensive training manual was noted as a positive benefit. As well, the role-playing scenarios helped mentors better understand the different situations they may experience as a mentor and learn how other mentors would handle different situations. Role-play scenarios that were perceived to be most effective were (1) learning how to set boundaries, (2) learning how to deal with safety concerns, and (3) acknowledging the feelings of participants (emotional support) rather than solely trying to provide advice (informational support). Many mentors (n = 6, 60%) commented that they found it beneficial to have the training delivered by a healthcare provider who could answer their questions effectively. Peer mentors indicated topics they would have liked to receive more information about were the different types of housing services available in the Toronto, Ontario area as well as resources for applying to various colleges or universities. In terms of feedback about improvements to training sessions, one mentor commented that she would have liked better time management during the training sessions. In order to keep peer mentors engaged during the study, an informal gathering was held in April 2017. Half (n=5) of
the peer mentors (n=5) were able to attend this gathering. Friendships were fostered between some of the peer mentors who did not know each other prior to the study with two (20%) of the mentors keeping in touch with each other after the study was finished.

Acceptability: Evaluation of Intervention by Peer Mentors

Part B of the Peer Mentor Experience Questionnaire (Appendix R) was completed by peer mentors who completed the research study (n=7). Overall, 6 of the mentors (86%) rated that they were either very satisfied or satisfied with their role as peer mentor in the mobile phone peer support program. One mentor felt neither satisfied nor dissatisfied with her role as a mentor, due to her having little contact with her participant. In open-ended text, mentors stated that they felt their experience as an adolescent mother helped them to provide support to new adolescent mothers because they could: (1) relate to what the participants were experiencing in their lives (n = 5), (2) share their experiences (n = 5), (3) answer questions easily (n = 4), and (4) provide information about available resources (n = 3). With respect to having the text messages and voice calls recorded on an encrypted server and reviewed by the PI daily, 6 of the mentors (86%) felt it was helpful. Three mentors explained that they felt the recordings would allow the PI to give them advice if they were doing something well or if they needed improvement in any area. One mentor felt the recording of the calls may have made the participants feel uncomfortable and less willing to open up. While four of the mentors (57%) felt there was no need for on-going educational sessions, three mentors (43%) felt it would have been beneficial in order to get updates on services and refresh their memories on the training manual content. One mentor (14%) suggested these training sessions be provided every second month. Five mentors (71%) felt they would have liked organized social opportunities for peer mentors to get together and talk about their experiences and provide peer support to each other during the study. While the PI provided support to the peer mentors during the study at least once per month via mobile phone
contact, a social gathering for the peers was not organized until the end of the study. One mentor (14%) suggested to hold these social opportunities approximately once per month, depending on the availability of the mentors. However, two mentors (29%) did not feel organized social events were necessary and that it would be difficult to coordinate with such varying schedules for the mentors. Other suggestions from peer mentors for improving the peer support program included using their personal phones to download a mobile app (i.e. software designed for use on a mobile device) rather than using a second phone to communicate with participants.

Adherance of Peer Mentors to the Trial Protocol

The overall retention rate for peer mentors (defined as the proportion of peer mentors who completed outcome data at follow-up) in this study was 70% (n=7). One peer mentor dropped out immediately after the training sessions due to an urgent family situation requiring her to move out of town. Thus, when participant recruitment began, a total of 9 peer mentors were available to provide peer support to participants. Three weeks into the participant recruitment period, a second peer mentor (who was not yet matched with a participant) withdrew from the study because her fiancé died in a traffic accident and she felt she could not handle the responsibility of the peer support program. One mentor, who had been matched with a participant for 4 weeks, felt she did not have enough time to provide reliable peer support because her work schedule changed, which required her to work longer hours than she originally anticipated. This mentor withdrew from the study and her participant was transferred to another mentor.

Adherence of peer mentors to the trial protocol was measured by an electronic version of the activity log (Appendix K), which was installed onto each of the peer mentor’s research mobile phones by QoC Health. As described in the previous chapter, one contact was defined as a single voice call or a cluster of text messages. Data were entered by the peer mentor directly
onto the research mobile phones after every contact and uploaded onto a secure Internet-based server on a daily basis. Every 24 hours, the PI verified that activity logs were being completed accurately by comparing them to recorded voice calls or text messages. Adherence in completing the Activity Logs was very high, with almost all entries (n= 114, 94.2%) being completed accurately and on the same day contact was made. The PI reminded peer mentors by text message if a contact was not entered within 24 hours and verified that data entry was completed.

There was no missing data for each contact.

Table 5 reports data on the (1) number of participants matched to each peer mentor; (2) total number of contacts per mentor; (3) average duration of all contacts; and (4) the minimum and maximum duration per contact. Results revealed that peer mentors were matched on average to 2.1 participants with a range of 1 to 7 participants per mentor. The maximum number of participants a peer mentor was matched to at the same time was three participants. Attempts to match participants with peer mentors based on age was made and was achieved for 29.4% (n = 5) participants. The other 70.6% of participants were matched with peer mentors based on availability. Because of slow recruitment spanning 18 months (June 2016 to January 2018), mentors fluctuated in their availability to initiate or maintain a peer support relationship with participants due to school, work, travel or family commitments. For example, one mentor (M008) who was in school did not wish to commence her mentoring role with a participant at the end of her school semester and exam period because of increased workload levels during this period. Another mentor (M006) gave birth to her second child during the study and requested not to mentor a participant during her first month postpartum. Three mentors (M001, M005 and M006) traveled to their home country in the Caribbean for up to 8 weeks and one mentor (M004) was away with her children during the summer for 3 weeks. One mentor (M007) was matched with a participant but withdrew from the study after providing support for 4 weeks. This
participant was then matched with another peer mentor (M004) until the participant was 12
weeks postpartum. Two mentors (M002 and M003) were consistently available to provide peer
support to participants and agreed to mentor more than two participants during the study period.
Consequently, these two mentors supported the majority of participants in the study (n = 11
participants, 64.7%) and provided almost three quarters of all contacts to participants (M003: n =
63 contacts, 52.1%; M002: n = 24, 19.8%). With respect to overall duration of contacts, one
mentor had a greater duration of contact minutes (M002, mean = 90.3 min, SD = 48.4).

Table 5: Number and Duration of Mobile Phone Contacts per Mentor

<table>
<thead>
<tr>
<th>Mentor ID</th>
<th>Number of participants matched to mentor</th>
<th>Total number of contacts to participants n</th>
<th>Type of support provided during each participant contact</th>
<th>Average duration of all contacts (minutes)</th>
<th>Minimum/Maximum duration per contact (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M001</td>
<td>2</td>
<td>12</td>
<td>I 1 n 6, E 11 n 9, A 9 n 9</td>
<td>7.3 Mean, 3.2 SD</td>
<td>1 Min, 10 Max</td>
</tr>
<tr>
<td>M002</td>
<td>4</td>
<td>24</td>
<td>I 13 n 13, E 23 n 14, A 14 n 14</td>
<td>90.3 Mean, 48.4 SD</td>
<td>1 Min, 140 Max</td>
</tr>
<tr>
<td>M003</td>
<td>7</td>
<td>63</td>
<td>I 17 n 17, E 62 n 45, A 45 n 45</td>
<td>20.4 Mean, 13.4 SD</td>
<td>1 Min, 45 Max</td>
</tr>
<tr>
<td>M004</td>
<td>1*</td>
<td>3</td>
<td>I 3 n 3, E 3 n 3, A 1 n 1</td>
<td>3.8 Mean, 1.8 SD</td>
<td>1 Min, 5 Max</td>
</tr>
<tr>
<td>M005</td>
<td>1</td>
<td>3</td>
<td>I 2 n 2, E 1 n 1, A 0 n 0</td>
<td>1.0 Mean, 0.0 SD</td>
<td>5 Min, 1 Max</td>
</tr>
<tr>
<td>M006</td>
<td>1</td>
<td>10</td>
<td>I 10 n 10, E 10 n 10, A 7 n 7</td>
<td>7.6 Mean, 2.3 SD</td>
<td>2 Min, 10 Max</td>
</tr>
<tr>
<td>M007</td>
<td>1*</td>
<td>2</td>
<td>I 2 n 2, E 2 n 2, A 0 n 0</td>
<td>2.0 Mean, 0.0 SD</td>
<td>2 Min, 2 Max</td>
</tr>
<tr>
<td>M008</td>
<td>1</td>
<td>4</td>
<td>I 4 n 4, E 4 n 4, A 3 n 3</td>
<td>4.7 Mean, 1.0 SD</td>
<td>1 Min, 5 Max</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>121</td>
<td>56 n 116, 116 n 79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Peer mentor shared same participant
E = Emotional Support; I = Informational Support; A = Appraisal Support

Two peer mentors contacted the PI about concerns for three different participants. Two of
these concerns were related to participants feeling upset about their relationship with either their
partner or their mother. In these cases, the mentor notified the PI about the situation to receive
verification if the situation was handled appropriately. The third concern was related to a
participant informing the mentor that their baby was placed into temporary custody with the
Children’s Aid Society because of failure to thrive (inability to gain sufficient weight). In this
case, the mentor wanted to inform the PI about this situation to determine if this situation
impacted the research study and determine how to communicate with participant about this
situation. In each of these cases, the PI confirmed the situation was handled appropriately, provided advice and verified that none of the concerns posed harm to either the participant or their infant.

Peer mentors reported 13 cases of technical issues with the research mobile phones. These issues hindered communication between the mentor and participant because mentors and participants were never sure if text messages were being received or not. Two main types of technical issues occurred during the recruitment process. Both issues were related to the voice-calling features of the phone application. The first issue was identified during the first 3 months of recruitment. The system used to record the voice-calls did not allow mentors to reliably connect with participants via voice calling so the mentors could only provide text messaging to the participants. In order to rectify this issue, a new recording system was developed and loaded onto the mobile phones. The second issue was identified after the new recording system was loaded onto all phones. This issue was related to the type of Sim card used, which could not handle the speed of the voice-calling connections and caused voice-calls to be distorted. In order to rectify this issue, new Sim cards were loaded onto all research phones. As well, the battery life of the phones was problematic. The locking system to prevent participants from accessing the Internet and the system to record calls and text messages utilized a significant amount of power and drained the batteries within 6 hours of charging them. All of the technical issues, except for the battery life, were resolved and once resolved, no further technical concerns were reported.
Participant Sample

In total, 131 potential participants were assessed for eligibility during the study period of June 23, 2016 to August 2, 2017. Of these potential participants, 59 (45%) were eligible to participate and 72 (55%) were ineligible (see Figure 6). The most common reason for ineligibility was related to the mother having already delivered her baby (38.9%), followed by age greater than 24 years (23.6%), not living near the Greater Toronto Area (GTA; 13.9%) and being less than 28 weeks pregnant (9.7%). Of the 59 eligible mothers, 19 (32.2%) refused enrollment, with the most common reason for refusal was lack of interest in the study (57.9%), followed by being too busy (42.1%). Thus, the acceptance rate for enrollment into this pilot trial was 67.8%. Figure 7 describes the flow of participants through the study, including recruitment and dropouts following CONSORT 2010 guidelines for pilot studies (Eldridge et al, 2016).

Figure 6: Eligibility of Participants
Figure 7: Flow of Participants through Study (CONSORT)
Participant Characteristics

Table 6 describes the participant demographic data at baseline. Overall, the mean age for all participants in the study was 21.6 (SD 1.8) with a range from 17-24 years. The mean number of weeks pregnant was 32.5 (SD 4.3) with a range from 28-40 weeks. There was no missing data except for one participant in the control group who declined to answer the question related to sexual orientation, therefore data for this variable is only available for 18 participants. No significant differences were found between the two groups.

Table 6: Baseline Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Control N = 19</th>
<th>Intervention N = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td>Mean (SD)</td>
<td>22.4 (3.0)</td>
<td>21.3 (1.8)</td>
</tr>
<tr>
<td>Weeks Pregnant</td>
<td>Mean (SD)</td>
<td>32.9 (3.8)</td>
<td>32.2 (4.7)</td>
</tr>
<tr>
<td>Prior History of Depression &gt; 2 weeks</td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12</td>
<td>63.2</td>
</tr>
<tr>
<td></td>
<td>Unsure</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Born in Canada</td>
<td>Yes</td>
<td>13</td>
<td>68.4</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>6.3 (6.9)</td>
<td>11.1 (6.9)</td>
</tr>
<tr>
<td>Lives With</td>
<td>Family</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>Baby’s father</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Friends</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Young parent residence</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Alone</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Type of Accommodation</td>
<td>One bedroom apartment</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Two bedroom apartment</td>
<td>6</td>
<td>31.6</td>
</tr>
<tr>
<td></td>
<td>Three or more bedroom apartment</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>House</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Young parent residence</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Shelter</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Homeless before pregnancy</td>
<td>Yes</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Number of weeks homeless, Mean (SD)</td>
<td>4.9 (12.9)</td>
<td>2.7 (5.1)</td>
</tr>
<tr>
<td>Homeless during pregnancy</td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Number of weeks homeless, Mean (SD)</td>
<td>2.1 (7.5)</td>
<td>1.2 (2.9)</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td>Planned pregnancy</td>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Other children</td>
<td>Yes</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Number of children, Median (range)</td>
<td>0 (2)</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>
Table 6: Baseline Demographic Characteristics of Participants (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Control N = 19</th>
<th>Intervention N = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Sex orientation*</td>
<td>Heterosexual</td>
<td>17</td>
<td>94.4</td>
</tr>
<tr>
<td></td>
<td>Bisexual</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Highest level of education</td>
<td>Grade 9 or less</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>Grade 10</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Grade 11</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Grade 12</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Some college or university</td>
<td>11</td>
<td>57.9</td>
</tr>
<tr>
<td>Currently in school</td>
<td>Yes</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td>Plans to go back to school</td>
<td>Yes</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td>Attended prenatal classes</td>
<td>Yes</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>Number of classes attended, Mean (SD)</td>
<td>5.1 (8.3)</td>
<td>4.3 (6.6)</td>
</tr>
<tr>
<td>Infant feeding intentions</td>
<td>Breastfeeding alone</td>
<td>14</td>
<td>73.7</td>
</tr>
<tr>
<td></td>
<td>Formula alone</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Combination of breastfeeding/formula</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Weeks planning to breastfeed, Mean (SD)</td>
<td>12.8 (6.5)</td>
<td>9.6 (6.3)</td>
</tr>
<tr>
<td>Who is providing support during pregnancy – more than one answer</td>
<td>Family</td>
<td>16</td>
<td>84.2</td>
</tr>
<tr>
<td></td>
<td>Baby’s father</td>
<td>11</td>
<td>57.9</td>
</tr>
<tr>
<td></td>
<td>Family of baby’s father</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>Friend</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td>Anyone unsupportive of pregnancy</td>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td>Who will provide support after baby is born - more than one answer</td>
<td>Family</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>Baby’s father</td>
<td>12</td>
<td>63.2</td>
</tr>
<tr>
<td></td>
<td>Family of baby’s father</td>
<td>9</td>
<td>47.4</td>
</tr>
<tr>
<td></td>
<td>Friend</td>
<td>6</td>
<td>31.6</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Has another young mother with children to talk to</td>
<td>Yes</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td>Relationship with mother</td>
<td>Very supportive</td>
<td>11</td>
<td>57.9</td>
</tr>
<tr>
<td></td>
<td>Supportive</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Neither supportive nor unsupportive</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Unsupportive</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Very unsupportive</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Relationship with father</td>
<td>Very supportive</td>
<td>10</td>
<td>52.6</td>
</tr>
<tr>
<td></td>
<td>Supportive</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Neither supportive nor unsupportive</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>Unsupportive</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Very unsupportive</td>
<td>1</td>
<td>5.3</td>
</tr>
</tbody>
</table>

* n = 18 (one participant refused to answer this question)
### Table 6: Baseline Demographic Characteristics of Participants (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Control N = 19</th>
<th>Intervention N = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Relationship with siblings</td>
<td>Very supportive</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td></td>
<td>Supportive</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>Neither supportive nor unsupportive</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Unsupportive</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>Very unsupportive</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>No siblings</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>CAS involvement as a child</td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Smoking currently</td>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td>Substance use before pregnancy</td>
<td>Alcohol</td>
<td>11</td>
<td>57.9</td>
</tr>
<tr>
<td>(more than one answer)</td>
<td>Marijuana</td>
<td>6</td>
<td>31.6</td>
</tr>
<tr>
<td></td>
<td>Crack/cocaine</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Prenatal resources used—more than one answer</td>
<td>Young parent resource center</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Public health nurse</td>
<td>5</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Midwife</td>
<td>9</td>
<td>47.4</td>
</tr>
<tr>
<td></td>
<td>Doula</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Social Worker</td>
<td>6</td>
<td>31.6</td>
</tr>
<tr>
<td>Satisfaction with prenatal care</td>
<td>Very satisfied</td>
<td>13</td>
<td>72.2</td>
</tr>
<tr>
<td></td>
<td>Satisfied</td>
<td>4</td>
<td>22.2</td>
</tr>
<tr>
<td></td>
<td>Neither satisfied nor dissatisfied</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Dissatisfied</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Very dissatisfied</td>
<td>1</td>
<td>5.6</td>
</tr>
</tbody>
</table>

### Feasibility: Participant Recruitment

Between June 23, 2016 and August 2, 2017, participants were recruited using a variety of recruitment strategies. Initially, recruitment consisted of presentations at young parent resource centers and community health centers, as well as distributing flyers to young parent resource centers, prenatal clinics, and midwife clinics within the Greater Toronto Area. Between June 23, 2016 and February 29, 2017 (8 months) only 10 participants were recruited. In addition to slow recruitment, technical issues (as discussed previously) required the recruitment process to be put on hold between October 7 and December 2, 2016 (2 months). The participant recruitment rate (defined as the number of participants recruited per month) for the 6 months of active recruitment was 1.7 participants per month. Because of slow recruitment, on March 2, 2017 an
ethics amendment was approved to expand recruitment methods to online advertising on Facebook and Kijiji. Using this new recruitment strategy, 30 participants were recruited between March 1 and August 2, 2017 (5 months), representing a recruitment rate of 6 participants per month. Table 7 describes the recruitment strategies utilized as well as eligibility and enrollment rates for participants.

### Table 7: Recruitment Strategies

<table>
<thead>
<tr>
<th>Recruitment Strategy</th>
<th>Participants Screened (n)</th>
<th>Participants Eligible (n)</th>
<th>Eligibility Rate (%)</th>
<th>Participants Enrolled n (%)</th>
<th>Enrollment Rate (%)</th>
<th>Screened to Enrolled Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook (online)</td>
<td>58</td>
<td>26</td>
<td>44.8</td>
<td>20 (50%)</td>
<td>76.9</td>
<td>34.4</td>
</tr>
<tr>
<td>Presentation</td>
<td>43</td>
<td>12</td>
<td>27.9</td>
<td>7 (17.5%)</td>
<td>58.3</td>
<td>16.3</td>
</tr>
<tr>
<td>Flyer</td>
<td>15</td>
<td>10</td>
<td>66.7</td>
<td>3 (7.5%)</td>
<td>30.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Referral from agency</td>
<td>7</td>
<td>7</td>
<td>100.0</td>
<td>6 (15%)</td>
<td>85.7</td>
<td>85.7</td>
</tr>
<tr>
<td>Referral from participant</td>
<td>3</td>
<td>3</td>
<td>100.0</td>
<td>3 (7.5%)</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Kijiji (online)</td>
<td>5</td>
<td>1</td>
<td>20.0</td>
<td>1 (2.5%)</td>
<td>100.0</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td><strong>59</strong></td>
<td></td>
<td></td>
<td><strong>40</strong></td>
<td></td>
</tr>
</tbody>
</table>

Just over half of the participants were recruited online (n=21, 52.5%) versus those recruited via an agency (either via a presentation, flyer, or referral; n= 19, 47.5%). Table 8 describes the demographic differences of participants recruited via an agency versus online recruitment.

### Table 8: Demographic Differences Between Agency Versus Online Recruitment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Agency N = 19</th>
<th>Online N = 21</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>21.5 (2.0)</td>
<td>22.1 (2.8)</td>
<td>ns*</td>
<td></td>
</tr>
<tr>
<td>EPDS baseline</td>
<td>6.6 (3.1)</td>
<td>7.8 (3.9)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>STAI baseline</td>
<td>32.1 (7.3)</td>
<td>31.7 (9.6)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Attended Prenatal Classes</td>
<td>Yes</td>
<td>13 (68.4)</td>
<td>6 (28.6)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Number of prenatal attended</td>
<td>7.5 (7.9)</td>
<td>2.5 (6.2)</td>
<td></td>
</tr>
<tr>
<td>Substance use before pregnancy</td>
<td>Alcohol</td>
<td>9 (47.3)</td>
<td>16 (76.2)</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Marijuana</td>
<td>5 (26.3)</td>
<td>13 (61.9)</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Crack/cocaine</td>
<td>0 (0.0)</td>
<td>4 (19.0)</td>
<td>0.045</td>
</tr>
</tbody>
</table>

* ns: not significant
Acceptability: Participant Evaluation of Peer Support Intervention

Acceptability of the intervention by participants was measured using the Peer Support Evaluation Invention (PSEI). The PSEI is a 4-subscale self-report instrument developed to measure an individual’s perception of support received from a peer. The PSEI demonstrated very good internal consistency in this study, with Cronbach’s alpha coefficients for all four subscales: supportive interactions = 0.89; relationship qualities = 0.90; perceived benefits = 0.97; and satisfaction = 0.88. Of the 17 participants in the intervention group who participated in follow-up data collection, 16 completed the PSEI. The one mother who did not complete the PSEI indicated she did not use the peer support program because she did not feel she needed support. She informed the RA that the mobile phone peer support program is “an amazing idea but [I] didn’t get the chance to use it”.

Supportive Interactions

Table 9 describes responses reflecting supportive interactions and shows that the majority of participants reported positive interactions with their peer mentor. Responses were categorized according to the three theoretical types of peer support including informational, emotional, and appraisal support. On average, 91.3 % (n = 14.6, range 87.5 - 93.8%) of participants agreed or strongly agreed with items that reflected emotional support. For example, 93.8 % (n = 15) of participants confirmed the statement “my peer mentor listened to me talk about my feelings or concerns”. For items that reflected informational support, an average of 65.7 % (n = 10.5, range 50.0 – 81.3%) of participants agreed or strongly agreed with these items. For example, 68.8% (n = 11) of participants confirmed the statement “my peer mentor told me what was usual for my current situation”. For items that reflected appraisal support, an average of 64.1 % (n = 10.3, range 43.8 – 75.0%) of participants agreed or strongly agreed with these items. For example,
75.0% (n = 12) of participants confirmed the statement “my peer mentor helped me feel that what I was going through was ‘normal’.

### Table 9: Supportive Actions

<table>
<thead>
<tr>
<th>Domain</th>
<th>Subscale Item</th>
<th>Agree or Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N = 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n</td>
</tr>
<tr>
<td>Emotional support</td>
<td>Listened to me talk about my feelings or concerns</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Helped me feel that I was not alone in my situation</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Expressed interest and concern about how I was doing</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Told me that help was available if I needed it</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Accepted me for who I was</td>
<td>14</td>
</tr>
<tr>
<td>Informational support</td>
<td>Told me what was usual for my current situation</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Suggested other ways of doing things</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Told me what to expect in a certain situation</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Assisted me to solve my problems or concerns</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Provided me with practical information</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Gave trustworthy advice</td>
<td>13</td>
</tr>
<tr>
<td>Appraisal support</td>
<td>Told me if I did something well</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Helped me feel that what I was going through was &quot;normal&quot;</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Expressed admiration for a personal quality of mine</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Gave me feedback on how I was doing</td>
<td>12</td>
</tr>
</tbody>
</table>

**Quality of Relationships**

Table 10 describes responses reflecting the quality of their relationships with their peer mentors. Items on this subscale were grouped into 10 domains: intimacy, trust, perceived acceptance, empathy, attachment, closeness, commitment, social competence, social skills, and conflict. The most frequently confirmed relationship quality was trust (3 items, n = 14.3, mean = 89.6%; e.g.: ‘I knew my peer would respond to me in a supportive way”), followed by perceived acceptance (3 items, mean = 77.1%; e.g.: I felt accepted by my peer”), social competence (3 items, mean = 75.0%; e.g.: “my peer presented a good first impression”), commitment (4 items, mean = 70.4%; e.g.: “my peer worked at maintaining a relationship with me), empathy (2 items, mean = 65.7%; e.g.: “my peer understood my point of view”), social skills (3 items, mean = 60.4%; e.g.: “my peer was sensitive and understanding”), intimacy (2 items, mean = 53.2%; e.g.:
“if something important happened to me, I could share it with my peer), attachment (2 items, mean = 43.8%; e.g.: “I felt comfortable getting close to my peer”), and closeness (2 items, mean = 37.5%; e.g.: “I felt close to my peer”). Items in the conflict domain (6 items, mean = 1.1%) were rarely confirmed. The only item that was confirmed by 1 participant was “my peer pressured me to change”.

Table 10: Maternal Perceptions of Relationship Qualities

<table>
<thead>
<tr>
<th>Theoretical Perspective</th>
<th>Domain</th>
<th>Subscale Item</th>
<th>Agree or Strongly Agree n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived peer</td>
<td>Intimacy</td>
<td>If something important happened to me I could share the experience with my peer</td>
<td>13</td>
<td>81.3</td>
</tr>
<tr>
<td>responsiveness</td>
<td></td>
<td>My peer could tell when I was worried about something</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>My peer was trustworthy</td>
<td>15</td>
<td>93.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer was dependable</td>
<td>13</td>
<td>81.3</td>
</tr>
<tr>
<td></td>
<td>Perceived</td>
<td>I felt close to my peer</td>
<td>8</td>
<td>50.0</td>
</tr>
<tr>
<td>acceptance</td>
<td></td>
<td>My peer felt bad if things didn’t go well for me</td>
<td>8</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Empathy</td>
<td>My peer understood my point of view</td>
<td>13</td>
<td>81.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer felt bad if things didn’t go well for me</td>
<td>8</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Attachment</td>
<td>I felt comfortable getting close to my peer</td>
<td>10</td>
<td>62.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I depended on my peer</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Nature and</td>
<td>I felt close to my peer</td>
<td>8</td>
<td>50.0</td>
</tr>
<tr>
<td>extent of inter-</td>
<td>Closeness</td>
<td>My peer influenced how I felt or acted</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td>dependence</td>
<td></td>
<td>My peer was an important source of support for me</td>
<td>10</td>
<td>62.5</td>
</tr>
<tr>
<td></td>
<td>Commitment</td>
<td>My peer was an important source of support for me</td>
<td>10</td>
<td>62.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer worked at maintaining a relationship with me</td>
<td>13</td>
<td>81.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I looked forward to talking with my peer</td>
<td>9</td>
<td>56.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer worked at maintaining a relationship with me</td>
<td>13</td>
<td>81.3</td>
</tr>
<tr>
<td></td>
<td>Peer qualities</td>
<td>My peer revealed personal information</td>
<td>7</td>
<td>43.8</td>
</tr>
<tr>
<td></td>
<td>Social</td>
<td>My peer was interesting and enjoyable to talk to</td>
<td>14</td>
<td>87.5</td>
</tr>
<tr>
<td>competence</td>
<td></td>
<td>My peer presented a good first impression</td>
<td>15</td>
<td>93.8</td>
</tr>
<tr>
<td></td>
<td>Social</td>
<td>My peer seemed like she would be able to talk to anyone</td>
<td>14</td>
<td>87.5</td>
</tr>
<tr>
<td>skills</td>
<td></td>
<td>My peer was sensitive and understanding</td>
<td>15</td>
<td>93.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer talked too much</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sentiment</td>
<td>My peer would get over-involved in my problems</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Conflict</td>
<td>My peer pressured me to change</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer made me feel guilty</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer made me feel angry</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer was critical of me</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My peer minimized my problems</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Perceived Benefits of Peer Support

Table 11 describes responses reflecting the perceived benefits of peer support. Items for this subscale reflected three theoretical perspectives: stress and coping, social integration, and social construction, which encompass 11 specific domains (coping, perceived stress, anxiety, depression, loneliness, social capital, help-seeking, self-esteem, self-efficacy, social comparison, and self-affirmation). Each subscale item contained a general statement of perceived benefit (“Over the past couple of months I generally feel” e.g., “Less alone”) and a sub-statement that was specifically related to peer support (“My peer helped me feel this way”). The four domains that comprised the “stress and coping” theoretical perspective of peer support benefits were coping (e.g., “more control of my situation”), perceived stress (e.g., “things are going my way”), anxiety (e.g., “less tense”), and depression (e.g., “less depressed”). On average, 65.1% of mothers confirmed the 12 items related to improvements in stress and coping and on average 43.4% of mothers who reported improvements in stress and coping attributed them to help from their peer mentor. The three domains that comprised the “social integration” theoretical perspective of peer support benefits were loneliness (e.g., “less alone”), social capital (e.g., “more trust towards my community”), and help-seeking (e.g., “I am more likely to get help if needed”). On average, 76.8% of mothers confirmed the seven items related to improvements in social integration. Of those mothers who reported improvements in social integration, 59.7% attributed them to help from their peer mentor. The four domains that comprised the social construction theoretical perspective of peer support benefits included self-esteem (e.g., “a more positive attitude towards myself”), self-efficacy (e.g., “more confident in my abilities”), social comparison (e.g., “more similar to other mothers”), and social affirmation (e.g., “less negative thoughts about myself”). On average 82.0% of mothers reported improvement in the eight social construction items of which 51.3% attributed those improvements to help from their peer mentor.
Table 11: Maternal Perceptions of Perceived Benefits

<table>
<thead>
<tr>
<th>Theoretical Perspective</th>
<th>Domain</th>
<th>Subscale Item</th>
<th>Over the past couple of months, I generally feel: agree or strongly agree N = 16</th>
<th>My peer helped me feel this way: agree or strongly agree N = 16</th>
<th>Proportion of benefit attributable to peer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Stress and coping</td>
<td>Coping</td>
<td>More able to solve problems or concerns</td>
<td>11</td>
<td>68.8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More control of my situation</td>
<td>11</td>
<td>68.8</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Better able to cope with all the things I have to do</td>
<td>13</td>
<td>81.3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Better able to respond to stressful situations</td>
<td>12</td>
<td>75.0</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Perceived stress</td>
<td>Things are going my way</td>
<td>9</td>
<td>56.3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More in control of important things in my life</td>
<td>13</td>
<td>81.3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td>More on top of things</td>
<td>10</td>
<td>62.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less worried</td>
<td>8</td>
<td>50.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More calm</td>
<td>6</td>
<td>37.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less tense</td>
<td>9</td>
<td>56.3</td>
<td>6</td>
</tr>
<tr>
<td>Depression</td>
<td>Life is more enjoyable</td>
<td>12</td>
<td>75.0</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less depressed</td>
<td>11</td>
<td>68.8</td>
<td>3</td>
</tr>
<tr>
<td>Social integration</td>
<td>Loneliness</td>
<td>Less alone</td>
<td>12</td>
<td>75.0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Able to turn to more people</td>
<td>10</td>
<td>62.5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less isolated from others</td>
<td>11</td>
<td>68.8</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have something in common with other mothers</td>
<td>15</td>
<td>93.8</td>
<td>9</td>
</tr>
<tr>
<td>Social capital</td>
<td>Help-seeking</td>
<td>More trust towards my community</td>
<td>9</td>
<td>56.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I am more likely to get help if needed</td>
<td>14</td>
<td>87.5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More knowledgeable about my situation</td>
<td>15</td>
<td>93.8</td>
<td>9</td>
</tr>
<tr>
<td>Self esteem</td>
<td></td>
<td>I have much more to be proud of</td>
<td>14</td>
<td>87.5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A more positive attitude toward myself</td>
<td>12</td>
<td>75.0</td>
<td>5</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td>More satisfied with myself</td>
<td>12</td>
<td>75.0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More confident in my ability to care for my baby</td>
<td>14</td>
<td>87.5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More confident in my abilities</td>
<td>14</td>
<td>87.5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More confident to deal with my situation</td>
<td>14</td>
<td>87.5</td>
<td>8</td>
</tr>
<tr>
<td>Social comparison</td>
<td></td>
<td>More similar to other mothers</td>
<td>13</td>
<td>81.3</td>
<td>8</td>
</tr>
<tr>
<td>Self affirmation</td>
<td></td>
<td>Less negative thoughts about myself</td>
<td>12</td>
<td>75.0</td>
<td>5</td>
</tr>
</tbody>
</table>
Satisfaction with Peer Support

Table 12 describes maternal satisfaction with peer support. Items in the satisfaction subscale were grouped into four domains: perceived quality (e.g., “my peer provided the assistance I needed”), convenience (e.g., “I liked the support by text message”), access (e.g., “I was able to talk to my peer when I needed it”), and general satisfaction (e.g., “I would recommend this type of support to a friend”). On average, 87.5% (range: 75.0 -100%) of participants confirmed the six items related to the perceived quality of the support they received. The three items that reflected satisfaction with convenience of support were confirmed by 78.2% of mothers on average (range: 68.8 - 87.5%). The three items that reflected satisfaction with access to peer support were confirmed by 79.2% of participants on average (range: 75.0 – 87.5%). Overall, 100% (n = 16) of participants would recommend this type of support to a friend and agreed or strongly agreed that they were satisfied with their peer support experience.

Table 12: Maternal Satisfaction with Support Received

<table>
<thead>
<tr>
<th>Domain</th>
<th>Subscale Item</th>
<th>Agree or Strongly Agree</th>
<th>N = 16</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived quality</td>
<td>My peer provided the assistance I needed</td>
<td>14</td>
<td>87.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My peer met my expectations</td>
<td>13</td>
<td>81.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My peer was respectful to me</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I liked my peer</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is nothing I would have liked done differently</td>
<td>13</td>
<td>81.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For my situation one-to-one support was better than group support</td>
<td>12</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convenience</td>
<td>Receiving support from my peer was convenient for me</td>
<td>13</td>
<td>81.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I liked the support over the mobile phone</td>
<td>12</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I liked the support by text message</td>
<td>14</td>
<td>87.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I had very few problems with the support I received</td>
<td>11</td>
<td>68.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>I was able to talk to my peer when I needed to</td>
<td>12</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My peer contacted me when planned</td>
<td>12</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I had enough contact with my peer</td>
<td>14</td>
<td>87.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General satisfaction</td>
<td>I would recommend this type of support to a friend</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall, I am satisfied with my peer support experience</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Four open-ended questions assessed participant perceptions of the peer support program.

See Table 13 for examples of comments describing what participant liked about this program.

<table>
<thead>
<tr>
<th>Pseudonym, age</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abby, age 17</td>
<td><em>I liked having someone to talk to and share my feelings</em></td>
</tr>
<tr>
<td>Jackie, age 19</td>
<td><em>I liked having someone there for you, someone to talk to and hear your opinions and thoughts</em></td>
</tr>
<tr>
<td>June, age 19</td>
<td><em>I was isolated. I liked having someone who had similar experiences, who I could create a bond with and trust</em></td>
</tr>
<tr>
<td>Eva, age 20</td>
<td><em>My mentor was helpful because she had the same number of kids as me which was helpful</em></td>
</tr>
<tr>
<td>Joan, age 20</td>
<td><em>It was convenient having the program over the phone because you’re not always able to meet</em></td>
</tr>
<tr>
<td>Patty, age 20</td>
<td><em>I like that my mentor didn’t know me. I didn’t always want to talk to someone who knows me. It was nice talking to someone else</em></td>
</tr>
<tr>
<td>Cindy, age 21</td>
<td><em>I didn’t have to ask for someone specific; there was the same person there every time</em></td>
</tr>
<tr>
<td>Shelly, age 21</td>
<td><em>Good program but I was always busy with my baby afterwards, so it was difficult to reach out to my peer mentor</em></td>
</tr>
<tr>
<td>Karin, age 22</td>
<td><em>I loved knowing someone was there to help. Not judging, just listening and helping in any means they could</em></td>
</tr>
<tr>
<td>Danielle, age 22</td>
<td><em>It was nice to connect with another mother without having a previous history</em></td>
</tr>
<tr>
<td>Heather, age 23</td>
<td><em>I could disclose information to this person, other than someone I know. It is good to know there is someone to talk to and not worry about their feelings or reaction. I liked that the support person was not a professional like a psychologist or psychiatrist</em></td>
</tr>
<tr>
<td>Cathy, age 24</td>
<td><em>I liked the support on cell phone and not face to face. Not commuting is convenient. I can’t get to meetings since I don’t have a car</em></td>
</tr>
</tbody>
</table>
With respect to areas for improvement, 8 of the participants (47%) commented that the phone connection quality was poor or the battery power of the phones was very short, which hindered them from contacting their mentor as often as they would have liked. Seven participants (41%) commented they found the use of a second phone inconvenient and they would have liked to have had peer support offered on their own phones (such as downloading an application) or via different electronic formats such as Facetime (where the participants and mentors could see each other), a Facebook/Instagram group chat, or an Internet-based support group. One participant indicated she would have preferred group based support more than individual support.

Adherence of Participants to Trial Protocol

Of the 21 participants in the intervention group, four participants did not receive peer support for the following reasons: two participants were unable to be contacted after randomization to receive a phone and do a test call with their peer mentor; one participant found out she was moving after she was randomized and therefore declined to participate in the peer support program; and one participant received a phone and was matched with a peer mentor, however, technical issues with the phone prevented her from connecting with her mentor. This participant was therefore unable to receive any peer support and did not complete final outcome measures. Seventeen participants received the allocated MPPS intervention and of these participants, the PI connected the majority to peer mentors within 72 hours post randomization (n= 15). Two participants could not be connected with their peer mentor until 7 days post randomization because they delivered their baby the day after they were randomized and were unavailable to meet the PI to receive their mobile phone.

A trained RA completed follow-up data collection for participants. Outcome data were collected for 33 participants, with an overall retention rate (defined as proportion of participants
who completed outcome data at follow-up) of 82.5% (intervention group n = 17, 81.0%; control group n = 16, 84.2%). The principal investigator contacted participants to book the final data collection appointments. Frequent attempts were required to reach participants (mean 4.9 times, SD 3.4, range 2-15) using multiple methods of communication (such as alternate telephone numbers, Facebook messenger or email) because the original contact number given was no longer in service. The number of attempts to contact participants in the control group (mean 5.1, SD 3.2) and intervention group (mean 4.8, SD 3.6) was similar. Participants often replied after a few weeks of being contacted to indicate they would be available to complete the final outcome measures. However, it then took another few weeks to secure a date to complete the outcome measures. For this reason, data collection rarely occurred at the scheduled 12 weeks postpartum. The timing of data collection ranged from 12-18 weeks postpartum with a mean of 15.7 weeks (SD 1.8) for participants in the intervention group (n=17) and 15.1 weeks (SD 1.4) for participants in the control group (n = 16).

Table 14 describes the number and duration of contacts between participants and peer mentors. Contacts were most frequently made by text message (n= 112, 92.6%), followed by voice calls (n=6, 4.9%) and face-to-face contact (n=3, 2.5%). Face-to-face visits between peer mentors and participants were provided at the request of the participant. Peer mentors initiated the majority of the contacts (n = 83, 68.6%), and just over half of the contacts were made in the prenatal period (n = 64, 52.9%). The most frequent type of support provided per contact was emotional support (n = 116, 95.9%), followed by appraisal support (n = 79, 65.3%) and informational support (n = 56, 46.3%). In categorizing the type of support provided by the type of contact, results showed that emotional, informational, and appraisal support were provided in all face-to-face contacts (n=3). For voice calls (n=6), emotional and appraisal support were provided in all contacts, and informational support was provided in 93.8% of contacts. For text-
messages (n=112), emotional support was provided in 98.9% of contacts, appraisal support was provided in 62.2% of contacts, and informational support was provided in 59.1% of contacts.

Peer mentors were asked to make a minimum of 10 contacts to each participant; however only 29.4 (n=5) of participants received the 10 contacts from peer mentors. The average number of contacts per participant was 7.1 (SD 6.0). Peer mentors informed the PI that participants who received three contacts or less (n = 6) did not require any support and preferred to contact the mentor if they required assistance. The remaining six participants received between 4-6 contacts each. In these cases, the peer mentors stopped reaching out to the participants because they did not want to appear to be overly intrusive and potentially cause negative feelings for the participant.

Table 14: Number and Duration of Contacts Between Participants and Peer Mentors

<table>
<thead>
<tr>
<th>Participant ID</th>
<th>Mentor ID</th>
<th>Total number of contacts</th>
<th>Total duration all calls (minutes)</th>
<th>Average duration of all contacts (minutes)</th>
<th>Minimum/Maximum duration per contact (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P001</td>
<td>M003</td>
<td>10</td>
<td>116</td>
<td>20.2 (Mean) 14.7 (SD)</td>
<td>4 (Min) 40 (Max)</td>
</tr>
<tr>
<td>P002</td>
<td>M003</td>
<td>3</td>
<td>10</td>
<td>33.6 (Mean) 0.8 (SD)</td>
<td>2 (Min) 4 (Max)</td>
</tr>
<tr>
<td>P003</td>
<td>M002</td>
<td>6</td>
<td>39</td>
<td>7.0 (Mean) 1.9 (SD)</td>
<td>4 (Min) 10 (Max)</td>
</tr>
<tr>
<td>P008</td>
<td>M007/M004</td>
<td>5</td>
<td>12</td>
<td>3.2 (Mean) 1.6 (SD)</td>
<td>1 (Min) 5 (Max)</td>
</tr>
<tr>
<td>P010</td>
<td>M003</td>
<td>4</td>
<td>7</td>
<td>1.9 (Mean) 0.4 (SD)</td>
<td>1 (Min) 2 (Max)</td>
</tr>
<tr>
<td>P012</td>
<td>M006</td>
<td>10</td>
<td>69</td>
<td>7.6 (Mean) 2.3 (SD)</td>
<td>5 (Min) 10 (Max)</td>
</tr>
<tr>
<td>P018</td>
<td>M002</td>
<td>10</td>
<td>407</td>
<td>102.9 (Mean) 43.4 (SD)</td>
<td>1 (Min) 140 (Max)</td>
</tr>
<tr>
<td>P019</td>
<td>M001</td>
<td>5</td>
<td>21</td>
<td>5.1 (Mean) 1.6 (SD)</td>
<td>1 (Min) 7 (Max)</td>
</tr>
<tr>
<td>P023</td>
<td>M001</td>
<td>7</td>
<td>36</td>
<td>8.6 (Mean) 3.1 (SD)</td>
<td>1 (Min) 10 (Max)</td>
</tr>
<tr>
<td>P026</td>
<td>M005</td>
<td>3</td>
<td>3</td>
<td>1.0 (Mean) 0.0 (SD)</td>
<td>1 (Min) 1 (Max)</td>
</tr>
<tr>
<td>P029</td>
<td>M002</td>
<td>6</td>
<td>215</td>
<td>83.1 (Mean) 44.0 (SD)</td>
<td>5 (Min) 120 (Max)</td>
</tr>
<tr>
<td>P033</td>
<td>M003</td>
<td>3</td>
<td>9</td>
<td>3.7 (Mean) 1.6 (SD)</td>
<td>2 (Min) 5 (Max)</td>
</tr>
<tr>
<td>P034</td>
<td>M003</td>
<td>3</td>
<td>6</td>
<td>2.0 (Mean) 0.0 (SD)</td>
<td>2 (Min) 2 (Max)</td>
</tr>
<tr>
<td>P035</td>
<td>M008</td>
<td>4</td>
<td>17</td>
<td>4.7 (Mean) 1.0 (SD)</td>
<td>2 (Min) 5 (Max)</td>
</tr>
<tr>
<td>P037</td>
<td>M002</td>
<td>2</td>
<td>4</td>
<td>2.0 (Mean) 0.0 (SD)</td>
<td>1 (Min) 2 (Max)</td>
</tr>
<tr>
<td>P039</td>
<td>M003</td>
<td>27</td>
<td>355</td>
<td>19.4 (Mean) 10.6 (SD)</td>
<td>1 (Min) 38 (Max)</td>
</tr>
<tr>
<td>P040</td>
<td>M003</td>
<td>13</td>
<td>147</td>
<td>26.9 (Mean) 15.6 (SD)</td>
<td>1 (Min) 45 (Max)</td>
</tr>
</tbody>
</table>

Total: 121 12.2 21.7
There was a strong and positive correlation between the number of contacts and participant satisfaction with their peer support experience ($r = 0.65$, $p = 0.007$). Correlation analysis was also performed to explore an association between age, satisfaction, and communication activities. There was a strong and negative correlation between participant age and number of peer mentor contacts ($r = -0.64$, $p = 0.005$) and total number of contacts ($r = -0.64$, $p = 0.006$).

**Secondary Outcomes**

**Depression**

Depressive symptomatology was assessed using the EPDS (Appendix T) as both a continuous measure (means, standard deviations) and dichotomous measure (frequencies, percentages) for cut off EPDS scores $> 9$ and $> 12$. The EPDS demonstrated acceptable internal consistency in this study with a Cronbach’s alpha of 0.79 at 12 weeks postpartum. Table 15 shows the mean EPDS scores for the control and intervention group at baseline (T1) and 12 weeks postpartum (T2). The overall mean EPDS score for both groups at 12 weeks postpartum was 7.82 (SD 3.5). When comparing dichotomous EPDS scores of $>12$, two participants (12.5%) in the control group had an EPDS score $> 12$ compared to none in the intervention group ($x^2 = 2.26$, $p = 0.13$). When comparing dichotomous EPDS scores of $> 9$, six participants in the control group (37.5%) and six participants in the intervention group (35.3%) had EPDS scores $> 9$ ($x^2 = 0.02$, $p = 0.9$). A one-way between groups analysis of covariance (ANCOVA) was conducted to compare the preliminary effectiveness of the mobile phone-based peer support intervention on the prevention of depressive symptomatology. After controlling for baseline depressive symptomatology, participants in the intervention group demonstrated lower mean EPDS scores at 12 weeks postpartum compared to participants in the control group ($F = 4.25$, $p = 0.048$, $d = 0.56$). This effect size can be used to calculate the sample size for a future definitive randomized controlled trial. Using GPower software, the total sample size needed to
achieve 80% power with an alpha set at 0.05 and effect size of 0.56 is 82 participants. In order to account for a 25% loss to follow-up, a sample size of 102 participants is required.

Correlation analysis showed that EPDS scores at 12 weeks postpartum were not associated with the total number of contacts \( (r = -0.89, p = 0.73) \) or the total duration of contacts \( (r = 0.20, p = 0.45) \) between peer mentors and participants. There was no association between participant satisfaction with the peer support intervention and participants receiving 10 or more contacts (Fisher’s exact test 0.63).

**Table 15: Mean EPDS Scores**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>SD</td>
</tr>
<tr>
<td>EPDS T1 Baseline</td>
<td>6.8a</td>
<td>3.2</td>
</tr>
<tr>
<td>EPDS T2 12 weeks postpartum</td>
<td>8.8c</td>
<td>2.7</td>
</tr>
</tbody>
</table>

\( ^a N = 19; \hspace{0.5cm} ^b N = 21; \hspace{0.5cm} ^c N = 16; \hspace{0.5cm} ^d N = 17; \hspace{0.5cm} ^1 \) 1-tailed

**Anxiety**

Anxiety was assessed using the STAI-S (Appendix U) as both a continuous measure (means, standard deviations) and dichotomous measure (frequencies, percentages) for cut off STAI-S scores > 40. The STAI-S demonstrated acceptable internal consistency in this study with a Cronbach’s alpha of 0.76 at 12 weeks postpartum. STAI-S baseline scores (T1) showed similar mean results of 31.1 \( (n = 21, SD 9.5) \) for the intervention group and 32.7 for the control group \( (n = 19, SD 7.5; \ t (38) = 0.58, p = 0.56) \). STAI-S scores at 12 weeks postpartum (T2) remained the same from baseline for the intervention group at 31.7 \( (n = 17, SD 9.5) \) compared to 33.7 for the control group \( (n = 15, SD 6.9; \ t (23.9) = .53, p = 0.60) \). The overall mean STAI-S score for both groups at 12 weeks postpartum was 32.85 \( (SD 10.99) \). It is important to note that the 12-week postpartum STAI-S score was not calculated for 1 participant in the control group because the participant did not understand 2 statements \( (I \ feel \ at \ ease, \ I \ am \ jittery) \) and did not wish to
answer these statements. Dichotomous STAI-S scores at 12 weeks postpartum showed that 4 participants (23.5%) in the intervention group had an STAI-S score > 40 compared to only 2 participants (13.3%) in the control group (p = 0.66, Fisher’s Exact Test, 2-sided). After controlling for baseline STAI-S scores, participants in the intervention group demonstrated lower STAI-S scores at 12 weeks postpartum compared to participants in the control group (F = 0.14, p = 0.71).

Correlation analysis was performed to explore the association between STAI-S scores at 12 weeks postpartum and the number of contacts between peer mentors and participants and the duration of contacts between peer mentors and participants. There was no association between number of contacts and the 12 week postpartum STAI-S score (n = 17; r = -0.41, p = 0.88) however there was a strong association between duration of contacts and the 12 week postpartum STAI-S score (n = 17; r = 0.51, p = 0.03).

Social Support

Social support was assessed using the SSQ6 (Appendix V), which measures 2 different dimensions social support: number of social supports available (SSQ6-N) and social support satisfaction (SSQ6-S). The SSQ6 demonstrated acceptable internal consistency in this study with a Cronbach’s alpha of 0.70 at 12 weeks postpartum. The mean SSQ6-N scores were slightly higher for intervention group at 3.5 (SD 1.9) compared to 2.6 (1.9) for the control group [t (31) = -1.27, p = 0.21]. With respect to mean SSQ6-S scores, the two groups were very similar [intervention group = 5.7 (SD 0.5), control group = 5.6 (SD 0.5); t (31) = 0.23, p = 0.82].

Correlation analysis was performed to explore the association between SSQ6-N, SSQ6-S and at 12 weeks postpartum and depressive symptomatology. There was a moderate and negative association between SSQ6-N and 12-week postpartum EPDS scores (n = 33; r = -0.64,
p = 0.000) as well as a mild and negative association between SSQ6-S and 12-week postpartum EPDS scores (n = 33; r = -0.36, p = 0.042).

**Health Services Utilization**

Health service utilization was assessed using the Health Service Utilization Questionnaire (Appendix W), which measures maternal self-reported use and frequency of contact with, the following health services: public health nurse (PHN), other nurse, new mother’s group, midwife, lactation consultation, family physician, obstetrician, social worker, Children’s Aid Society (CAS), psychologist, psychiatrist, after-hours walk-in clinic, and emergency room. Participants in both the intervention and control group accessed various health services after the birth of their baby (see Table 16 for mean scores and standard deviations). The results between the two groups were not significant. The mean total number of health service visits by participants in the intervention group was 23.7 (SD 20.5) compared to 18.4 (SD 15.2) in the control group (t (31) = -0.84, p = 0.41). Overall, most participants (n = 29, 87.9%) visited their family doctor at least once in the first 3 months postpartum, followed by receiving telephone calls from a PHN (n = 21, 63.6%), midwife visits (n = 15, 45.4%), PHN visits (n = 14, 42.4%), social worker visits (n = 13, 39.3%), emergency department visits (n = 12, 36.3%), lactation consultants visits (n = 11, 33.3%), mother’s group sessions (n = 11, 33.3%), obstetrician visits (n = 8, 24.2%), CAS worker visits (n = 8, 24.2%) and hospital admissions for their baby (n = 6, 18.2%). The least frequently accessed health services were psychologist visits (n = 2, 6.1%), other nurse visits (n = 2, 6.1%), hospital admissions for mothers (n = 2, 6.1%), psychiatrist visits (n = 3, 9.1%), and walk-in clinic visits (n = 4, 12.1%).

Participants rated their satisfaction with health services. On average, those participants who used health services rated the following as being the most helpful: hospital admission for their baby (n = 6, 100%), other nurse visits (n = 2, 100%), midwife visits (n = 14, 93.3%), family
doctor visits (n=27, 93.1%), lactation consultant visits (n = 9, 81.8%), mother’s group sessions (n = 9, 81.8%), obstetrician (n= 6, 75%), walk-in clinic visits (n = 3, 75%), emergency room visits (n = 9, 75%), social worker visits (n = 8, 61.5%), PHN visits (n = 8, 57.1%), PHN calls (n = 11, 52.4%) and psychologist visits (n = 1, 50%). The least helpful health services included hospital admissions for mother (n = 1, 33%), psychiatrist visits (n = 1, 33.3%), and CAS worker visits (n = 3, 37.5).

Table 16: Health Services Utilization

<table>
<thead>
<tr>
<th>Variable: Number of</th>
<th>Control Group N = 16</th>
<th>Intervention Group N = 17</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>mean</td>
</tr>
<tr>
<td>Public Health Nurse (PHN) Visits</td>
<td>4</td>
<td>12.0</td>
</tr>
<tr>
<td>Other Nurse Visits</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>Telephone Conversations with PHN</td>
<td>9</td>
<td>4.3</td>
</tr>
<tr>
<td>Mother Group Sessions</td>
<td>5</td>
<td>5.8</td>
</tr>
<tr>
<td>Midwife Visits</td>
<td>5</td>
<td>6.8</td>
</tr>
<tr>
<td>Lactation Consultant Visits</td>
<td>7</td>
<td>1.7</td>
</tr>
<tr>
<td>Family Doctor Visits</td>
<td>14</td>
<td>3.1</td>
</tr>
<tr>
<td>Obstetrician Visits</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td>Psychologist Visits</td>
<td>2</td>
<td>4.5</td>
</tr>
<tr>
<td>Psychiatrist Visits</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Social Worker Visits</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>Children’s Aid Society Visits</td>
<td>4</td>
<td>7.3</td>
</tr>
<tr>
<td>Walk-in Clinic Visits</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Emergency Room Visits</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Hospital Admissions - mother</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hospital Admissions - baby</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Summary of Results

The primary objective of this pilot randomized controlled trial was to determine the feasibility and the acceptability of a MPPS intervention for adolescent mothers and adherence to the trial protocol. The recruitment rate for peer mentors (i.e.: experienced mothers) was 6 peer mentors per month for 2 months and the acceptance rate for enrollment of peer mentors was
100%. The recruitment rate for participants (i.e., pregnant adolescents) after an ethics amendment was 6 participants per month for 5 months with an acceptance rate for enrollment of 67.8%. Half of the enrolled participants (n=20) were recruited online via Facebook.

Satisfaction scores by peer mentors were excellent for both the training sessions and the intervention. All reported that the training prepared them for their role as a peer mentor and the majority (86%) reported either being either satisfied or very satisfied with their experience as a peer mentor. Satisfaction scores by participants in the intervention group were excellent with all participants indicating they were either satisfied or very satisfied with their peer support experience and reporting that they would recommend this type of support to a friend.

Peer mentors were matched on average to 2.1 participants per mentor with a range of 0.5 to 7 participants. Adherence by the peer mentors to the trial protocol in completing the electronic activity logs within 24 hours post contact with a participant was high, however adherence in completing the minimum of 10 contacts per participant was low, with only 29.4 (n=5) of participants receiving 10 contacts from their peer mentor. Slightly more contacts were made in the prenatal period (52.9%) compared to the postpartum period (47.1%). The most frequent mode of contact was by text message (92.6%), with peer mentors initiating the majority of the contacts (68.6%). The most frequent type of support provided per contact was emotional support (95.9%), followed by appraisal support (65.3%) and informational support (46.3%). The retention rate for peer mentors was acceptable at 70%. The retention rate for participants overall in both groups was very good at 82.5%.

Secondary outcomes sought to determine the possible influence of the MPPS program on depressive symptomatology, anxiety, social support, and health service utilization. The overall mean EPDS score for both groups at 12 weeks postpartum was 7.82 (SD 3.5). The overall prevalence of depressive symptomatology at 12 weeks postpartum as measured by EPDS scores
of > 12 was 12.5% in the control group compared to 0% in the intervention group. After controlling for baseline depressive symptomatology, participants in the intervention group demonstrated lower EPDS scores at 12 weeks postpartum compared to participants in the control group. The overall mean STAI-S score for both groups at 12 weeks postpartum was 32.85 (SD 10.99). The overall prevalence of anxiety at 12 weeks postpartum as measured by STAI-S scores of > 40 was 13.3% in the control group compared to 23.5% in the intervention group. No significant differences were found between participants in the intervention group and the control group in terms of social support availability or social support satisfaction. The health services used most frequently by participants were family doctor visits and telephone calls from public health nurses.
Chapter 5
Discussion

The objective of this study was to evaluate the feasibility and acceptability of a MPPS intervention and compliance with the trial protocol to inform a future definitive full-scale randomized controlled trial. This chapter begins with a discussion of the primary outcomes for this trial, which are related to the feasibility and acceptability of the MPPS program and adherence with the trial protocol. Secondary outcomes regarding participant depression, anxiety, social support, and health services utilization are explored to examine variances. Finally, strengths and limitations of the study are presented.

Primary Outcomes: Feasibility, Acceptability and Adherence

Peer Mentor Recruitment

Findings suggest that it was feasible to recruit peer mentors into this pilot randomized controlled trial. All peer mentors were recommended from a YPNFA network agency in Toronto, Ontario. Of the eligible peer mentors, all agreed to participate and were enrolled into the study. These findings suggest that (1) the eligibility criteria established for peer mentors in this study was appropriate; (2) young mothers could be recruited as peer mentors from YPNFA agencies; and (3) young mothers from YPNFA agencies were receptive to participating as peer mentors in this study. The high enrollment rate for peer mentors could be related to the fact that the PI collaborated with the Young Parents No Fixed Address (YPNFA) network to obtain referrals for peer mentors in the study. The young parent agencies affiliated with the YPNFA network were able to recommend suitable peer mentors because they had an existing relationship with young mothers, were aware of their reliability, maturity and communication skills, and were able to explain the research study to potential peer mentors. Collaboration with community
partners has been suggested as a key recruitment strategy in other research studies. A systematic review of strategies for improving research with socially disadvantaged groups found that studies that engaged community groups and organizations in the study design, sampling, recruitment, data collection, and intervention delivery improved overall recruitment, participation, and retention rates (Bonevski et al., 2014).

The majority of study peer mentors indicated that the reason they became mentors was their desire to help other young mothers and share their knowledge. This finding is consistent with the perceptions of peer volunteers recruited for a randomized controlled trial that evaluated the effect of telephone-based peer support on the prevention of postpartum depression among adult mothers (Dennis, 2012). In addition, several participants in the peer support group (n=8) and control group (n=3) informed the PI that they would be interested to become peer mentors for other mothers. This result is similar to a recent study examining a Skype-based peer support program (iPeer2Peer) for adolescents with chronic pain, where several participants involved in the study inquired about becoming a peer mentor themselves (Ahola Kohut et al., 2016). This study suggested that the iPeer2Peer program may be able to create a pool of peer mentors and promote sustainability of the program. (Ahola Kohut et al., 2016). It is possible that peer support programs in general may have the capacity to be self-sustaining by encouraging participants who were involved in the peer support program to become potential peer mentors for future participants. For this reason, participants involved in peer support programs should be asked if they would be interested in becoming peer mentors once they complete the peer support program. Names and contact information could be kept on file for future reference. While participants with previous experience in a peer mentor program would need to meet required eligibility criteria, not all participants would have young parent agency involvement, therefore this particular eligibility criteria would need to be re-assessed for these mentors.
Having a diverse pool of peer mentors is an important consideration for peer support interventions because one method of matching peer mentors and participant is by ethnic background (Dennis, 2010). In this study, seven out of 10 peer mentors were either born in a Caribbean country or had their families originating from a Caribbean country, which is partially representative of the overall teen mother population in Toronto. A report from Toronto Public Health indicates that certain areas of Toronto have higher teen pregnancy rates than the city overall, including Northwest Toronto, East York and Scarborough (Toronto Public Health, 2013). In these areas, the most common visible minority groups identify as African-Caribbean, Latin American, South Asian, and South-East Asian (City of Toronto, 2018). Although the peer mentor sample was partially representative of the teen mother population in Toronto, not all participants could be matched with a peer mentor based on ethnicity. For example, three participants in the peer support group requested that they be matched with a mentor from their same ethnic background (South Asian), however, this was not possible because there were no peer mentors from this ethnic background. For a definitive trial, it would be beneficial to seek out mentors from a greater variety of young parent agencies in order to try to recruit a diverse sample of peer mentors.

The mean age for recruitment of peer mentors in this study was 21.3 years, with a range of 19 to 24 years, suggesting that peer mentors 19 years and older may be the optimal age for recruitment in a future study. This finding is consistent with a systematic review of peer support interventions for adolescents with chronic illness, which recommended that older adolescents or young adults be recruited as mentors (Ahola Kohut et al., 2014). In this study, two mentors were consistently available to provide peer support to participants and both of these mentors were 24 years old. It is possible that mentors between 19-24 years of age may have more stability with their schedules, thereby allowing more time to participate in a peer-mentoring program.
Acceptability: Evaluation of the Training and Intervention by Peer Mentors

Satisfaction with the peer mentor training was excellent with all peer mentors, indicating that the training prepared them for their role as a peer mentor. All peer mentors who enrolled in the peer mentor-training program completed three, 4-hour sessions. Moreover, peer mentors were actively engaged in the training sessions and utilized the training manual as a guide during role-play scenarios. This evidence suggests that peer mentors are committed to the training sessions and that the duration and content of the training is appropriate for a future trial. Based on feedback from the peer mentors, future training sessions should include information about housing programs and educational opportunities for young mothers. This information can be included in the peer support-training manual and used during role-play scenarios. Since many peer mentors commented that they enjoyed having the training conducted by a health professional, a larger trial in the future should ensure this.

Peer mentors reported a high degree of satisfaction with the peer support intervention and indicated they would become a mentor again for a future study. This suggests that they found the intervention acceptable. However, one mentor reported being neither satisfied nor dissatisfied with her peer mentor role, which was influenced by her minimal contact with her participant despite repeated attempts to make contact. This finding suggests that mentors feel more positive about their peer-mentoring role if they feel they are actively able to help another mother. In a previous peer support trial with adult mothers, peer volunteers reported feelings of disappointment when providing support to a new mother which was usually related to working with new mothers who did not need support or did not return phone calls (Dennis, 2012). In the training sessions for this pilot trial, the PI discussed the fact that certain participants may not require as much support as other participants. Since this is an individualized peer support program, peer mentors were informed that some participants may benefit from the program just
by knowing a mentor is available. For a future trial, this topic could be further emphasized and restated on an on-going basis throughout the study in order to prevent feelings of disappointment for peer mentors.

Peer Mentor Adherence to the Trial Protocol

Of the 10 peer mentors who completed the 12-hour training, 70% (n=7) stayed with the trial until it was complete. The retention rate for this trial is higher than a previous breastfeeding peer support trial among adolescent mothers where only 20% of adolescent peers (n = 1) were retained for the duration of the study (Meglio et al., 2010). A possible reason for the higher retention rate could be related to the fact that peer mentors for this study were recommended from YPNFA network agencies in Toronto, Ontario based on their reliability. As mentioned previously, collaboration with community partners has been shown to increase retention rates in studies (Bonevski et al., 2014) and could have contributed to the success of retaining mentors in this trial.

Adherence in completing activity logs by peer mentors in this trial was very high. This suggests that having an electronic activity log was convenient for peer mentors to use. Matching of peer mentors to participants based on age was attempted, however this was only possible for 28.6% (n=6) of participants. Matching should be carefully considered for a future trial since participants indicated they enjoyed speaking with peer mentors who were close to their age and had the same number of children. Participants also expressed a desire to be matched by ethnic background. However, as mentioned previously, this was not possible due lack of peer mentors from certain ethnic backgrounds. For future studies, the most important qualities to match participants with peer mentors are 1) age; 2) number of children; and 3) ethnic background.

Due to peer mentor availability, two mentors provided the majority of support to participants. One peer mentor had a greater duration of contacts with her participants compared
to other peer mentors. This peer mentor was enrolled in a nursing diploma program throughout the peer support trial and informed the PI that she used her therapeutic communication skills when communicating with participants. The second mentor, who was consistently available and therefore matched to 7 participants, possessed a Bachelor’s Degree in Psychology. A third peer mentor, while only matched to 2 participants, had some education in the social services field. The educational background of peer mentors in this study is noteworthy because research indicates that once peers become professionalized, they may shift their feeling of accountability from the participant they are mentoring towards the health-care system, which in turn reduces their ability to fully identify with their participants (Dennis, 2003). In this trial, the peer mentors were not over-trained and therefore did not become paraprofessionals. All peer mentors felt the three 4-hour training sessions were sufficient for them to provide effective peer support.

**Participant Recruitment**

Of the eligible participants, 19 (32.2%) refused to participate in the study. The most common reasons for refusal were lack of interest or being too busy. This finding suggests that while many eligible participants are interested and willing to participate in a peer support study, many young pregnant women face logistical barriers, such as busy schedules, which hinders their participation. Other research studies have encountered similar results with maternal adolescent populations. Chaotic home environments, unstable lifestyles, multiple demands, and conflicts with their mothers are some of the barriers to recruitment, which are not easily modifiable (Pinto-Folz et al., 2011; South-Paul et al., 2014).

Recruitment strategies were initially targeted at distributing flyers and delivering presentations at YPNFA agencies. Referrals from agencies and other participants demonstrated the highest eligibility rates (100%), however, only 9 participants were recruited using these strategies. Once online recruitment was initiated, the recruitment rate rose from approximately
1.7 participants per month to 6 participants per month. This finding suggests that online recruitment is an effective method, with Facebook recruitment enrolling 50% of participants in this study (n= 20). Online recruitment via Facebook has been a successful and cost-effective strategy utilized in other research studies involving women in early pregnancy in the United States (Arcia, 2014) and young women in Australia (Fenner et al., 2012). Online recruitment is able to reach participants in more geographically diverse areas and may be particularly suitable for younger women. For example, the study by Arcia (2014) was able to reach young women in 43 states within the United Stats with the mean and median ages of 20.9 and 19.0 years respectively. This study suggested that younger pregnant women may spend more time using Facebook and click on targeted advertisements than older pregnant women.

**Participant Differences Between Online Versus Agency Recruitment**

Participants in this peer support trial who were recruited online via Facebook or Kijiji were less likely to attend prenatal classes compared to participants who were referred from an agency. Overall, 6 of the participants who were recruited online attended prenatal classes versus 13 participants who were recruited via an YPNFA agency. This finding suggests that online recruitment may reach a specific cohort of young pregnant women who do not access prenatal care services. In addition to lower prenatal class attendance, participants recruited online had a higher self-reported prenatal use of marijuana and crack/cocaine compared to participants who were recruited via an agency. A possible explanation for these findings is that participants recruited online may be a particularly vulnerable adolescent maternal population who may experience unique barriers to accessing health services. It is not known if participants in this study were unaware of available prenatal services or if they chose not to access prenatal services. In a future definitive trial, it would be beneficial to determine the reasons why participants are not accessing prenatal classes. Prior research has shown that adolescents can be difficult to
engage in health care services, because they are protective of their own privacy and fear being judged (Robb, McInery & Hollins-Martin, 2013; Thompson, 2016). They also face numerous barriers to accessing prenatal care such as negative attitudes toward healthcare providers, lack of perceived importance about early prenatal care, confusion about available prenatal care services, and a desire for an adolescent-focused clinic (Kingston et al., 2012). In a retrospective, population-based study conducted in Ontario, Canada (n = 23,992 pregnant adolescents), attendance at prenatal classes was significantly lower among adolescent women compared to adult women (Fleming et al., 2013). A major reason pregnant adolescents delay seeking prenatal care is due to judgmental attitudes from health care providers and other pregnant adult women, however, when multidisciplinary prenatal classes specifically targeted for young mothers were available, there was been an increase in prenatal class attendance (Fleming et al., 2013). Public health departments in Toronto, Peel and Durham regions offer free, weekly Teen Prenatal Programs that cater to the needs of young pregnant and parenting women. A MPPS program could potentially connect young mothers who do not access prenatal care with adolescent specific prenatal resources.

Acceptability: Participant Perceptions of Peer Support Intervention

Results from the Peer Support Evaluation Inventory in this pilot trial demonstrated that participants in the MPPS intervention group had a high degree of satisfaction in the four subscales: supportive interactions, quality of relationships, perceived benefits of support, and satisfaction with peer support. Findings in this pilot trial are consistent with a randomized controlled trial of a telephone-based peer support intervention for adult mothers (Dennis, 2010). With respect to supportive interaction, participants in the intervention group indicated that their peer mentors provided them with emotional support (93.8%, n=15) and almost two thirds of the participants stated their mentor provided informational and appraisal support confirming peer
support includes the provision of these three supportive functions (Dennis, 2003).

With respect to maternal perceptions of relationship qualities, the majority of participants in this trial felt their peer mentors were trustworthy, accepting, empathic, and committed in their provision of support. More than half (62.5 %, n=10) believed their peer mentor was an important source of support and felt comfortable getting close to their peer. Consistent with Dennis (2010), few participants stated their peer mentor could tell when they were worried about something, depended on their peer or felt their peer mentor influenced how they acted. This is not a surprising finding since many of the participants in the intervention group (n = 12, 75%) felt they did not require additional support and had less than 6 contacts with their peer mentor. Participants positively evaluated their peer mentors’ qualities related to social competence and social skills. None of the participants felt that their peer mentor talked too much, a complaint found in previous peer support trials (Dennis, 2010)

Negative effects of peer support, such as conflict between peer mentors and participants, were rare in this trial. Only one participant (6.3%) indicated that her peer mentor pressured her to change. No participants indicated that their peer mentor was over-involved in their problems, made them feel guilty or angry, criticized them or minimized their problems. The low number of negative effects in this pilot trial are similar to another peer support trial with adult mothers where 9.6% of participants indicated their peer volunteer minimized their problems, 5.6% stated their peer would get over-involved in their problems, 3.1% indicated their peer pressured them to change, and 1% or less stated their peer was critical of them or made them feel guilty or angry (Dennis, 2010).

Maternal perceptions of perceived benefits showed that approximately half of the participants felt their peer mentor helped them with stress and coping, social integration and social construction. On average, many participants (65.1%) reported improvements in stress and
coping (such as being more able to solve problems and feeling less tense) with 43.4% attributing these improvements to their peer mentor. More than three quarters of participants reported improvements in social integration (such as feeling less isolated from others and more knowledgeable about their situation), with 59.7% attributing these improvements to their peer mentor. Over 80% of mothers reported improvements in social construction (such as feeling more satisfied with themselves, feeling more confident in their ability to care for their baby, and feeling more similar to other mothers), with 51.3% attributing these improvements to their peer mentor. These findings confirm peer support’s mechanism of action (Dennis, 2003) and are consistent with a previous telephone-based peer support study (Dennis, 2010) where 77.4% of participants reported improvements in stress and coping (52.2% attributed these improvements to their peer mentor), 80.4% of participants reported improvements in social integration (68.3% attributed these improvements to their peer mentor) and 82.3% of participants reported improvements in social construction (58.3% attributed these improvements to their peer mentor).

Maternal satisfaction with the MPPS intervention was excellent, with all participants indicating they were either satisfied or very satisfied with their peer support experience and reporting that they would recommend this type of support to a friend. The findings related to high levels of satisfaction are similar to other perinatal peer support trials with adult mothers (Dennis, 2003, Dennis et al., 2009) and a peer support trial with adolescents experiencing chronic pain (Ahola Kohut et al., 2016). Based on comments from the open-ended questions, two main themes from participants were: 1) knowing they could connect with someone who has had similar experiences and is not judgmental; and 2) receiving support from someone they did not know. Suggestions for changes to the MPPS intervention included allowing participants to download an App on their personal mobile to receive peer support with their peer mentor as opposed to be given a research specific mobile phone with an installed Application.
Participant Adherence to the Trial Protocol

Retention Rate

The majority of participants in this pilot trial completed outcomes measures at 12 weeks postpartum, with an overall retention rate of 82.5%. This retention rate is higher than other randomized controlled trials with adolescent mothers, which have ranged from 59% (Meglio et al., 2010) to 63.5% (Barnet et al., 2002). Retaining adolescent mothers in research studies has been identified as a challenge (Pinto-Folz et al., 2011; Seed et al., 2009; South-Paul et al., 2014). Retention strategies were considered before this trial began, which included obtaining multiple types of contact information from participants (such as phone numbers, Facebook address, email address, etc.) and providing incentives to participants. In addition to these retention strategies, the PI contacted the participants multiple times in order to arrange a date to complete the data collection forms by phone with the research assistant. Having the PI arrange the follow-up appointment was important because the participants already had an established relationship with the PI and the PI was aware of the ease with which each participant could be contacted. For example, if the PI needed to make multiple contacts to coordinate a date to sign consent forms at the beginning of the trial, there was a greater chance of the PI needing to make multiple contacts to arrange the data collection dates. The PI would start by notifying the participant 1-2 weeks before the end of the study (by text message or private Facebook message, depending on the recruitment method of the participant and their preference for contact) to let them know they needed to complete the data collection forms soon and that they would receive their final incentive after the data collection forms were completed. Less than half of the participants (n=15) would respond to the PI within 1-2 to days to acknowledge receipt of the text message or Facebook message and inform the PI of a day and time they were available to complete the data collection questionnaires. For those participants who did not respond within 1-2 days, the PI
would send a reminder message. If participants did not respond to the 2nd message reminder within 3 days, the PI would try to call the participant at the same number. Some participants responded to the initial text message but then did not respond to subsequent messages to arrange the appointment date and time. For some participants (n = 6), the PI needed to contact a back-up number for a friend or family member (n = 3), send an email message (n=2) or contact a landline number (n=1).

The postpartum period is demanding for all mothers but as mentioned previously, adolescent mothers in particular face greater challenges, such as chaotic home environments, unstable lifestyles, multiple stressors, and conflicts with their mothers (Pinto-Folz et al., 2011; South-Paul et al., 2014). The PI attempted to ensure the text messages or voice mail messages were positive, easy-going and non-judgmental for participants. Frequently the participants would apologize for lengthy delays in replying. For the participants who required >10 reminder contacts (n=3), the PI asked participants if they experienced negative feelings (i.e.: feelings of intrusiveness) about the frequency of the contacts. Each of these participants stated that the frequent contacts were not perceived negatively. Participants informed the PI that they forgot to return the call or text message because they were too busy, and the frequent contacts were a good reminder for them to contact the PI. A future trial should incorporate the retention strategies from this pilot study together with successful retention strategies from other studies. Three systematic reviews have assessed effective retention strategies in research (Booker, Harding, & Benzeval, 2011; Brueton et al., 2013; Robinson et al., 2015). One review focused specifically on in-person follow-up (Robinson et al., 2015) while the other two reviews considered a variety of types of follow-up, such as in-person and phone-based follow-up (Booker, et al., 2011; Brueton et al., 2013). Some promising strategies which could be incorporated into a future trial include 1) using incentives (Booker et al., 2011; Brueton et al., 2013; Robinson et al., 2015); 2) reminding
participants to complete questionnaires through repeated calls; 3) obtaining multiple modes of contact such as email or social media contact information (Booker et al, 2011; Robinson et al., 2015); 4) hiring research staff with strong interpersonal skills (Robinson et al., 2015); and 5) conducting follow-up by telephone (Brueton et al., 2013). Using a larger number of retention strategies appears to retain more study participants (Robinson et al., 2015).

**Intervention Dosage**

Almost all of the contacts between peer mentors and participants were made by text message, suggesting text-messaging is the preferred mode of contact to deliver a MPPS intervention to adolescent mothers. This finding is not unusual since research has shown that text messaging is the dominant mode of communication between adolescents, with 63% sending text messages on a daily basis (Lenhart, 2015). In this pilot trial, peer mentors initiated the majority of contacts (68.6%), however this finding is lower than a previous telephone-based peer support for adult mothers (Dennis et al., 2009), where peer mentors initiated 93% of contacts. A possible reason for this difference could be related to the dominance and high frequency of text messaging among the general adolescent population, which may make this mode of communication more acceptable for participants to reach out to peer mentors.

Based on data collected in the electronic activity logs, peer mentors reported that the most frequent form of support they provided was emotional support (95.9%), followed by appraisal support (65.3%), and informational support (46.3%). When participants completed the PSEI, 93.8% indicated that they received emotional support, 65.7% indicated they received informational support and 64.1% indicated they received appraisal support. These findings indicate consistency between the peer mentor’s perception of support provided and the participant’s perceptions of support received. Overall, these findings confirm that the defining
attributes of peer support included the provision of these three supportive functions, which is consistent with Dennis et al.’s (2009) telephone-based peer support trial.

Less than one third of participants in the intervention group received the suggested 10 contacts per participant (mean number of contacts = 7.1, SD 6.0). Peer mentors indicated the reasons they did not make the suggested 10 contacts was because participants did not want the additional contacts and the peer mentor did not want to reach out to participants too often for fear of being considered intrusive and prompting negative feelings for the participant. The PI’s experience in contacting participants for follow-up appointments suggests that participants may not reply to their peer mentor’s contacts because they are busy and not because they do not want to communicate with their mentor. This assumption is supported by the a strong and positive correlation between the number of contacts and participant satisfaction with their peer support experience ($r = 0.65, p = 0.007$), suggesting that the greater the number of contacts, the greater the satisfaction reported by participants. However, previous peer support studies suggest that sometimes only a small number of contacts are necessary to improve clinical outcomes (Dennis et al., 2002; Dennis et al., 2009). For this reason, peer support should be provided based on a participant’s individuals needs with only minimal initial contacts required to get the relationship established. For a future trial, peer mentors should be trained about the link between the number of contacts and participant satisfaction. In addition, the same non-judgmental, easy-going and positive strategies used by the PI during follow-up communications with participants could be promoted and practiced during role-playing in the training sessions. There was also a strong and negative correlation between participant age and number of peer mentor contacts ($r = -0.64, p = 0.005$) and duration of contacts ($r = - 0.64, p = 0.006$) suggesting that younger participants are associated with a greater number of contacts and duration of support.
Secondary Outcomes
Depressive Symptomatology

The overall prevalence of probable major depression in this study (EPDS score >12) was 12.5% (12.5% in the control group and 0% in the intervention group). This finding is much lower than prevalence rates reported in several other studies with adolescents. In six cross-sectional and prospective cohort studies that measured major depressive symptomatology between 2-12 weeks postpartum (Chen, 1996; Figueiredo et al., 2007; Hudson et al., 2000; Logsdon et al., 2005; Schmidt et al., 2006; Secco et al., 2007), the PI calculated the average prevalence to be 37.8% (95% confidence interval 34.3% - 40.3%). Possible reasons why the prevalence rate in this current pilot trial is lower than the estimated 37.8% could be related to 1) excluding participants with an EPDS score >12; 2) small sample size; 3) potential stigma to report depressive symptoms; and 4) the potential fear of having their child apprehended if depressive symptoms were reported.

With respect to probable minor depression (EPDS score >9), the overall prevalence of PPD in this pilot trial was 36.4%. While Logsdon and Myers (2010) recommend that the EPDS be used as a PPD screening tool for adolescent mothers, they found that the EPDS performs very differently in adolescent mothers compared with adult mothers. They suggested that the cutoff value used to screen for depression among adolescent mothers may need to be lower than the current recommended cutoff of > 12 in order to obtain similar performance measures when used in adults. For example, they suggest that a “cutoff of 5 in an adolescent population may produce similar results (sensitivity 0.8, specificity 0.6) to a value of 12 in an adult population” (Logsdon & Myers, 2010, p. 1126). Further research is warranted in order to determine the optimal EPDS cut-off score for adolescent mothers.

After controlling for baseline depressive symptomatology in this pilot trial, participants in
the intervention group had a lower mean EPDS score at 12 weeks postpartum compared to the control group ($F = 4.25$, $p = 0.048$, $d = 0.56$). These preliminary results suggest a possible positive trend in favor of the intervention group and indicate that depressive symptomatology may be amenable to a MPPS intervention. However, a future definitive randomized controlled trial is required in order to examine the effectiveness of the peer support intervention on PPD prevention.

While the association between the duration of contacts and EPDS scores was weakly correlated, the association between the number of contacts and EPDS scores at 12 weeks postpartum was negative and strong ($r = -0.89$, $p = 0.73$). This finding suggests that a higher number of contacts between participants and their mentor may be associated with lower EPDS scores. However, the association between those participants who received at least 10 contacts and mean EPDS score at 12 weeks postpartum was not strong ($r = 0.20$, $p = 0.44$). While these findings suggest that a greater number of contacts may be associated with lower EPDS scores, it does not appear that the suggested 10 contacts was associated with lower EPDS scores. These results suggest that a standardized MPPS intervention is not necessary which is consistent with previous telephone-based peer support interventions evaluating individualized support in the perinatal period (Dennis, 2002, Dennis et al, 2009). Other explanations for these findings could be related to research showing that it is not necessarily the quantity of interactions and relationships that is most strongly associated with positive health outcomes but rather, the quality of these interactions and relationships (Balaji, Claussen, Smith, Visser, Morales, & Perou, 2007). As well, the perception that support is available, if needed, rather than the actual provision of support, may be another explanation for the finding that the number of contacts may or may not influence health outcomes. Research has shown that perceived support may actually have a stronger influence on health outcomes than the actual received support (Wills & Shinar, 2000).
For a future trial, initial contact between the peer mentor and the participant should be verified with subsequent provision of peer support being individualized and solely based on participant’s need.

**Anxiety**

The overall prevalence of anxiety symptomatology (STAI-S > 40) at 12 weeks postpartum in this pilot study was 18.4% (13.3% in the control group and 23.5% in the intervention group). This finding is similar to a large meta-analysis, which found a prevalence of self-reported anxiety in the postpartum period of approximately 15.0% (95% CI 13.7-16.4; Dennis, Falah-Hassani & Shiri, 2017). Although the prevalence of anxiety symptomatology was higher in the intervention group compared to the control group, an ANCOVA analysis showed that participants in the intervention group demonstrated lower STAI-S scores at 12 weeks postpartum compared to participants in the control group after controlling for baseline STAI-S scores ($F = 0.14$, $p = 0.71$). This finding shows a positive trend in favor of the intervention group, suggesting that anxiety symptomatology may be amenable to a MPPS intervention. A future, definitive randomized controlled trial is required in order to examine the effectiveness of the peer support intervention on anxiety.

The comorbidity between anxiety and postpartum depression (referred to as ‘anxious depression’) has been a consistent finding in the literature (American Psychiatric Association, 2013; Matthey et al., 2003, Vesga-Lopez et al., 2008). In this pilot trial, participants in the intervention group showed lower depressive symptomatology but higher anxiety symptomatology compared to the control group. These findings are consistent with previous research indicating that anxiety is more prevalent than depression during pregnancy and/or the postpartum period (Heron et al. 2004; Lee, Lam, Sze Mun Lau, Chong, Chui, & Fong, 2007). However, this finding is not consistent with a large peer-support trial among adult mothers
(Dennis et al., 2009), which found lower depressive symptomatology in the intervention group (14%) compared with the control group (25%; \( \chi^2 = 12.5, P < 0.001 \)), as well as lower anxiety symptomatology in the intervention group (21%) compared to the control group (27%; \( \chi^2 = 3.66, p = 0.055 \)). A possible reason for this discrepancy could be that some women with anxiety problems in the perinatal period exhibit only anxiety and do not experience the persistently low mood or loss of pleasure that typifies depression (Matthey et al, 2013; Ross et al, 2005). Since there is a paucity of research exploring anxiety among the adolescent perinatal population, further research in this area is warranted to explore the link between PPD and anxiety among adolescent mothers.

While there was a negative association between number of contacts and the 12-week postpartum STAI-S score \( (r = -0.41, p = 0.88) \), results also showed a positive and moderately strong association between duration of contacts and the 12-week postpartum STAI-S score \( (n = 17; r = 0.51, p = 0.03) \). This finding suggests that participants who had a greater duration of contact with their mentor also had higher levels of anxiety. It is possible that participants with higher levels of anxiety were encouraged and willing to express their feelings of anxiety to their peer mentor, hence the reason for the greater duration in contacts. However, a larger, definitive randomized controlled trial is needed to explore and understand the relationship between duration and number of contacts, and anxiety symptomatology.

**Social Support**

There were no significant differences found between the intervention and control group with respect to the number of social supports available or social support satisfaction, which suggests that the MPPS intervention may not influence these variables. However, due to the small sample size, this conclusion cannot be made. Both groups had moderate levels of social support availability and high levels of social support satisfaction. Adequate social support is
important in the perinatal period, particularly for adolescent mothers when their natural support networks may diminish causing isolation, role conflict and lack of support (DeVito, 2010).

There was a negative association between the number of social supports available (SSQ6-N) and depressive symptomatology, as well as the social support satisfaction and depressive symptomatology. These findings suggest that a decrease in the number of social supports available and a decrease in social support satisfaction are associated with increased depressive symptomatology. This is consistent with previous research among adolescent mothers. In a cross-sectional study examining the levels of depression, self-esteem, loneliness, and social support among adolescent mothers enrolled in the New Parents Project (an Internet-based program that offers health information and support), a negative relationship was found between social support and depressive symptomatology (n = 21, r = -0.61, p ≤ 0.05; Hudson et al., 2000). The salient role of social support and social networks has been identified as a key social determinant of health, which is recognized by the World Health Organization (2008) and the Public Health Agency of Canada (Butler-Jones, 2008). Moreover, numerous research studies have shown that social ties and social support are causally related to improved mental health (Kawachi & Berkman, 2001; Lakey & Cronin, 2008).

Health Services Utilization

There were no significant differences between the intervention and control groups with respect to health service utilization. This finding may be consistent with previous research, which determined that some adult mothers do not proactively seek out help in the postpartum period (Dennis & Chung-Lee, 2006). Peer mentoring could potentially break down these barriers for adolescent mothers and is an important area for future research.

Adolescents can be difficult to engage in health care services, because they are protective of their own privacy and fear being judged (Robb, McInery & Hollins-Martin, 2013; Thompson,
In addition to providing direct support, peer mentors could also potentially be seen as a bridge between adolescent mothers and health care providers, in terms of helping them understand what type of information they should be asking health care professionals and giving young mothers the confidence to raise these questions. Sometimes young mothers feel afraid or threatened to ask questions because they may be perceived as poor mothers (Thompson, 2016). If young mothers do not have a positive relationship with their postpartum health care provider, they may not want to raise questions or ask for further supports or resources. This is congruent with other research, which found that young mothers were hindered from obtaining or making use of available support and information because of the fear of stigmatization (Robb et al., 2013).

**Study Strengths and Limitations**

**Strengths**

This was the first study to evaluate the feasibility, acceptability and adherence of a MPPS intervention for the prevention of postpartum depression among adolescent mothers. The methods employed in this pilot trial were robust and addressed some of the methodological weaknesses found in other PPD prevention interventions among adolescent mothers (Barnet et al., 2002; Ginsburg et al., 2012; Logsdon et al., 2005). The strengths of this trial include the use of a pilot RCT design, collaboration with a community partner, defined eligibility criteria for peer mentors, precise inclusion and inclusion criteria for participants, the use of reliable and valid instruments appropriate for an adolescent population, and blinded outcome assessments by an RA not involved with the study.

The MPPS intervention used in this pilot trial was adapted from a previously evaluated telephone-based peer support intervention (Dennis, 2003; Dennis et al., 2009). The intervention aligned with the peer support conceptual framework used to guide this study. The peer mentor training was delivered in a standardized format using the same peer support training outline and
manual for all sessions to prevent compliance bias. Although the peer support intervention was individualized for each participant in terms of not requiring a prescribed dose for the number of text-messages or voice calls made to each participant, the provision of support followed the theoretical components of peer support (emotional, informational, and appraisal support). Participants in the intervention group were provided with a secure, password protected mobile phone for use during the study, which was only connected to their peer mentor, thereby reducing the risk of contamination bias. Only participants in the intervention group received the active ingredients of peer support.

In order to prevent selection bias, the randomization process used sequentially numbered, opaque, sealed, envelopes in random blocks of 4 and 6 with stratification by previous history of depression, which were constructed by a RA not involved in the study. This process ensured that each participant had the same chance of being assigned to the MPPS intervention group or the control group and ensured a balance in the number of participants allocated to each group. Since this was a community-based pilot study, there was no control over the participants in either group receiving additional support from family, friends and healthcare providers in the prenatal and postpartum periods. However, the randomization process helped to guarantee that any co-intervention would occur in a similar manner and would be equally distributed between participants in the control and intervention groups, thereby not threatening the integrity of the trial results.

Data were collected using reliable, valid tools to measure the outcomes in this study. The questionnaires demonstrated very good psychometric properties, including sufficient internal consistency and validity. In order to track data completion, a tracking form was created to trace all participants. As the outcome data were collected, the data tracking form was updated on a biweekly basis. Blinding of participants in this study was not possible, however in order to
prevent detection bias, the RA who collected outcome data was blinded to group allocation. The Peer Support Evaluation Inventory was the last questionnaire to be administered at which time, the RA opened a sealed, opaque envelope revealing group allocation. The PI and another RA who was blinded to the entire study protocol double entered all primary outcome data and 20% of secondary outcomes onto separate Microsoft Excel® databases. Logic and range checks were applied to verify the accuracy of the data. Results were compared and the few discrepancies that were found were corrected prior to data analysis. Reporting bias was prevented with all outcome data described in the results section.

Attrition bias was low with follow-up rates exceeding 80% in both the intervention and control group, which is similar or higher to follow-up rates reported in other intervention studies with adolescent mothers. The main reason for the loss to follow-up was an inability for the PI to contact the participant to schedule an appointment to complete follow-up questionnaires. An intention to treat protocol was followed with participants being randomized to the intended group and receiving the intended intervention without any violations.

Limitations

There are a number of limitations, which may have influenced the results of this pilot trial. This study was conducted in a single metropolitan area, therefore generalizability of the findings are limited. While the self-report questionnaires used to collect data demonstrated very good psychometric properties, the nature of self-reporting increases the potential for response bias. Both the participants and peer mentors evaluated their peer-support experience positively, although it is not known the extent to which social desirability influenced maternal and peer-mentor evaluations.

Technical issues with the mobile phones influenced the number of contacts between
participants and peer mentors. While peer mentors and participants attempted to remain positive when technical difficulties arose with the mobile phone applications, they reported that the poor connection and limited battery life of the mobile phones hindered them from connecting with each other as often as they would have liked. One participant was not able to receive any peer support because of technical issues with their mobile phone application. For this reason, the overall number of contacts made in their study may have been higher if no technical issues were encountered. Technical difficulties with the mobile phones may have also obstructed the development of a supportive relationship. While participants reported a high level of satisfaction with the peer support intervention, it is not known if the limited ethnic backgrounds of peer mentors created feelings of discomfort for participants to open up with their peer mentor and if this deterred participants from establishing a relationship and connecting with their peer mentor.

Recruitment and retention challenges may have influenced results in this study. The initial low recruitment rate did not allow for some of the peer mentors to get connected with a participant right away. While the PI attempted to maintain a connection with all mentors on a regular basis (both with those connected with a participant and those not connected with a participant), it is not known if the delay to be matched with a participant negatively influenced a mentor’s feeling of engagement with the research study. In addition, obtaining follow-up data required the PI to make repeated contacts to several participants. Many participants who received multiple contacts to complete follow-up questionnaires reported that they did not feel these repeated contacts were intrusive. However, it is not known if other participants were negatively affected by the repeated contacts, which may have influenced follow-up rates.

Finally, in this trial, participants in the control group and peer support group may have received support from family or friends who had previous experience as an adolescent mother. Any co-intervention, or provision of unintended additional care, could have occurred in a similar
manner for participants in both the control and peer support groups. However, this type of lay support co-intervention is conceptually different from the peer support intervention and therefore does not threaten the integrity of the results in this pilot trial.
Summary

Adolescent mothers are a particularly vulnerable maternal population who are at approximately three times greater risk for developing postpartum depression (PPD) compared to adult mothers, with an estimated prevalence of 38% (Chen, 1996; Figueiredo et al., 2007; Hudson et al., 2000; Logsdon et al., 2005; Schmidt et al., 2006; Secco et al., 2007). An extensive body of research has confirmed that PPD is the most frequent form of maternal morbidity following childbirth and has serious negative consequence including maternal suffering, paternal suffering, impaired maternal-infant interactions, and cognitive, behavioral and emotional problems in infants and children (O’Hara & McCabe, 2013). Due to the high prevalence and burden of disease of PPD for adolescent mothers, it is important to find effective, evidence-based PPD preventive interventions, which are acceptable to adolescent mothers. Lack of social support has consistently been identified as a key predictor for PPD in adolescent mothers (Nunes & Phipps, 2012). However no effective interventions exist that specifically target social support in adolescent mothers. Individualized, telephone-based peer support has demonstrated a reduction of postpartum depressive symptomatology by 50% in adult mothers (Dennis et al., 2009), however it is not known if this intervention is feasible or acceptable for adolescent mothers. Using the peer support conceptual framework (Dennis, 2003), an individualized MPPS intervention was developed. The main purpose of this pilot randomized controlled trial was to evaluate the feasibility and acceptability of the MPPS intervention and compliance with the trial protocol to inform a future definitive full-scale randomized controlled trial.

Forty eligible and consenting pregnant adolescents were recruited from the community
and randomly allocated into either the intervention group or the control group. Adolescents in the
control group received standard prenatal and postpartum in-hospital and community care.
Adolescents in the intervention group received standard care plus a MPPS intervention provided
by a trained peer mentor during the participant’s last trimester of pregnancy and the first 12
weeks postpartum. Peer support was provided either via voice calling or text messaging,
depending on the participant's preference. The mean age for all participants in the study was 21.6
years (SD 1.8) with a range from 17-24 years. Participants were a mean of 32.5 (SD 4.3) weeks
pregnant with a range from 28-40 weeks. The mean age for peer mentors was 21.3 years (SD
1.8).

Descriptive statistics were used to analyze research questions related to the feasibility,
acceptability and adherence to the trial protocol, such as recruitment, retention, follow-up rates,
etc. Additionally, acceptability by participants in the intervention group was evaluated via a
questionnaire to determine likes/dislikes and areas for improvement. Secondary research
questions were used to determine the preliminary effect of MPPS on depressive
symptomatology, anxiety, social support, and health service utilization at 12 weeks postpartum.
Depressive symptomatology and anxiety were measured using descriptive statistics and Analysis
of Covariance (ANCOVA) controlling for baseline depression and anxiety scores respectively.
Social support and health service utilization were measured using descriptive statistics and
independent sample t-tests.

The recruitment rate for peer mentors was 6 peer mentors per month over 2 months and
the acceptance rate for enrollment of peer mentors was 100%. The recruitment rate for
participants after an ethics amendment to include online recruitment was 6 participants per
month over 5 months, with an acceptance rate for enrollment of 67.8%. Half of the enrolled
participants (n=20) were recruited online via Facebook. The retention rate in this study was
82.5%. Overall, 100% of participants indicated they would recommend this type of support to a friend and agreed or strongly agreed that they were satisfied with their peer support experience. Analysis of secondary outcomes revealed that 12.5% (n=2) of participants in the control group had an Edinburgugh Postnatal Depression Scale (EPDS) score of > 12 whereas none of the participants in the intervention group had a EPDS score >12. After controlling for baseline depressive symptomatology, participants in the intervention group demonstrated lower mean EPDS scores at 12 weeks postpartum compared to participants in the control group. There were no group differences in anxiety, social support or health service utilization.

Implications

Implications for Research

This pilot trial demonstrated that MPPS may be a feasible and acceptable way to provide support to adolescents during pregnancy and in the postpartum period. This pilot work also demonstrated acceptable adherence to the trial protocol. Preliminary evidence suggests that the peer support intervention may be beneficial in preventing depressive symptomatology among adolescent mothers and a definitive randomized controlled trial is warranted.

Sample size estimates were calculated for a future trial. After controlling for baseline depressive symptomatology, participants in the intervention group demonstrated lower mean EPDS scores at 12 weeks postpartum compared to participants in the control group ($F = 4.25$, $p = 0.048$, $d = 0.56$). The effect size of 0.56 was used to calculate the sample size for a future definitive randomized controlled trial. Calculations were made using GPower software, where the total sample size needed to achieve 80% power with an alpha set at 0.05 and effect size of 0.56 is 82 participants. In order to account for a 25% loss to follow-up, a total sample size of 102 participants would be required with 51 participants in each group.
Recruiting a larger sample of adolescent mothers for a future trial would require a multi-city study and greater collaboration with community partners. Peer mentors should continue to be recruited from Young Parent Agencies and obtaining a greater diversity in peer mentor ethnicity should be a focus during recruitment. Collaborative relationships would need to be developed with agencies in order to obtain recommendations for suitable peer mentors. Online recruitment and presentations to young mother agencies and prenatal programs should continue to be the main method of participant recruitment since these were the most successful recruitment methods. A paid coordinator would need to be hired in order to organize and support the peer mentors at different sites. The coordinator would require training and intervention fidelity checks from the PI to ensure the reliable delivery of the peer support intervention. The responsibilities of the coordinator would be to conduct the peer mentor training, collect the training evaluation forms, match participants with peer mentors, monitor recorded voice-calls and text messages, provide on-going support to peer mentors, ensure Activity Logs were completed, and collect the peer mentor experiences questionnaires at the end of the study.

Findings from this study support the implementation of two modifications to the MPPS intervention. First, since many participants found the use of a research phone inconvenient and indicated they would have preferred to have used their personal mobile phone to connect with their peer mentor, a future definitive trial should allow participants to use their own phone during the study. The connection with the peer mentor could be made through a secure, free App downloaded onto their personal mobile phone. This App could be adapted from the App utilized in this current study by QoC Health. The App would require the use of the Internet; therefore participants would need access to Wi-Fi or have a data plan on their mobile phone in order to be able to access the App. Since the majority of the participants in this study had reliable access to Wi-Fi, it is anticipated that participants in a future trial would also have access to Wi-Fi. The
accessible use of the Internet by participants in this study is supported by a 2013 Canadian survey of 5,436 Canadian students in grades 4 to 11 (Steeves, 2014). This study found that Internet usage is universal with 99% of students being able to access the Internet outside of school on a daily basis (Steeves, 2014). Access to the Internet would need to be a new inclusion criterion for participants. Second, peer mentors should receive further training about the link between the number of contacts and participant satisfaction and reinforce the finding that while participants may be too busy to return calls or text messages, they do not feel messages are intrusive if they are provided in a supportive and non-judgmental manner. These strategies should be promoted and practiced during role-playing in the training sessions. Consistent with prior research (Logsdon & Myers, 2010), future research is also needed to determine the optimal EPDS cut-off score for adolescent mothers.

Future research should also be attuned to the rapidly changing ways in which adolescents use social media. For example, in the past three years, there has been a shift in social media use for adolescents between the ages of ages 13-17 years (Pew Research Center, 2018). The 2018 survey by the Pew Research Center (PRC) in the United States found that social media sites, such as Instagram and Snapchat are becoming more popular with this younger age group. Yet, socio-economic status can play a role in the type of social media used. The PRC survey found that adolescents from lower-income households are far more likely than those from higher income households to use Facebook than other social media sites (Pew Research Center, 2018). Targeting multiple social media sites should be considered for a future study.

Knowledge Translation

The goal of the knowledge translation (KT) plan for this pilot study is to generate awareness and interest in Young Parent Agencies and the research community about the
potential use of MPPS as a method of preventing postpartum depression (and ultimately adverse maternal and infant outcomes) among adolescent mothers. Mobile phones may be an efficient way to promote health in a hard to reach population, and identified knowledge users have the connections and the capacity to implement this intervention broadly.

Integrated Knowledge Translation

Integrated KT approaches already used in this project include active collaboration and partnership with community members, since the onset of the study in order to guide the development of this proposed research project. The principal investigator (PI) has been a member of the Young Parents No Fixed Address (YPYNFA) network since 2011 and sits of the Model of Care committee. It was based on meetings with other YPNFA members that the needs and gaps in support services for the adolescent mother population in Toronto were identified and subsequently led to the creation of the current study. YPNFA members have been involved in the conceptualization of the study, such as identification of recruitment and retention strategies for participants and peer mentors and assessment of the potential technical challenges in using mobile phones as a form of communication with adolescent mothers.

End of Project Knowledge Translation

End of project KT strategies are focused on the engagement of knowledge users and the research community to ensure scalability. The following actions have been taken to share lessons with knowledge users: 1) presentation of research findings by the PI to YPNFA members during a YPNFA meeting on May 15, 2018; 2) presentation by the PI and one peer mentor at the Trillium Primary Health Care Research Day in Toronto, Ontario on June 6, 2018; and 3) dissemination of a YouTube video describing the research study and experiences of the peers in the mobile phone peer support intervention. The video is posted on the YPNFA website and Women’s College Hospital Women’s XChange website. Other future KT strategies include: 1) a
presentation to stakeholders at Toronto Public Health; 2) a plain language summary report posted on the YPNFA website and disseminated to the YPNFA and Ontario Women’s Health Network email list-serves; and 3) a one page brochure distributed to all young parent agencies in the Greater Toronto Area. In order to disseminate findings to the research community, results of the study will be presented at the Canadian Association of Perinatal and Women’s Health Nurses (CAPWHN) in Ottawa, Ontario on October 13, 2018 and the Canadian Mental Health Association (CMHA) Conference in Montreal, Quebec on October 23-24, 2018. Results will also be submitted to at least one peer-review journal for publication.

**Conclusion**

Adolescent mothers are at increased risk of developing postpartum depression (PPD) compared to adult mothers. Lack of social support has been identified as a key predictor of PPD among adolescent mothers, however no interventions to date have targeted MPPS in the prevention of PPD. This pilot trial demonstrated that MPPS is a feasible and acceptable way to provide support to adolescents during pregnancy and in the postpartum period, and the outlined protocol has acceptable adherence. Preliminary evidence also suggests that the peer support intervention may influence depressive symptomatology among adolescent mothers, and a definitive randomized controlled trial with an adequate sample size is warranted to determine the effectiveness of this intervention as a preventive strategy.
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### Appendix A: List of PPD Prevention Studies Among Adolescent Mothers

<table>
<thead>
<tr>
<th>Author, Date, Country</th>
<th>Purpose of Study</th>
<th>Research Design / Participants</th>
<th>Depression Instrument</th>
<th>Intervention</th>
<th>Results</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnet, Duggan, Devoe &amp; Burrell, 2002</td>
<td>To evaluate the effect of a volunteer model home visitation program on adolescent parenting stress, parenting behaviours and mental health</td>
<td>RCT 232 adolescents recruited from a school for childbearing adolescents (118 intervention group, 114 control group), age 12-18 years, at 28 or more weeks gestation or had delivered a baby in past 6 months</td>
<td>Mental Health Inventory - 5 (MHI-5) measured at baseline and 15 months postpartum</td>
<td>Intervention group: Female volunteers (&gt;21 years of age) recruited from the community received 16 hours of training to implement an in-home parenting curriculum. Volunteers provided weekly 1½ hour visits for a duration of one year. Each volunteer was paired with one teenager. Control group: Usual services provided by school</td>
<td>Intervention group showed significantly better parenting scores at follow-up than the control group ($P=.01$) but showed no differences in parenting stress or mental health</td>
<td>Unclear when baseline MHI-5 was administered. In the intervention group, only 54% remained engaged and actively participating at 12 months. Actively participating mothers received approx. 1 visit per month (75% less than specified by the model)</td>
</tr>
<tr>
<td>Ginsburg et al., 2012</td>
<td>To evaluate the feasibility of a depression prevention program for American Indian (AI) adolescent s and young adults.</td>
<td>Pilot RCT 47 pregnant AI women recruited from (22 assigned to intervention group, 25 to education support group), 15–19 years (mean age = 18.15 years), gestational age 28 weeks or less, CES-D score of 16 or higher.</td>
<td>Center for Epidemiological Studies of Depression (CES-D) at baseline, 4, 12, and 24 weeks postpartum. Other measures: Edinburgh Postnatal Depression Scale (EPDS); Interview Schedule for Children-Computer Version; Social Support Index; Global Assessment Scale for Children Postpartum</td>
<td>Intervention group: Living in Harmony program (LIH), eight weekly 30–60-minute in-home (or in office) sessions initiated prior to 29 weeks gestation and three monthly booster sessions. Sessions included psychoeducation, identification of depressive cognitions and behaviours, problem-solving skills, enhancing social supports and planning for the future. Control group: Educational-Support program (ES), eight weekly, 30–60-min in-home or office sessions (initiated prior to 29 weeks gestation) and three booster sessions. Both interventions delivered by AI paraprofessionals.</td>
<td>Only means reported for CES-D and EPDS. At all post intervention assessments, mothers in both groups showed similar reduction in depressive symptoms and similar rates of MDD (0 and 6% in LIH and ES respectively). Both groups showed similar improvements in global functioning. No changes in either group for social support.</td>
<td>Small sample size, high attrition rate (32% in LIH, 24% in ES), no usual care control group.</td>
</tr>
<tr>
<td>Author, Date, Country</td>
<td>Purpose of Study</td>
<td>Research Design / Participants</td>
<td>Depression Instrument</td>
<td>Intervention</td>
<td>Results</td>
<td>Limitations</td>
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<tr>
<td>Logsdon, Birkimer, Simpson &amp; Looney, 2005 USA</td>
<td>To determine the effectiveness of a social support intervention delivered to pregnant adolescent girls between 32 and 36 weeks of gestation in preventing symptoms of depression at 6 weeks postpartum.</td>
<td>Repeated measures design 128 pregnant and postpartum adolescents from an alternative public school for pregnant and parenting adolescents.</td>
<td>Postpartum Support Questionnaire; Rosenberg’s Self-Esteem instrument; Center for Epidemiological Studies of Depression instrument at 32 to 36 weeks of pregnancy and 6 weeks postpartum.</td>
<td>Participants completed the instrument at baseline, then were randomly assigned to one of three intervention groups (pamphlet, video, or pamphlet plus video) or control group. The content of the intervention was based on a synthesis of the literature describing social support needed and desired by postpartum adolescents.</td>
<td>No significant differences in Center for Epidemiological Studies of Depression instrument scores among the groups at 6 weeks postpartum. Using path analysis, predictors of symptoms of depression at 6 weeks postpartum were (a) receiving more support from friends, family, and others and (b) having low self-esteem.</td>
<td>109 participants completed questionnaires at 6 weeks postpartum</td>
</tr>
<tr>
<td>Phipps, Raker, Ware &amp; Zlotnick (2013) USA</td>
<td>To estimate the effect of an interpersonally oriented intervention on the reduction of PPD in primiparous adolescents</td>
<td>Pilot RCT (blinded), 106 pregnant primiparous adolescents (54 intervention group, 52 control group) who were ___ 17 years at conception and &lt; 25 weeks gestation at 1st prenatal visit Mean age = 16</td>
<td>KID-SCID* at baseline and 48 hours, 6 weeks, 3 months and 6 months postpartum</td>
<td>Intervention group: REACH (Relaxation, Encouragement, Appreciation, Communication, Helpfulness) interpersonal therapy program x 5 one hour prenatal sessions and one postpartum session. Control group: attention and dose-matched program on prenatal education (maternal health, fetal development, nutrition, preparation for labor, taking home a baby). No overlap in content in control group with REACH program</td>
<td>At 6 months postpartum, rate of depression was significantly lower in the intervention group (12.5%) compared to the control group (25%). Hazard rate ratio 0.44 (CI 95%, 0.17-1.15)</td>
<td>Small sample size, initially sessions delivered as group sessions but participants preferred individual sessions therefore program was modified</td>
</tr>
</tbody>
</table>

* Notes: RCT: Randomized Controlled Trial; CES-D- Center for Epidemiological Studies–Depression Scale, CES-DC- Center for Epidemiological Studies–Depression Scale, Children, EPDS- Edinburgh Postnatal Depression Scale, KID-SCID –Structured Clinical Interview for DSM-IV, Childhood Diagnoses, DISC - Diagnostic Support Questionnaire, Rosenberg’s Self-Esteem instrument, and the Center for Epidemiological
Appendix B: Peer Support Conceptual Framework

From Dennis (2003)

<table>
<thead>
<tr>
<th>Personal Characteristics</th>
<th>Selection Process</th>
<th>Training</th>
<th>Provider Category</th>
<th>Defining Attributes</th>
<th>Consequences Effect Model</th>
<th>Potential Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lay individuals eligible to participate in supportive interventions due to similar characteristics with the target population</td>
<td>Lay individuals selected by community members</td>
<td>Minimal</td>
<td>Natural Lay Helpers</td>
<td>Emotional Support</td>
<td>Augmenting Social Network</td>
<td>Preventing Health Concerns</td>
</tr>
<tr>
<td>Lay individuals selected by health professionals/program developers or self-selected</td>
<td>PEERS</td>
<td>Extensive</td>
<td>Paraprofessionals</td>
<td>Buffering Support</td>
<td>Reinforcing Help-Seeking Behaviour</td>
<td>Decreasing Barriers to Care</td>
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<td></td>
<td></td>
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<td></td>
<td>Appraisal Support</td>
<td>Encouraging Effective Coping</td>
<td>Promoting Social Comparisons</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Informational Support</td>
<td>Increasing Self Efficacy</td>
<td>Aiding Self-Esteem</td>
</tr>
</tbody>
</table>
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

LETTER OF EXPLANATION FOR YOUNG PARENT AGENCIES

TITLE OF PROJECT: Mobile Phone Based Peer Support to Prevent Postpartum Depression among Adolescent Mothers: A Pilot Randomized Controlled Trial

INTRODUCTION
My name is Barbara Chyzzy and I am a PhD student in the University of Toronto, Graduate Department of Nursing Science. I am conducting this study in partial fulfillment of the requirements for a PhD degree, under the supervision of Dr. Cindy-Lee Dennis, Professor of Nursing.

BACKGROUND
Prior research has shown that telephone based peer support is a convenient and useful way of delivering support in the early postpartum period and can significantly reduce the risk of postpartum depression. However, no research has been conducted with adolescent mothers to see if a similar type of program would work for this age group. Therefore, this research study aims to fill this gap in knowledge and determine the feasibility of delivering peer support to adolescent mothers by mobile phones (with voice-calling and text-messaging). Peer mentors (young mothers between the ages of 15-24 years old who have been recommended by a Young Parent No Fixed Address agency and have undergone a 12 hour training program) will provide support by mobile phone during pregnancy and for 3 months after delivery to new teen mothers.

PARTICIPANTS
Eligible participants are young women who are pregnant (> 28 weeks), aged 15-24 years and can read and understand English. Pregnant teens that have a known substance use disorder or serious medical / psychiatric illness will not be able to participate in this study because we believe they require specialized support which cannot be offered by this peer support program.

PURPOSE OF THE STUDY
The purpose of the study is to evaluate if a mobile phone based peer support program which uses both voice calling and text messaging is a feasible and acceptable way to provide
support to young mothers in the early postpartum period. I also intend to test the preliminary effects of mobile phone based peer support on depression and anxiety at 3 months postpartum. If this study is deemed to be feasible, a larger multi-city will be conducted.

DETAILS OF THE STUDY
Mothers will be randomly assigned (like a coin toss) to one of two groups. Randomisation means that neither the new mother nor I choose which type of support the new mother will receive; rather the type of support is chosen at random, or by chance. This process of choosing the type of support received is very important to be able to answer the question as to the effectiveness of the peer support program. Mothers who are randomized to the “usual care group” will receive all components of usual community and in-hospital prenatal and postpartum care and follow-up. No care will be withheld. Mothers randomized to receive “additional mobile phone based support” will receive the same community and in-hospital prenatal and postpartum care as all other mothers. In addition, a peer mentor will provide support by mobile phone during the pregnancy and for 3 months after delivery. A research nurse will telephone new mothers in both groups at 3 months postpartum to complete questionnaires.

RECRUITMENT OF PARTICIPANTS
Your assistance is greatly appreciated to identify new mothers at your agency that may be eligible to participate in this study. First, verbal permission must be obtained from the new mother prior to me approaching them. Therefore, I will be asking agency staff to use the “Permission To Approach Potential Participants Form” (see attached) to ask for permission from young pregnant teens for me to contact them to give a more detailed explanation about the study. The recruitment of participants will be conducted for a six month time period starting in the fall of 2015. As part of my appreciation for you taking the time to discuss my study with new mothers, I will have a monthly prize draw at your agency on the 4th Friday of every month. Additionally, I will provide you with the results of this study when completed. This would also be a great time to get your input for a larger trial to be conducted in the future. If you have any questions or comments about this study, please do not hesitate to contact me at 647-292-6521.

I look forward to the beginning recruitment and working with you.

Thank you very much for your support.

Sincerely,

Barbara Chyzzy, RN, MN, PhD(c)
Appendix D: Permission To Approach Potential Participants Form

This form is to be completed by a young parent agency staff member. Please identify potential participants who are: 1) 16-24 years old; 2) > 28 weeks gestational age (third trimester of pregnancy); and 3) able to read, speak and understand English. Pregnant teens that have a known substance use disorder or serious medical / psychiatric illness will not be able to participate in this study because we believe they require specialized support which is beyond the scope of this peer support program. Please read the following brief study explanation to potential participants:

“A registered nurse named Barbara Chyzzy, a PhD student at the University of Toronto, is conducting a study involving pregnant adolescents who are between 15-24 years old and are 28 weeks or more pregnant. The purpose of the study is to find out if mobile phone based support provided by an experienced young mother is helpful for new mothers during pregnancy and in the first 3 months after you deliver your baby. To compensate you for your time, you will receive $50 in gift cards. Ms. Chyzzy would like permission to contact you to further explain the study. The fact that you agree to have her contact you does not mean that you are consenting to participate in the study. It simply means that you are giving permission to have Ms. Chyzzy explain the study to you. There will be no risk to you; your prenatal and postpartum care will not change if you do not wish to get involved in the study. If you are interested in hearing more about the study, I will give your contact information to Barbara and she will be in touch with you soon. If you are not interested in the study, that is fine. Would you mind telling us why? It would help the researchers to know the reason why young mothers are not interested in the study. Thank you for your time.”

Participant verbal consent (please check one):
☐ OBTAINED, Ms. Chyzzy may contact potential participant
☐ NOT OBTAINED, Ms. Chyzzy may not contact potential participant

Please explain the reason for non-participation (if available):

Once this form has been completed, please call Barbara Chyzzy at 647-292-6521 to inform her of the participant’s name and contact number. Please keep this form at your agency in the Permission to Approach Potential Participants Form Collection Folder provided. Barbara will collect hard copies of the forms.

Name of Young Parent Agency: _________________________________________
Name of Young Parent Agency Staff: _________________________________________
Date: _________________________________________
Mother’s name: _________________________________________
Mother’s Phone #: _________________________________________
Appendix E: Participant Recruitment Flyer

ARE YOU PREGNANT AND BETWEEN 16-24 YEARS OLD?

Participants Needed for Research Study:

University of Toronto researchers would like to learn if support provided by an experienced young mother using a mobile phone is helpful for new mothers during pregnancy and in the first 3 months after you deliver your baby.

You may be able to participate if you are:

1. Between the ages of 16 to 24 years
2. 28 weeks or more pregnant
3. Able to speak, read and understand English

You will receive Walmart Gift Cards to show appreciation for participating in the study.

If you are interested in participating and would like to receive more information, please contact Barbara Chyzy from the University of Toronto at 647-824-2365.

This study has been approved by the University of Toronto Research Ethics Board.
# Appendix F: Log Form For Non-Participation

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Agency</th>
<th>Date (mm/dd/yy)</th>
<th>How did the participant hear about this research study?</th>
<th>Reason for non-participation (if available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>A = Advertising flyer (where?)</td>
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<td>2</td>
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<td>B = Informed by young parent agency (which one?)</td>
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<td>3</td>
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<td>C = Presentation</td>
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<td>4</td>
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<td>D = Online (give details)</td>
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<td>5</td>
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<td>E = Other (explain)</td>
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</table>
Appendix G: Participant Consent Form

MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

PARTICIPANT CONSENT FORM

TITLE OF PROJECT: Mobile Phone Based Peer Support to Prevent Postpartum Depression among Adolescent Mothers: A Pilot Randomized Controlled Trial

Principal Investigator: Barbara Chyzzy, RN, BN, MN, PhD (c), Lawrence S. Bloomberg Faculty of Nursing, University of Toronto

Co-Investigators: Dr. Cindy-Lee Dennis, Dr. Jennifer Stinson, Dr. LaRon Nelson and Dr. Simone Vigod

PURPOSE OF THE RESEARCH
You’re being invited to participate in this research study because you’re a young woman between 16-24 years old and are 28 weeks or more pregnant. We’d like to learn if support provided by an experienced young mother using a mobile phone is helpful for new mothers during pregnancy and in the first 3 months after you deliver your baby. Ms. Chyzzy will read through this form with you, describe the study procedures in detail and answer any questions you may have. This study has been approved by the University of Toronto Research Ethics Board.

DETAILS OF THE STUDY

Research Techniques:
If you choose to join in this study, you’ll be randomly placed (like flipping a coin) to one of two groups. If you are in Group 1, you’ll receive the regular kind of care other young mothers receive during pregnancy and after delivery. If you’re in Group 2, you’ll also receive the regular kind of care other young mothers receive during pregnancy and after delivery. In addition, you’ll receive support from another young mother by mobile phone during your pregnancy and for 12 weeks after you deliver your baby.
Description of research:

If you’re in Group 1, we’re asking that you agree to:
   a) Continue to receive the regular kind of care young mothers get during pregnancy and after delivery.
   b) Complete questionnaires with Ms. Chyzzy once you join the study.
   c) Complete questionnaires with a research assistant 12 weeks after your baby is born.
      These questionnaires will ask about depression, anxiety, and health services used during your pregnancy and after your baby was born.

If you’re in Group 2, we’re asking that you agree to:
   a) Continue to receive the regular kind of care young mothers get during pregnancy and after delivery.
   b) Complete questionnaires with Ms. Chyzzy once you join the study.
   c) Be paired with a peer mentor who is an experienced mother between 16-24 years old. You will be provided with a mobile phone to use during this study. This mobile phone will only work to talk or text with your peer mentor. You and your peer mentor will decide how often you want to call each other or if you prefer to use text messages.
   d) Complete questionnaires with a research assistant 12 weeks after your baby is born.
      These questionnaires will ask about depression, anxiety, and health services used during your pregnancy and after your baby was born. They will also ask how you felt about the peer support you received.

Potential Harms

There isn’t anything that we know of that could hurt you by participating in this study. But, when you are completing the questionnaires, you might feel a little uncomfortable with the questions. So we’ll make sure you have a private place to fill in these questionnaires. If you after completing the questionnaires you feel uncomfortable and need to see a healthcare provider, we’ll connect you to a public health nurse, your physician or your midwife to make sure you get the care you need.

The research team wants to make sure you and your infant are kept safe during the study. If we think you or your baby might get hurt for any reason, the law requires the researcher to contact the Children’s Aid Society (CAS) or 911. CAS might investigate if we are concerned about your safety or the safety of your baby and your baby. If the baby is being hurt, she or he might be removed from your care while the situation is being investigated.

If you are in Group 2, there is a chance you might not get along with your peer mentor and feel uncomfortable to talk or text with her. You don’t need to continue with the study if this happens.

Potential Benefits

You might benefit directly from this study, but the results will help us better understand if peer support by mobile phone is helpful for new mothers. It will also help us in the planning of a bigger study where we can find out if peer support prevents young mothers from getting
postpartum depression. This means the results from this study could help other young mothers in the future.

**Confidentiality**
All information obtained during this study is strictly confidential and no information about your identity will be given out or published without your approval (unless required by law). Instead of your name, we will identify you using a study number. All of our information will be kept in locked files and will be available only to the research team. Text messages and voice calls between participants and peer mentors will be recorded and put onto a secure database, which will (for safety and monitoring reasons) be reviewed only by the Ms. Chyzzy within 24 hours. All electronic data will be stored for 7 years and destroyed in a secure manner after this time. You will not be named in any reports, publications or presentation that may come from this study.

**Participation**
Your participation in this study is voluntary. If you choose not to participate in this study, you will continue to have access to all usual care during pregnancy and after you deliver your baby. You may withdraw from this study at any time and your withdrawal will not affect your future medical care.

**Reimbursement:**
As a way to say thank you for your participation, you will receive a $15 gift card after enrolling in the study, a $10 gift certificate 4 and 8 weeks after you deliver your baby as well as a $15 gift card upon when you complete questionnaires 12 weeks after you deliver your baby.

**Contact Information:**
If at any time you have any questions, problems or concerns you may contact Barbara Chyzzy, Principal Investigator at 647-824-2365 or Dr. Cindy-Lee Dennis, Professor and Supervisor at 416-946-8608.

If you have any questions about your rights as a participant, you can contact the Office of Research Ethics at the University of Toronto at 416-946-3273 or by email at ethics.review@utoronto.ca. The Research Ethics Board is a group of people who oversee the ethical conduct of research studies. These people are not part of the study team. Everything that you discuss will be kept confidential.
**Consent:**

By signing this form, I agree that:

1) The study has been explained to me and all my questions were answered.

2) The possible harms or discomforts and the possible benefits of this study have been explained to me.

3) I understand that I have the right not to participate and the right to stop participating in the study at any time. The decision about whether or not to participate will not affect any of my prenatal or postpartum care.

4) I am free now, and in the future, to ask any questions about the study.

5) I have been told my research records will be kept confidential except where release of information is required by law (e.g., suspected child abuse or ideas about suicide).

6) I understand that no information that would identify me will be released or printed.

7) I will be given a copy of this signed consent form for my records.

I voluntarily consent to participate in this study.

Name of Participant and Age: ___________________________________________________

__________________________________  ________________________________________

Signature  Date

Name of Person Obtaining Consent: ____________________________________________

__________________________________  ________________________________________

Signature  Date
Appendix H: Participant Contact Information Sheet

Trial Enrollment Date: ☐ ☐ ☐ ☐ ☐ ☐

Participant Study ID: ☐ ☐ ☐

Please complete the following information so that we can keep in contact with you by telephone throughout the study (please print).

Your name: __________________________________________________________
Address: ____________________________________________________________
City: ________________________________________________________________
Date of Birth: _________________________________________________________
Postal code: __________________________________________________________
Phone # 1: ____________________________________________________________
Phone # 2: ____________________________________________________________
Email: ________________________________________________________________
Facebook: _____________________________________________________________

This page will be removed following completion of the questionnaire and stored separately from all other forms in order to maintain your confidentiality. You will be given a code number, which will be used on all future questionnaires. As people often move and can be difficult to follow, could you please give us the telephone number of two relatives or friends who will know your whereabouts if you move or change telephone numbers.

Relative/friend’s first name and telephone number:

________________________________________________________

Relative/friend’s first name and telephone number:

________________________________________________________

Randomization Envelope Number: _____________

Upon consent, mother randomized to:

Experimental Group ☐ Peer Mentor ID ☐ ☐ ☐ ☐
Control Group ☐
In the next 3 days, please let Barbara Chyzy know the best time / day to arrange your first your peer mentor and to contact you. Barbara will check when your peer mentor is available and match a time that’s good for both of you.

<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Date</th>
<th>Time (s)</th>
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</table>
Appendix I: Participant Demographic Questionnaire

To be completed by Barbara Chyzzy (Principal Investigator) in person

Participant Study ID: ____________

1. How old are you? ____________ years

2. How many weeks pregnant are you? _________ weeks

3. What is your due date? (day/month/year) ______________________

4. Were you born in Canada?
   1. ○ Yes
   2. ○ No. If no, where were you born? ________________________________
      How long have you lived in Canada? _________ (years)

5. Who do you currently live with?
   1. ○ With my family. With who specifically? __________________________
   2. ○ With my baby’s father
   3. ○ With a common-law partner who is not my baby’s father
   4. ○ With friends
   5. ○ In a young parent residence
   6. ○ By myself

6. Where do you currently live?
   1. ○ In a bachelor apartment
   2. ○ In a one bedroom apartment
   3. ○ In a two bedroom apartment
   4. ○ In a three or more bedroom apartment
   5. ○ In a house
   6. ○ In a young parent residence
   7. ○ In a shelter

7. In the two years before you became pregnant, how many times did you move (into a different homes or apartment?) ________

8. Before this pregnancy, have you ever been homeless, lived in a shelter or had to stay with friends when you didn’t have a place to live?
   1. ○ Yes. For how long _________ (weeks)
   2. ○ No
9. Since you became pregnant, have you ever been homeless, lived in a shelter or had to stay with friends when you didn’t have a place to live?
   1. Yes. For how long _________ (weeks)
   2. No

10. Are you married?
   1. Yes
   2. No, but living common law
   3. No, but have a serious boyfriend
   4. No

11. Was the current pregnancy planned?
   1. Yes
   2. No

12. Do you have any other children?
   1. Yes. How many? ______ How old are they? ______________
   2. No

13. Do you consider yourself to be (choose all that apply):
   1. Heterosexual or straight
   2. Lesbian
   3. Bisexual
   4. Transgender
   5. Other

14. What is the highest high school grade you have completed?
   1. Grade 9 or less
   2. Grade 10
   3. Grade 11
   4. Grade 12
   5. Some college or university

15. Are you currently in school?
   1. Yes - full time
   2. Yes - part time
   3. No

16. After your baby is born, do you plan to go back to school?
   1. Yes
   2. No
   3. Not sure yet

17. Did you attend or are you currently attending prenatal classes?
   1. Yes
   How many classes have you attended? ______________
   Where? ______________
   2. No
18. How do you plan to feed your baby?
1. Breastfeeding alone (including pumping breast milk)
2. Formula feeding alone
3. A combination of formula and breastfeeding

19. If you plan to breastfeed, for how long? ____________ (months)

20. Who is providing you support during your pregnancy? (check all that apply)
1. Family member. Who? ____________________________
2. The baby’s father
3. Family of my baby’s father
4. A friend
5. Other. Who? ________________________________
6. No one

21. Is there anyone who is not supportive of your pregnancy
1. Yes. Who? ________________________________
   How are they not supportive?
   ________________________________
2. No.

22. After your baby is born, who do you think will provide some support for you and your baby? (check all that apply)
1. Family member. Who? ____________________________
2. The baby’s father
3. Family of my baby’s father
4. A friend
5. Other. Who? ________________________________
6. No one

23. Do you have another young mother with children to talk to?
1. Yes
2. No

24. How would you describe your relationship with your mother?
1. Very supportive
2. Supportive
3. Neither supportive nor non-supportive
4. Unsupportive
5. Very unsupportive

25. How would you describe your relationship with your father?
1. Very supportive
2. Supportive
3. Neither supportive nor non-supportive
4. Unsupportive
5. Very unsupportive
26. If you have sisters and/or brothers, how would you describe your relationship with them?
   1. I do not have any sisters or brothers
   2. Very supportive
   3. Supportive
   4. Neither supportive nor non-supportive
   5. Unsupportive
   6. Very unsupportive

27. As far as you are aware, were you ever depressed for more than 2 weeks in a row before your pregnancy?
   1. Yes
   2. No
   3. Don’t know

28. As a child, did you ever have any involvement with the Children’s Aid Society?
   1. Yes
   2. No

29. Do you currently smoke?
   1. Yes. How many cigarettes per day? _______________________
   2. No

30. Did you ever use of the following substances before your pregnancy? (check all that apply)
   1. Alcohol
   2. Marijuana
   3. Crack/Cocaine
   4. Other. Please specify__________________________

31. What professional prenatal support resources have you used? (check all that apply)
   1. Young parent resources center (such as Jessie’s, Massey Center, Rosalie Hall, Rose of Sharon, Humewood House, etc). If so, which one(s)____________________
   2. Public Health Nurse
   3. Prenatal midwife care
   4. Prenatal doula care
   5. Social worker
   6. Other. Please explain: _____________________

32. How satisfied have you been with the prenatal care you have received from your health care provider?
   1. Very satisfied
   2. Somewhat satisfied
   3. Neither satisfied nor dissatisfied
   4. Somewhat dissatisfied
   5. Very dissatisfied

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE
## Appendix J: Adaptations To Peer Support Intervention With Rationale

<table>
<thead>
<tr>
<th>Dennis et al’s study</th>
<th>Current Study</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of landline telephones with ability for voice calling only</td>
<td>Use of mobile phones with ability for voice calling and text messaging</td>
<td>Cell phone use among adolescents is high with 87% of adolescents age 14-17 owning a cell phone in the United States. Short Message Service (SMS) text-messaging is the dominant daily mode of communication among female teens (Lenhart, 2012). Research with adolescent mothers recommends the use of cell phones and text messaging as a preferred way of communicating with this transient population (Pinto-Foltz et al, 2009, Seed et al; South-Paul et al, 2009).</td>
</tr>
<tr>
<td>Recruitment of peer volunteers from the general maternal community</td>
<td>Recruitment of peer mentors who have been recommended from a young parent community agency</td>
<td>Previous studies have shown poor retention of peer volunteers who have been recruited from the general adolescent mother population (diMeglio et al, 2010). For this reason, peer mentors must be recommended from a YPNFA young parent agency. It is anticipated that young parent agencies will have an established relationship with potential peer mentors and will therefore be aware of their reliability, maturity and communication skills. This knowledge will enable the PI to recruit peer mentors who have demonstrated reliability in previous situations and this will increase the chances of retaining peer mentors for the duration of the study.</td>
</tr>
<tr>
<td>Recruitment of peer volunteers who have experience with PPD</td>
<td>Recruitment of peer mentors who have experience as an adolescent mother</td>
<td>In Dennis et al’s study, participants were recruited with an EPDS score &gt; 9 (indicating probable PPD), however in the current study participants will be recruited with an EPDS &lt; 13. For this reason, peer volunteers in Dennis et al’s study had experience with PPD as an eligibility requirement whereas this is not a requirement in the current study. Experience as an adolescent mother is the primary basis for eligibility as peer mentors.</td>
</tr>
<tr>
<td>121 page comprehensive peer volunteer manual</td>
<td>Simplified 96 page peer mentor manual</td>
<td>A simplified version of Dennis et al’s peer volunteers manual will be given to peer mentors at the peer mentor training session. Although all peer mentors are required to be able to read, write and understand English, the literacy level of the peer mentors may vary (ie: some peer mentors may not have completed high school). Research related to literacy levels of health education material reveals that people typically read at least two grade levels below their highest level of schooling and prefer materials that are written below their literacy abilities (Bastable, 2008). It is recommended that written material be produced at a 5th grade level for the general population (Bastable, 2008). Therefore in order to accommodate a wide range of literacy levels, information in the peer mentor manual will be written at a 5th grade level. The key factors in accommodating the low literate reader is to write in plain, familiar language using an easy to read visual format (Bastable, 2008). Examples include 1) using short words and common vocabulary with one to two syllables; 2) keeping sentences short (no longer than 20 words); 3) clearly defining technical words; 4) reducing concept density by limiting each paragraph to a simple message; 5) allowing for plenty of white space including the generous use of spacing between paragraphs; 6) highlighting important ideas or key terms; 7) using color consistently throughout the document; 8) using drawings and simple</td>
</tr>
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</table>
pictures to aid understanding of the text information; and 9) limiting the entire length of the document (it should be long enough just to cover the essentials).

<table>
<thead>
<tr>
<th>Four hour peer mentor training sessions</th>
<th>Twelve hour peer mentor training sessions</th>
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<tbody>
<tr>
<td>A longer training session for adolescents peer mentor was deemed necessary in order to fully review content of the peer support manual and to actively engage in role playing sessions, large-group discussions and small group activities. A systematic review of peer support interventions for adolescents with chronic disease revealed that the mean length of training from 4 studies was 8.4 hours (Ahola Kohut, Stinson, van Wyk, Giosa &amp; Luca, 2014). Twelve hours of training was chosen as an adequate amount of training in order to cover the content of the training manual and train peer mentors on the use of the recording applications on their cell phones. Based on an evaluation of maternal perceptions from the original peer support trial, a greater focus on appraisal (motivational) support training will be highlighted including encouragement to persist in problem-solving, reassurance that efforts will result in positive outcomes, normalization of challenges, and communication of optimism (Dennis, 2010). Adult learning techniques will be used since youth at risk (which includes adolescent mothers) have learning strategy preferences which are characteristic of adult learners (Shaw, Conti &amp; Shaw, 2013). These techniques will include a learner-centered approach (Weimer, 2002) where peer mentors will have input into and control over the direction of the training based on their learning needs. During the training session, free childcare will be provided for all peer mentors to ensure they are able to focus on the learning.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Minimum of four telephone contacts initiated by the peer volunteer to the participant</th>
<th>Minimum of ten text message or voice call contacts initiated by the peer mentor to the participant</th>
</tr>
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<tbody>
<tr>
<td>The minimum number of contacts was increased since the length of the intervention in the current study is longer (up to 12 weeks longer depending on when during pregnancy the participant was recruited). As well, text messaging among adolescents is very frequent with adolescent girls sending a median of 100 text messages per day (Lenhart, 2012).</td>
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<table>
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<tr>
<th>No recording of telephone calls</th>
<th>Recording of all mobile phone voice calls and text messages as</th>
</tr>
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<tbody>
<tr>
<td>Recording of mobile calls and text messages will be employed to ensure treatment fidelity and safety of participants since adolescent mothers are a highly vulnerable segment of the population. All technical aspects related to recording will be handled by QoC Health, a mobile health company based out of Toronto, Ontario. All voice calls and text messages will be loaded onto a secure, encrypted internet-based server and will be reviewed by the PI within 24 hours. The PI will confirm adherence to information taught in the training session and verify any issues related to mother or infant safety.</td>
<td></td>
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Appendix K: Activity Log

Participant Study ID: [ ] [ ] [ ]

Peer Mentor Study ID: [ ] [ ] [ ]

Dear Peer Mentor: Please document each mobile phone call or cluster of text message interactions you have with your mentee on the electronic version of this 'Activity Log' on your mobile phone.

<table>
<thead>
<tr>
<th>Method of Collection</th>
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<tbody>
<tr>
<td><strong>Year:</strong> 2015 or 2016)</td>
</tr>
<tr>
<td>Automatically collected on encrypted server</td>
</tr>
<tr>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>Automatically collected on encrypted server</td>
</tr>
<tr>
<td><strong>Time of contact (am or pm)</strong></td>
</tr>
<tr>
<td>Automatically collected on encrypted server</td>
</tr>
<tr>
<td><strong>Contact was</strong></td>
</tr>
<tr>
<td>1. text message</td>
</tr>
<tr>
<td>2. mobile phone call</td>
</tr>
<tr>
<td>3. face to face</td>
</tr>
<tr>
<td>4. message left on the mobile phone</td>
</tr>
<tr>
<td>Automatically collected on encrypted server</td>
</tr>
<tr>
<td><strong>Duration of mobile phone call or text message conversation (min)</strong></td>
</tr>
<tr>
<td>Automatically collected on encrypted server</td>
</tr>
<tr>
<td><strong>Contact initiated by:</strong></td>
</tr>
<tr>
<td>1. Mentor</td>
</tr>
<tr>
<td>2. Participant</td>
</tr>
<tr>
<td>Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages</td>
</tr>
<tr>
<td><strong>Mentor informed mentee the call or text was being recorded? Y/N</strong></td>
</tr>
<tr>
<td>Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages</td>
</tr>
<tr>
<td><strong>Did you have any concerns during the call or text? Y/N</strong></td>
</tr>
<tr>
<td>If yes complete Concerns Checklist and notify Ms. Chyzzy immediately at 647-292-6521</td>
</tr>
<tr>
<td>Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages</td>
</tr>
<tr>
<td><strong>Did you have any technical difficulties during the call or text? Y/N</strong></td>
</tr>
<tr>
<td>Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages</td>
</tr>
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</table>

**Type of Support Provided:**

| **Informational support:** Y/N                           |
| - offer knowledge, facts, suggestions or resources      |
| Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages |
| **Emotional support:** Y/N                              |
| - listen attentively, offer understanding and reassurance |
| Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages |
| **Appraisal support:** Y/N                              |
| - offer motivation, encouragement and positive communication |
| Input onto electronic version of activity log by the peer mentor after every call or cluster of text messages |
Appendix L: Peer Mentor Eligibility Assessment Form

*To be complete by Barbara Chyzzy (Principal Investigator) in person*

Why do you want to participate in this study?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

**ELIGIBILITY CRITERIA (ALL CRITERIA MUST BE CHECKED TO BE ELIGIBLE):**

1. Recommended by YPNFA agency staff based on the following qualities: reliability, maturity and ability to communicate effectively with staff and peers
   Indicate name of agency: ____________________________________________________

2. Between the age of 16 to 24 years

3. Experience as an adolescent (16-24 years) mother

4. Ability to speak, read and understand English

5. Is not currently diagnosed with a psychological or psychiatric illness (e.g., anxiety, depression)

6. Self-reported confidence in their ability to parent their child

7. Willingness to commit to a 12 hour training program and mentor 2 participants over a period of 5-6 months

*Note: if the peer mentor meets the above eligibility criteria, they will be invited for a formal interview with the PI to determine to assess qualities need to deliver peer support (such as maturity, emotional stability, listening skills and verbal communication skills)*

**Assessment of Eligibility**

1. Is the peer mentor eligible to participate in the study?  
   Yes [ ]  No [ ]

2. Does the peer mentor give consent to participate?  
   Yes [ ]  No [ ]

   If no, reason for non-participation:

   ____________________________________________________________

3. Upon consent:

   Peer Mentor ID  [ ] [ ] [ ]
Appendix M: Peer Mentor Consent Form

MOBILE PHONE PEER SUPPORT PROGRAM
FOR ADOLESCENT MOTHERS

PEER MENTOR CONSENT FORM

TITLE OF PROJECT: Mobile Phone Based Peer Support to Prevent Postpartum Depression among Adolescent Mothers: A Pilot Randomized Controlled Trial

Principal Investigator: Barbara Chyzzy, RN, BN, MN, PhD (c)
Co-Investigators: Dr. Cindy-Lee Dennis, Dr. Jennifer Stinson, Dr. LaRon Nelson and Dr. Simone Vigod

INTRODUCTION
My name is Barbara Chyzzy and I am a PhD student in the University of Toronto, Lawrence S. Bloomberg Faculty of Nursing. I am conducting this study in partial fulfillment of the requirements for a PhD degree, under the supervision of Dr. Cindy-Lee Dennis, Professor, Lawrence S. Bloomberg Faculty of Nursing.

STUDY PURPOSE
You’re being invited to participate in a research study because you have been recommended by a Young Parent No Fixed Address agency staff member, are between the ages of 16-24 years and have experience as an adolescent mother. The purpose of this study is to learn if peer support would be helpful for adolescent mothers during pregnancy and after giving birth. Ms. Chyzzy will read through this consent form with you, describe procedures in detail and answer any questions you may have. This study has been approved by the University of Toronto Research Ethics Board.

DETAILS OF THE STUDY
If you choose to participate in this study, you will provide support by mobile phone to a pregnant teen during pregnancy and for 12 weeks after she delivers her baby. The total time commitment will be approximately 24 weeks (6 months). You will only be asked to provide support to at least 2 participants at any given time.
Requirements of peer mentors:
1. All peer mentors will be screened on their ability to: talk to others, give information, express feelings, share experiences and display good listening skills. You will also attend a 12-hour training session. The focus of the training session will be to develop the skills required for effective mobile phone support (by voice calling and text messaging). You will learn when and how to make referrals to health care providers and will practice role-playing during the training session.
2. All peer mentors will receive a training manual that contains information on peer support; skills and techniques for effective telephone support; general information on life with a baby, community resources; and, facts on how to help other mothers.
3. All peer mentors will be paired with participants based on your availability. Ms. Chyzy will initiate the first contact by voice calling between the peer mentors and participant within 72 hours after randomization. The peer mentor will continue to voice call or text during pregnancy and for 12-weeks after the participants gives birth. The number of voice calls or text messages to be made will be decided between the peer mentor and the participant. A minimum of ten voice calls or text messages should be initiated by the peer mentor. The focus of the calls or text messages will be on emotional (caring), informational (advice) and appraisal (encouragement) support.
4. All peer mentor activities (voice calls, text messages and left messages) will be recorded on an Activity Log that is to be returned every month using a stamped, self-addressed envelope. The principal investigator will review the Activity Logs. Peer mentors who do not follow the peer support program protocol or do not return Activity Forms will be released from the study. Peer mentors will complete a Peer Mentor Training Evaluation Form at the end of their training session.

At this time, we are asking that you will agree to the above requirements of peer mentors.

Potential Harms
The risks to peer mentors include the potential for emotional distress which could happen from a) negative reactions from participants, b) if you get overly attached to participants, and c) if you stop working with a participant she loses her baby or if Children’s Aid Society removes the baby from her care. Also, if expectations are not clearly made between you and the participant, there is a risk for you to feel overwhelmed by the support needs of the mother.

Potential Benefits
While you may not benefit directly from this study, results from this study will assist in planning a larger study investigating peer support for adolescent mothers. Results from the larger study will give us information about whether or not peer support reduces postpartum depression. Therefore, results from this study may benefit adolescent mothers in the future.

Confidentiality
All information obtained during this study is strictly confidential and no information that reveals your identity will be released or published without consent unless required by law. This legal obligation includes circumstances such as suspected child abuse, or expression of suicidal idea where researchers are obliged to report to the appropriate authorities.
You will be identified only by a study number. Research information will be kept in locked files and will be available only to the research team. Text messages and voice calls between participants and peer mentors will be recorded and uploaded to a secure database which will (for safety and monitoring reasons) be reviewed by Ms. Chyzzy within 24 hours.

**Participation**
Your participation in this study is voluntary. If you choose not to participate in this study, you will not have any negative consequences. You may withdraw from this study at any time and your withdrawal will not affect your future medical care.

**Reimbursement**
You will receive an honorarium for participating in this study consisting of $50 for completing the 12 hour training program and $50 for each mother you provide with peer support. Peer mentors will provide support to a maximum of 2 mothers at any given time.

**Contact Information:**
If at any time I have further questions, problems or concerns I can contact:
Principal Investigator: Ms. Barbara Chyzzy, PhD Student
Lawrence S. Bloomberg Faculty of Nursing, University of Toronto
Tel: 647-824-2365
Supervisor: Dr. Cindy-Lee Dennis, Professor
Lawrence S. Bloomberg Faculty of Nursing, University of Toronto
Tel: 416-946-8608

If I have any questions about my rights as a participant, I can contact the University of Toronto Office of Research Ethics at ethics.review@utoronto.ca or 416-946-3273

**Consent:**
By signing this form, I agree that:
1) The study has been explained to me and all my questions were answered.
2) The possible harms or discomforts and the possible benefits (if any) of this study have been explained to me.
3) I understand that I have the right not to participate and the right to stop participating in the study at any time.
4) I am free now, and in the future, to ask any questions about the study.
5) I have been told my research records will be kept confidential except where release of information is required by law (e.g. suspected child abuse or suicidal ideas)
6) I understand that no information that would identify me will be released or printed without asking me first.
7) I will be given a copy of this signed consent form for my records.

I hereby consent to participate.

Name of Peer Mentor and Age: __________________________________________________

__________________________________  ________________________________
Signature                                      Date

Name of Person Obtaining Consent: __________________________________________________

__________________________________  ________________________________
Signature                                      Date
Appendix N: Outline of Peer Mentor Training Program

Prior to initiating contact with a participant, all peer mentors will attend 12 hours of training which will be divided into two, six hour sessions with the PI. Content for the training is based on Dennis’ (2009) peer support trial. The goals of the training session are to develop peer mentor skills to be able to provide effective mobile phone-based peer support and make appropriate referrals to health professionals if necessary. Training sessions will include information from the 96 page Peer Support Training Manual (adapted from Dennis’ trial) with additional information (ie: community resources) unique to an adolescent population. A range of teaching methods will be used such as brief didactic lectures (5-10 minutes to ensure mentors are actively engaged in their learning, rather than being passive learners), large group discussions, small group activities and role playing scenarios.

<table>
<thead>
<tr>
<th>Item</th>
<th>Length of Time</th>
<th>Topics Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductions</td>
<td>1.5 hour</td>
<td>Icebreakers (get to know each other BINGO) Outline of the research study and team Training objectives Maintaining privacy and confidentiality</td>
</tr>
<tr>
<td>Understanding Peer Support &amp; the Role of the Peer Mentor</td>
<td>4.5 hours</td>
<td>Role of a peer mentor / peer mentor expectations Benefits of peer support Exploring peer mentor experiences after their baby was born How to provide support based on the 3 components of peer support theory (informational, emotional and appraisal support) including role playing scenarios for each type of support: <strong>Informational Support</strong> - providing information to new mothers which is useful for problem-solving:  - Review of resources available and how to access them  - Review of what to expect in the initial postpartum period (bringing baby home, recovering from childbirth, what to do when baby is crying)  - Strategies for providing informational support  - How to share personal experiences <strong>Emotional Support</strong> – listening to new mothers and providing her with feelings of being cared for and accepted  - Review of attentive listening skills  - How to offer reassurance and understanding  - How to allow new mothers to disclose feelings <strong>Appraisal Support</strong>  - How to provide motivation, encouragement and positive feedback  - How to help new mothers feel good about themselves  - How to normalize new mother experiences</td>
</tr>
<tr>
<td>Item</td>
<td>Length of Time</td>
<td>Topics Covered</td>
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<td>----------------------------------</td>
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<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Providing Peer Support</td>
<td>4 hours</td>
<td>Getting connected &amp; staying connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• How to connect (first contact), develop a relationship and communicate with the mother</td>
</tr>
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<td></td>
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<td>• How to establish boundaries and making an agreement for calling and texting (how often? when?)</td>
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<td></td>
<td></td>
<td>• How to stay connected with the mother (length of calls / text messages and frequency of calls/text messages)</td>
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<tr>
<td></td>
<td></td>
<td>• How to establish a feeling of ‘connectedness’</td>
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<td></td>
<td></td>
<td>• Role playing scenarios</td>
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<tr>
<td>Skills and techniques to provide peer support</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>• Empathetic listening</td>
</tr>
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<td></td>
<td></td>
<td>• Reflection</td>
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<tr>
<td></td>
<td></td>
<td>• Asking open-ended questions</td>
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<td></td>
<td></td>
<td>• Problem-solving and exploring options</td>
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<tr>
<td></td>
<td></td>
<td>• Dealing with safety concerns (issues of self-harm or harm to baby) and communicating with PI and healthcare professionals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Role playing scenarios</td>
</tr>
<tr>
<td>Child Abuse and the Role of Children’s Aid Society (CAS)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Identifying child abuse and neglect</td>
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<tr>
<td></td>
<td></td>
<td>• Role of CAS and involvement of CAS / implications for participants and peer mentors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• How to use the safety concerns checklist and procedures in the safety protocol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Role playing suspected abuse</td>
</tr>
<tr>
<td>Self care for peer mentors: how to take care of yourself</td>
<td></td>
<td></td>
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<tr>
<td>Overview of postpartum depression</td>
<td></td>
<td>The 3 step helping process</td>
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<td></td>
<td></td>
<td>1) Exploring with the mother</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Setting priorities with the mother</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3) Preventing postpartum depression</td>
</tr>
<tr>
<td>Activity Log and Mobile Phone Training</td>
<td>2 hours</td>
<td>How to record information on activity logs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How to record text messages and voice calls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice session with mobile phones</td>
</tr>
</tbody>
</table>
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Appendix P: Peer Mentor Contact & Demographic Form

Trial Enrollment Date: ☐ ☐ ☐  ☐ ☐ ☐  ☐ ☐ ☐

Peer Mentor Study ID: ☐ ☐ ☐

Participant Study ID: ☐ ☐ ☐

Please complete the following information so that we can keep in contact with you by telephone throughout the study (please print).

Your name: ___________________________________________
Address: ___________________________________________
City: ______________________________________________
Date of Birth: ______________________________________
Postal code: ________________________________________
Phone # 1: _________________________________________
Phone # 2: _________________________________________
Email: _____________________________________________
Facebook: _________________________________________

This page will be removed following completion of the questionnaire and stored separately from all other forms in order to maintain your confidentiality. You will be given a code number, which will be used on all future questionnaires. As people often move and can be difficult to follow, could you please give us the telephone number of two relatives or friends who will know your whereabouts if you move or change telephone numbers.

Relative/friend’s first name and telephone number:
__________________________________________________

Relative/friend’s first name and telephone number:
__________________________________________________
1. Why did you volunteer to be a peer volunteer?
________________________________________________________________________
________________________________________________________________________

2. How old are you? __________ years

3. Were you born in Canada?
   1. ☐ Yes
   2. ☐ No. If no, where were you born? _________________________________
   3. ☐ How long have you been in Canada? ____________________ years

4. Who do you live with?
   1. ☐ With my family. With who specifically? _________________________________
   2. ☐ With my baby’s father
   3. ☐ With a common-law partner who is not my baby’s father
   4. ☐ With friends
   5. ☐ In a young parent residence.
   6. ☐ By myself

5. Have you ever been homeless, lived in a shelter or had to stay with friends when you didn’t have a place to live?
   1. ☐ Yes. For how long __________ weeks
   2. ☐ No

6. Are you married?
   1. ☐ Yes
   2. ☐ No, but living common law
   3. ☐ No, but have a serious boyfriend
   4. ☐ No

7. Do you have any other children?
   1. ☐ Yes. How many? _______ child(ren)
   2. ☐ No

8. Do you consider yourself to be (choose all that apply):
   1. ☐ Heterosexual or straight
   2. ☐ Lesbian
   3. ☐ Bisexual
   4. ☐ Transgender
   5. ☐ Other

9. Are you currently in school?
   1. ☐ Yes - full time
   2. ☐ Yes - part time
   3. ☐ No
10. What is your highest high school grade you completed?
   1. Grade 9 or less
   2. Grade 10
   3. Grade 11
   4. Grade 12
   5. Some college or university

11. Are you employed?
   1. Yes, fulltime
   2. Yes, part-time/casual
   3. Yes, but on maternity leave
   4. No, currently looking for employment
   5. No, stay at home mom by choice
Appendix Q: Participant Eligibility Assessment Form

Today’s Date: [ ] [ ] [ ] Year [ ] [ ] [ ] Month [ ] [ ] [ ] Day

How did you hear about this research study?
- Advertising flyer [ ] Where? _____________________
- Informed by young parent agency [ ] Which Agency? _____________________
- Presentation by Barbara Chyzy [ ]
- Other [ ] Please Explain: _____________________

Why do you want to participate in this study?
___________________________________________________________________________

PART A: Inclusion criteria: PI will ask “Are you…” (all questions must be answered ‘yes’ to be eligible)

1. Between the ages of 16 and 24 years? [ ] Yes [ ] No
2. 28 weeks or more pregnant? [ ] Yes [ ] No
3. Having a single pregnancy? [ ] Yes [ ] No
4. Are you able to speak, read and understand English? [ ] Yes [ ] No

PART B: Exclusion Criteria: PI will ask: (all questions must be answered ‘no’ to be eligible)

1. Have you been informed your pregnancy is high risk? [ ] Yes [ ] No
   If yes, for which type of complication? _______________________________________
2. Are you currently using any alcohol, marijuana, crack or other substances during your pregnancy? [ ] Yes [ ] No
3. Do you currently have a mental health condition such as schizophrenia or bipolar disorder? [ ] Yes [ ] No

If all answers in PART A are ‘yes’ and all answers in PART B are ‘no’, PI will proceed to complete an Edinburgh Postnatal Depression Scale (EPDS) screening.

1. EPDS score > 12 [ ] Yes [ ] No
   EPDS Score: _________
PARTICIPANT ASSESSMENT OF ELIGIBILITY

1. Is the mother eligible to participate in the study?  Yes ☐  No ☐

2. Does the mother give consent to participate?  Yes ☐  No ☐

If no, reason for non-participation:
________________________________________________________________________
________________________________________________________________________

Participant Study ID:  __________

Participant Randomized to:
Control Group  ☐
Experimental Group  ☐

Peer Mentor Study ID:  __________
Appendix R: Peer Mentor Experience Questionnaire

PART A
(Evaluation of Peer Mentor Training Session)

Today’s Date: [ ] [ ] [ ]
Year    Month    Day

Peer Mentor Study ID: [ ] [ ]

1. Do you think this training session has prepared you for your peer mentor role?
   [ ] 1. Yes
   [ ] 2. No. Why not?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. Would you have liked to receive more information in a specific area?
   [ ] 1. Yes. In what area?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   [ ] 2. No

3. What, if anything, did you like the most about the training session?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. What, if anything, would you like to see done differently in the training session?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Dear Peer Mentor,

Thank you for participating in the Mobile Phone Peer Support Program! Because this peer support program is led by mothers, for mothers, we want your input into how this program is developed and implemented. If you have any suggestions or ideas that you feel should be incorporated into this peer support program, please let us know.

1. Overall, how satisfied were you with your role as a peer mentor in the mobile phone peer support program?
   - [ ] 1. Very satisfied
   - [ ] 2. Satisfied
   - [ ] 3. Neither satisfied nor dissatisfied
   - [ ] 4. Dissatisfied
   - [ ] 5. Very dissatisfied

2. Do you feel your experience as an adolescent mother helped you provide support to new adolescent mothers?
   - 1. Yes. Why? __________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
   - 2. No. Why not? _________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________

3. Do you think having the text messages and voice calls recorded between you and the new mother was helpful for you as a peer mentor?
   - 1. Yes. Why? __________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
   - 2. No. Why not? _________________________________________________________
      ______________________________________________________________________
4. Do you think the peer mentors should have on-going educational sessions during the mobile phone peer support program?
   1. Yes. Why? ______________________________________________
      How often? ___________________________________________
   2. No

5. Do you feel there be organized social opportunities for peer mentors to get together and talk about their experiences (provide peer support to each other) after the training session?
   1. Yes. How often? _______________
   2. No

Please share any other comments or concerns you have about the Mobile Phone Peer Support training program so we can try to improve future training sessions:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

*To be completed by the PI:*

Did the peer mentor complete the 12 hour training program? Yes □ No □

Did the peer mentor complete the 12 week peer support program? Yes □ No □
Appendix S: Peer Support Evaluation Inventory

Participant Study ID:  

Today’s Date:  

Name of Research Assistant: ____________________________

*To be completed for all participants in the peer support group. Research assistants will call participants to complete questionnaire.* The Peer Support Evaluation Inventory (PSEI) is a questionnaire developed to help you tell us about your peer support experience.

**Directions:** In answering the following questions, please think about your peer support experience. The following questions ask you to pick a number which best describes your feelings. While you may not find an answer that exactly matches your feelings, please indicate the number that comes closest to how you feel. There are no right or wrong answers.

### Part 1 Supportive Interactions

<table>
<thead>
<tr>
<th>“Think specifically about the interactions you had with your peer mentor”. In general, my peer:</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Unsure</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Listened to me talk about my feelings or concerns</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2 Helped me feel that I was not alone in my situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3 Expressed interest and concern about how I was doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4 Told me that help was available if I needed it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5 Accepted me for who I was</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6 Told me what was usual for my current situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7 Suggested other ways of doing things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8 Told me what to expect in a certain situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9 Assisted me to solve my problems or concerns</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10 Provided me with practical information</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11 Gave trustworthy advice</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12 Told me if I did something well</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13 Helped me feel that what I was going through was &quot;normal&quot;</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14 Expressed admiration for a personal quality of mine</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15 Gave me feedback on how I was doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</table>
Part 2 Relationship Qualities

“Describe the quality of the relationship with your peer mentor” In general:

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<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Unsure</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
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<tr>
<td>1</td>
<td>If something important happened to me I could share the experience with my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>2</td>
<td>My peer could tell when I was worried about something</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>My peer was trustworthy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>My peer was dependable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>5</td>
<td>I knew my peer would respond to me in a supportive way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>I felt accepted by my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>I felt comfortable ‘just being myself’ with my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>With my peer I could confide my most inner feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>My peer understood my point of view</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>My peer felt bad if things didn’t go well for me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>I felt comfortable getting close to my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>I depended on my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>I felt close to my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>My peer influenced how I felt or acted</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>My peer was an important source of support for me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>My peer worked at maintaining a relationship with me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>I looked forward to talking with my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>18</td>
<td>My peer invested time to help me</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>19</td>
<td>My peer revealed personal information</td>
<td>1</td>
<td>2</td>
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<tr>
<td>20</td>
<td>My peer was interesting and enjoyable to talk to</td>
<td>1</td>
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<td>21</td>
<td>My peer presented a good first impression</td>
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<td>22</td>
<td>My peer seemed like she would be able to talk to anyone</td>
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<td>23</td>
<td>My peer was sensitive and understanding</td>
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<td>24</td>
<td>My peer talked too much</td>
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<td>25</td>
<td>My peer would get over-involved in my problems</td>
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<td>26</td>
<td>My peer pressured me to change</td>
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<td>27</td>
<td>My peer made me feel guilty</td>
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<td>28</td>
<td>My peer made me feel angry</td>
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<td>2</td>
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<td>My peer was critical of me</td>
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<td>2</td>
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<td>My peer minimized my problems</td>
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<td>2</td>
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</tr>
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</table>
**Part 3 Perceived Benefits**

“Think specifically about the benefits of the support you received. Over the past few months I generally feel:

<table>
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<tr>
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<th>Disagree</th>
<th>Unsure</th>
<th>Agree</th>
<th>Strongly agree</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>More able to solve problems or concerns</td>
<td>1</td>
<td>2</td>
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<tr>
<td></td>
<td>My peer helped me feel this way</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>More control of my situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td></td>
<td>My peer helped me feel this way</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>3</td>
<td>Better able to cope with all the things I have to do</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>My peer helped me feel this way</td>
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<td>2</td>
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<tr>
<td>4</td>
<td>Better able to respond to stressful situations</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td></td>
<td>My peer helped me feel this way</td>
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<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>5</td>
<td>Things are going my way</td>
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<td>2</td>
<td>3</td>
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<tr>
<td></td>
<td>My peer helped me feel this way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>More in control of important things in my life</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>My peer helped me feel this way</td>
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<tr>
<td>7</td>
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<td>More calm</td>
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<td>4</td>
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<tr>
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<td>3</td>
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<tr>
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<td>2</td>
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<td>Less depressed</td>
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</tr>
<tr>
<td>14</td>
<td>Able to turn to more people</td>
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<tr>
<td>16</td>
<td>I have something in common with other mothers</td>
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<tr>
<td></td>
<td>My peer helped me feel this way</td>
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<tr>
<td>17</td>
<td>More trust towards my community</td>
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<td>My peer helped me feel this way</td>
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<td>I am more likely to get help if needed</td>
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<td>My peer helped me feel this way</td>
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<tr>
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<td>I have much more to be proud of</td>
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<td></td>
<td>My peer helped me feel this way</td>
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<td></td>
<td>A more positive attitude toward myself</td>
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<td>My peer helped me feel this way</td>
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<td></td>
<td>More satisfied with myself</td>
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<td>My peer helped me feel this way</td>
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<td></td>
<td>More confident in my ability to care for my baby</td>
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<td></td>
<td>My peer helped me feel this way</td>
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<td></td>
<td>More confident in my abilities</td>
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<td></td>
<td>My peer helped me feel this way</td>
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<td>More confident to deal with my situation</td>
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<td>My peer helped me feel this way</td>
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<td></td>
<td>More similar to other mothers</td>
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<td></td>
<td>My peer helped me feel this way</td>
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<td>1</td>
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<td>4</td>
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<td></td>
<td>Less negative thoughts about myself</td>
<td></td>
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<td></td>
<td>My peer helped me feel this way</td>
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</tr>
</tbody>
</table>

**Part 4 Satisfaction with Support Received**

"Think specifically about how satisfied you feel about the support you received.” In general:

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Unsure</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My peer provided the assistance I needed</td>
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<td>2</td>
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</tr>
<tr>
<td>2</td>
<td>My peer met my expectations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>My peer was respectful to me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>I liked my peer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>There is nothing I would have liked done differently</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>For my situation one-to-one support was better than group support</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Receiving support from my peer was convenient for me</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>I liked the support over the mobile phone</td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>I liked the support by text message</td>
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<td>4</td>
</tr>
<tr>
<td>10</td>
<td>I had very few problems with the support I received</td>
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<td>4</td>
</tr>
<tr>
<td>11</td>
<td>I was able to talk to my peer when I needed to</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>My peer contacted me when planned</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>I had enough contact with my peer</td>
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<tr>
<td>14</td>
<td>I would recommend this type of support to a friend</td>
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<tr>
<td>15</td>
<td>Overall, I am satisfied with my peer support experience</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Open-ended Questions:

1. What did you like about this peer support program and why did you like it?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. What didn’t you like about this peer support program and why didn’t you like it?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

3. If there was anything you could change about this peer support program, what would you change?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

4. Is there anything else you would like to tell us about your peer-support experience?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Thank you so much for taking the time to complete this questionnaire
Appendix T: Edinburgh Postnatal Depression Scale (EPDS)

Participant Study ID:  

Timing of Assessment: Baseline (T1) □ 12 Weeks Postpartum (T2) □

Lead in to questions: “Please be as open and honest as possible when answering these questions. It is not easy being a new mother and it is OK to feel unhappy at times. As you have recently had a new baby, we would like to know how you are feeling. Please state the answer which comes closest to how you have felt during the past several days, not just how you are feeling today” (RNAO, 2005):

1. I have been able to laugh and see the funny side of things:
   1. As much as I always could
   2. Not quite so much now
   3. Definitely not so much now
   4. Not at all

2. I have looked forward with enjoyment to things:
   1. As much as I ever did
   2. Rather less than I used to
   3. Definitely less than I used to
   4. Hardly at all

3. I have blamed myself unnecessarily when things go wrong:
   1. Yes, most of the time
   2. Yes, some of the time
   3. Not very often
   4. No, never

4. I have felt worried and anxious for no good reason:
   1. No, not at all
   2. Hardly ever
   3. Yes, sometimes
   4. Yes, very often
5. I have felt scared or panicky for no very good reason:
   1. Yes, quite a lot
   2. Yes, sometimes
   3. No, not much
   4. No, not at all

6. Things have been getting on top of me:
   1. Yes, most of the time I haven’t been able to cope at all
   2. Yes, sometimes I haven’t been coping as well as usual
   3. No, most of the time I have coped quite well
   4. No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping:
   1. Yes, most of the time
   2. Yes, sometimes
   3. Not very often
   4. No, not at all

8. I have felt sad or miserable:
   1. Yes, most of the time
   2. Yes, quite often
   3. Not very often
   4. No, not at all

9. I have been so unhappy that I have been crying:
   1. Yes, most of the time
   2. Yes, quite often
   3. Only occasionally
   4. No, never

10. The thought of harming myself has occurred to me:
    1. Yes, quite often
    2. Sometimes
    3. Hardly ever
    4. Never

---

**EPDS SCORING**

**QUESTIONS 1, 2, & 4:** are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

**QUESTIONS 3, 5-10:** Are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.

**MAXIMUM SCORE:** 30

Always review item 10 (suicidal thoughts) – If positive (1, 2 or 3) on this question, complete Maternal Self-Harm Documentation Form
Appendix U: STAI-STATE

Participant Study ID: 

Today’s Date: 

Timing of Assessment: Baseline (T1) [ ] 12 Weeks Postpartum (T2) [ ]

Please read each statement and circle the appropriate number to indicate how well you FEEL RIGHT NOW, that is, at this moment. There are no right or wrong answers.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>Somewhat</th>
<th>Moderately</th>
<th>Very much so</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel calm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I feel secure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>3. I am tense</td>
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<td>4</td>
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<td>4. I feel strained</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<td>5. I feel at ease</td>
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<td>2</td>
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<tr>
<td>6. I feel upset</td>
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<tr>
<td>7. I am presently worrying over possible misfortunes</td>
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<tr>
<td>8. I feel satisfied</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>9. I feel frightened</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>10. I feel comfortable</td>
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<td>11. I feel self-confident</td>
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<td>4</td>
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<tr>
<td>12. I feel nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I am jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>14. I feel indecisive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>15. I am relaxed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. I feel content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. I am worried</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>18. I feel confused</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>19. I feel steady</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>20. I feel pleasant</td>
<td>1</td>
<td>2</td>
<td>3</td>
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Permission for use by Barbara Chyzzy received from Mind Garden, Inc. on December 16, 2014
Appendix V: Social Support Questionnaire 6 (SSQ6)

To be completed by blinded Research Assistant by telephone

Participant Study ID:   

Social Support Questionnaire 6 (SSQ6) Instructions:

The following questions ask about people in your life who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the person’s initials and their relationship to you (see example). Do not list more than one person next to each of the numbers beneath the question.

For the second part, circle how satisfied you are with the overall support you have.

If you have no support for a question, check the words “No one,” but still rate your level of satisfaction. Do not list more than nine persons per question.

Please answer all questions as best you can. All your answers will be kept confidential.

Example:
Who do you know whom you can trust with information that could get you in trouble?
No one 1) T.N. (brother) 2) L.M. (friend) 3) R.S. (friend) 4) T.N. (father) 5) L.M. (employer) 6) ______________ 7) ______________ 8) ______________ 9) ______________

How Satisfied?
6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied

To score SSQ6:
1. Add total number of people for all 6 items. (Max. is 54). Divide by 6 for per item score. This gives you SSQ Number Score, or SSQN.
2. Total satisfaction scores for all 6 items. (Max is 36). Divide by 6 for per item score. This gives you SSQ Satisfaction score or SSQS.
3. You can also add up total number of people that are family members and that can give the SSQ family score.
1. Whom can you really count on to be dependable when you need help?

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<th>1) _______________</th>
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<td>6) _______________</td>
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<td>7) _______________</td>
<td>8) _______________</td>
<td>9) _______________</td>
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</tbody>
</table>

**How Satisfied?**

6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied

2. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

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<th>1) _______________</th>
<th>2) _______________</th>
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<td>7) _______________</td>
<td>8) _______________</td>
<td>9) _______________</td>
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</tbody>
</table>

**How Satisfied?**

6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied

3. Who accepts you totally, including both your worst and your best points?

<table>
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<tr>
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<th>1) _______________</th>
<th>2) _______________</th>
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<td></td>
<td>7) _______________</td>
<td>8) _______________</td>
<td>9) _______________</td>
</tr>
</tbody>
</table>

**How Satisfied?**

6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied
4. Whom can you really count on to care about you, regardless of what is happening to you?

No one 1)________________ 2)______________ 3)______________
4)______________ 5)______________ 6)______________
7)______________ 8)______________ 9)______________

How Satisfied?
6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied

5. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?

No one 1)________________ 2)______________ 3)______________
4)______________ 5)______________ 6)______________
7)______________ 8)______________ 9)______________

How Satisfied?
6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied

6. Whom can you count on to console you when you are very upset?

No one 1)________________ 2)______________ 3)______________
4)______________ 5)______________ 6)______________
7)______________ 8)______________ 9)______________

How Satisfied?
6 – very
5 – fairly satisfied
4 – a little satisfied
3 – a little dissatisfied
2 – fairly dissatisfied
1 – very dissatisfied
Appendix W: Health Service Utilization Questionnaire

To be completed by blinded Research Assistant by telephone

Participant Study ID: 

We are interested to know what types of health services you have used since you delivered your baby until now. These services could have been received in your home, in an office, community center or a hospital.

1. Have you had any home visits by a public health nurse?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
     O Yes
     O No
     O Mixed

2. Have you had any home visits by another type of nurse?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
     O Yes
     O No
     O Mixed

3. Have you had any telephone conversations with a public health nurse?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
     O Yes
     O No
     O Mixed

4. Have you attended a new mother’s group?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
     O Yes
     O No
     O Mixed
5. Have you had any visits to or from a midwife
   O Yes
   O No
   How many times? ______________
   Was it beneficial?
   O Yes
   O No
   O Mixed

6. Have you had any visits to or from a breastfeeding clinic or lactation consultant?
   O Yes
   O No
   How many times? ______________
   Was it beneficial?
   O Yes
   O No
   O Mixed

7. Have you had any visits to or from a family doctor?
   O Yes
   O No
   How many times? ______________
   Was it beneficial?
   O Yes
   O No
   O Mixed

8. Have you had any visits to or from an obstetrician?
   O Yes
   O No
   How many times? ______________
   Was it beneficial?
   O Yes
   O No
   O Mixed

9. Have you had any visits to or from a psychologist?
   O Yes
   O No
   How many times? ______________
   Was it beneficial?
   O Yes
   O No
   O Mixed
10. Have you had any visits to or from a psychiatrist?
   - O Yes
   - O No
   How many times? ____________
   Was it beneficial?
   - O Yes
   - O No
   - O Mixed

11. Have you had any visits to or from a social worker?
    - O Yes
    - O No
    How many times? ____________
    Was it beneficial?
    - O Yes
    - O No
    - O Mixed

12. Have you had any visits to or from a Children’s Aid Society (CAS) worker?
    - O Yes
    - O No
    How many times? ____________
    Was it beneficial?
    - O Yes
    - O No
    - O Mixed

13. Have you had any visits to an after-hours walk in clinic?
    - O Yes
    - O No
    How many times? ____________
    Was it beneficial?
    - O Yes
    - O No
    - O Mixed

14. Have you had any visits to an emergency department?
    - O Yes
    - O No
    How many times? ____________
    Was it beneficial?
    - O Yes
    - O No
    - O Mixed
15. Have you been admitted to hospital since the delivery of your baby?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
   O Yes
   O No
   O Mixed

16. Has your baby been admitted to hospital since he or she was born?
   O Yes
   O No
   How many times? ____________
   Was it beneficial?
   O Yes
   O No
   O Mixed
Appendix X: YPNFA Letter of Collaboration

YOUNG PARENTS NO FIXED ADDRESS
c/o Oolagen Youth Mental Health
65 Wellesley Street East, Suite 500 Toronto, ONT M4Y 1G7

November 11, 2015

Re: Community Collaboration for Research Project

The Young Parents No Fixed Address Network supports the research project conducted by Barbara Chyzzy entitled “Mobile Phone Based Peer Support to Prevent Postpartum Depression Among Adolescent Mothers: A Pilot Randomized Controlled Trial”.

Young Parents No Fixed Address (YPNFA) is a network of agencies and organizations dedicated to building strong community partnerships to address the challenges for homeless/street involved, pregnant and parenting youth and their children. We have been collaborating for the past 18 years.

Our network members will assist with advertising the research project and facilitating Ms. Chyzzy’s recruitment of peer mentors and participants through our 30 plus member agencies from across Toronto.

In keeping with our target population, we recommend for Ms. Chyzzy’s research project to include mothers who are between the ages of 15-24 years of age. We also understand the reasons behind having a starting age of 16 years.

Sincerely,

Yvette Roberts
YPNFA Coordinator
Telephone: 416-509-4097
Email: yvette@oolagen.org
Appendix Y: Women’s XChange Award Letter

Barbara Chyzzy
University of Toronto
155 College Street
Toronto, Ontario
M5T 1P8

Dear Ms. Chyzzy,

On behalf of Women’s Xchange at the Women’s College Research Institute, we congratulate you on the success of your $15K Challenge submission! We have approved your application for funding in the amount of $14,000 for your project entitled Mobile phone based peer support to prevent postpartum depression in adolescent mothers: A pilot RCT. The following terms and conditions must be met in order to receive these funds:

- You must wait for research ethics board (REB) approval prior to commencing any research. You are responsible for obtaining this approval from your institutional REB or the REB of your academic collaborator.
- We ask that you keep complete and accurate records of all project expenses with supporting documentation for each transaction. Funds must be spent according to the submitted and approved budget proposal. Any requests for changes to this budget must be approved in advance by Women’s Xchange. Any unspent funds at the end of your project must be returned to Women’s Xchange.
- We also ask that you acknowledge the funder (Women’s Xchange) on all materials produced as a result of this award.
- Funding is effective immediately (cheque forthcoming) and a financial report will be due to Women’s Xchange no later than March 31st, 2016.
- As outlined in the guidelines, an executive summary of the project is required one year following the release of funds. A 2-3 minute video showcasing the project shall be produced in Spring 2016 (further details forthcoming).
- As a recipient of this award, you may be asked to participate on a future $15K Challenge review committee.
- Please note you are also obliged to respond to queries from Women’s Xchange throughout the duration of your project for the purpose of knowledge translation activities and reporting to the Ministry of Health and Long Term Care.

We look forward to an ongoing relationship with you in promoting and supporting women’s health research across Ontario.

Sincerely,

Robin Mason, PhD
Scientific Lead, Women’s Xchange

By signing below, I acknowledge that I have read and agreed to the above terms and conditions:

Barbara Chyzzy

Name (please print)  Signature  Date

March 22, 2015
Appendix Z: Safety Protocols

Mobile Phone Based Peer Support Program For Adolescent Mothers

SAFETY PROTOCOLS

Contents:

1. One Page Summary of Safety Protocols
2. Protocols for Peer Mentors:
   A. Peer Mentor Safety Protocol Flowchart
   B. Peer Mentor Protocol for Immediate Safety Issue and Dialing 911
   C. Peer Mentor Protocol for Not Immediate Safety Issues
3. Protocols for Research Assistant (RA) during Data Collection:
   A. Research Assistant Protocol for Positive Response on EPDS
   B. Research Assistant Protocol if Mother Indicates Harm to Infant
4. Documentation Forms
   A. Peer Mentors Concerns Checklist
   B. Issue of Safety Documentation Form
   C. Positive Response on EPDS Self-Harm Question Form
   D. Infant Harm Documentation Form
   E. Referral to Public Health Nurse Form
5. Intake Numbers for Referrals to Children’s Aid Society and Public Health Nurse
One Page Summary of Safety Protocols

The safety of trial participants and their children must be ensured at all times during this research study. The protocols on the following pages will guide the Peer Mentors, Principal Investigator (Barbara Chyzzy), PhD Research Supervisor (Dr. Cindy-Lee Dennis) and PhD Committee Members (Dr. LaRon Nelson, Dr. Jennifer Stinson and Dr. Simone Vigod) on the actions to take in the event of a safety concern for a participant. These safety protocols have been adapted from Dr. Dennis’ telephone based interpersonal therapy trial for mothers with postpartum depression. Protocols have been developed specifically for Peer Mentors as well as research assistants (RA) and the Principal Investigator (PI). An overview of the protocols is summarized below.

For All Immediate Safety Issues:
If at any time during this research study, it is believed that a participant is harming herself or may harm her infant and believes there is an **immediate danger** to the mother or baby, **911 must be contacted.** The research personal person speaking with the participant should remain on the phone with the mother, **DIAL 911** on a separate telephone line, and wait on the line until support arrives for the mother.

For All Not Immediate Safety Issues:
If at any time during this research study there is a safety issue for a participant which is not an immediate danger to the mother or her infant, the research personal should contact the PI (Barbara Chyzzy) immediately to discuss the situation. For Peer Mentors, the PI will document all information. RAs should document their own findings and send this information to the PI. The PI will contact her PhD research supervisor (Dr. Cindy-Lee Dennis) and at least one of the above listed PhD committee member to determine next steps for further action.

Contacting Children’s Aid Society:
It is important to acknowledge that a report to a child welfare organization, such as the Children’s Aid Society (CAS), may have life-long after effects for the mother, her baby and her family. CAS will be contacted automatically for all “immediate safety issues”. However, before making a report to a CAS for “not immediate safety issues”, the entire research team (including the PI, PhD Research Supervisor and all PhD Committee Members) will evaluate all aspects of the mother’s case and decide on appropriate actions.
Peer Mentors Safety Protocol Flowchart

Peer mentors should follow this flowchart for any YES answers on the CONCERNS CHECKLIST

CONCERNS CHECKLIST
During your voice or text message conversation, did the participant mention any:
1. Thoughts of self-harm?
2. Thoughts of suicide?
3. Thoughts of harm to infant?
4. Threats to other people?
5. Inappropriate behaviour from adults?
6. Feelings of hopelessness?
7. Feelings of being bullied?
8. Any other safety concerns?

YES

Is there an immediate danger for mother or baby?
Example: Mother says she has hurt or is going to hurt herself or her baby right away

YES
1. Remain on phone line or continue texting with mother
2. Ask mother “where are you right now?”
3. **DIAL 911 on separate phone**
4. Give the 911 operator the mother’s address
5. Wait on the cell phone line with the mother until support arrives
6. Contact Barbara Chyzzy

NO
1. Contact Barbara Chyzzy immediately to discuss situation
2. Barbara Chyzzy will document all information and contact Dr. Cindy-Lee Dennis (research supervisor) and other members of the research team to discuss what action to take.

Contact information for Barbara Chyzzy: 647-292-6521 or 905-737-1793

If you are not able to reach Barbara Chyzzy, please call Dr. Cindy-Lee Dennis (PhD supervisor) at 416-946-8608 or 416-485-0808
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Peer Mentor Protocol for Immediate Safety Issue and for Dialing 911

STEPS:
If the Peer Mentor checks off any box on the Peer Mentor Concerns Checklist) and believes there is an immediate issue of danger or harm to the mother, baby or others, the following steps should be taken.

1. The Peer Mentor should confirm the mother’s exact location and address.

2. The Peer Mentor should remain on the telephone line with the mother, and on a separate telephone line, **DIAL 911**

3. The Peer Mentor should give an explanation to the 911 operator and say something such as: “My name is (your first and last name) and I am a University of Toronto peer mentor involved a research study for teen mothers. I currently have a mother on another cell phone line who is receiving peer support from me through this study. She just informed me that... (explain emergency situation to operator, e.g., she is about to kill herself, her baby or others right at this moment).”

4. The Peer Mentor should provide the mother’s name and address to the operator when prompted.

5. The Peer Mentor should wait on the cell phone line with the mother and operator until local support arrives.

6. The Peer Mentor should also tell the mother that she will immediately notify the research team to inform them about the emergency situation. If the emergency situation is related to immediate harm to the mother's baby or other children, the Peer Mentor should inform the mother she will also contact the Children's Aid Society (CAS) as required by law (see point 8 for further discussion).

7. After the mother has received emergency support, the Peer Mentor should contact the PI (Barbara Chyzzy) immediately. If the PI is unavailable, the Peer Mentor should contact the Research Study Supervisor (Dr. Cindy-Lee Dennis).
8. While speaking with the Peer Mentor, the PI will document detail of the conversation on the appropriate form including:

- Date
- Participant’s ID number
- Peer Mentor’s ID number
- Description of Safety Issue
- Date / time of contact between participant and peer mentor
- Date and time 911 was contacted
- Details on suspected harm to self or infant/child
- Date and time CAS was contacted (see section below for further detail)
- Other comments / notes

a) If the emergency situation is related to immediate self-harm, suicide, or harm to/from other adults, the PI will complete the Issue of Safety Documentation Form and proceed to Step 9 below.

b) If the emergency situation is related to immediate harm to the mother's baby or other children (by the mother, another adult or a child), the Peer Mentor and PI will make a 3-way call to CAS as required by law (see below). This is to inform CAS about the events and assist in connecting the mother and her family with additional help. The Peer Mentor will be responsible to report the information to CAS but the PI will remain on the 3-way call for support to the Peer Mentor. The PI will then complete the Issue of Safety Documentation Form and proceed to Step 9 below.

Responsibility to report an infant or child in need of protection: The main purpose of Ontario’s Child and Family Services Act (CFSA) is to protect and promote the best interests of children1. According to the CFSA, if a person has reasonable grounds to suspect that an infant or child is in need or may be in need of protection, that person must immediately report directly to the mother's local Children's Aid Society (CAS) / Child Welfare Agency2. The person with the reasonable grounds to suspect harm to an infant must not rely on anyone else to report to CAS/Child Welfare on his/her behalf. "Reasonable grounds” refers to the information that an average person, using normal and honest judgment, would need in order to decide to report.1

Professional confidentiality: The duty to report overrides the provisions of any other provincial statute, specifically, those provisions that would otherwise prohibit disclosure by the professional or official2

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9. The PI will send the *Issue of Safety Documentation Form* to her PhD Research Supervisor, Dr. Cindy-Lee Dennis and each of the PhD committee members (Dr. LaRon Nelson, Dr. Jennifer Stinson and Dr. Simone Vigod).

10. The PI will arrange a meeting or teleconference with PhD Research Supervisor, Dr. Cindy-Lee Dennis and each of the PhD committee members (Dr. LaRon Nelson, Dr. Jennifer Stinson and Dr. Simone Vigod) to discuss the situation and determine if the participant can continue participation in the study.

11. The PI will review audio or text message recordings to verify if all information was accurately documented on the *Issue of Safety Documentation Form*.

12. If a full review by the study’s research team determines that the mother should OR should not resume participation in the peer support program, the Peer Mentor together with the PI will confidentially telephone the mother using 3-way calling to inform her about this decision.

13. The PI will complete follow-up notes (eg: what happened afterward – has the mother continued the peer mentoring sessions? Withdrawn from the study? etc)
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Peer Mentor Protocol for Not an Immediate Safety Issue

STEPS:
If the Peer Mentor checks off any box on the Peer Mentor Concerns Checklist and believes the concern is a not an immediate safety issue, the following steps should be taken:

1. The Peer Mentor should complete the discussion with the mother by saying something like “I am concerned about you and your baby and I would like to talk with my study supervisors to see if extra support would help you and your family”

2. The Peer Mentor should contact the PI (Barbara Chyzzy) within 24 hours. If the PI is unavailable, the Peer Mentor should contact the Research Study Supervisor (Dr. Cindy-Lee Dennis).

3. While speaking with the Peer Mentor, the PI will document the following details of the conversation on Form B: Issue of Safety Documentation Form:
   - Date
   - Participant’s ID number
   - Peer Mentor’s ID number
   - Description of Safety Issue
   - Date of contact between participant and peer mentor
   - The approximate time of contact between participant and peer mentor
   - Date and time 911 was contacted
   - Details on suspected harm to self or infant/child
   - Whether CAS was contacted (see section below for further detail)
   - Other comments / notes

4. The PI will send the Issue of Safety Documentation Form to her Research Supervisor (Dr. Cindy-Lee Dennis) and at least one of the PhD research committee members (either Dr. LaRon Nelson, Dr. Jennifer Stinson or Dr. Simone Vigod).

5. A meeting or teleconference with the Barbara Chyzzy, Dr. Dennis and at least one of the PhD committee members will be held as soon as possible to discuss concerns regarding the peer mentor’s response to questions in point 3 above. After a full review and discussion, a final decision will be made by the research team to determine if the Children’s Aid Society (CAS) will be contacted or if a referral to a Public Health Nurse will be made:

a) If the decision is made that CAS should be contacted, the PI will contact CAS with the Peer Mentor via a 3-way call to inform her that CAS will be introduced as part of her care. The Peer Mentor can inform the mother something such as: “Thank you for trusting me to support you. I am concerned about you and your baby and as recommended by the
study supervisors, we would like to provide you with additional help by calling someone from the Children’s Aid Society so they can help you and your family.”

b) If the decision is made that CAS should NOT be contacted but a referral for support is recommended (such as referral to a Public Health Nurse or a community agency), the PI will contact the Peer Mentor and inform her of this decision. The Peer Mentor and PI will review contact information for potential referrals. The Peer Mentor will then call back to the mother and say something such as: “Thank you for trusting me to support you. I have discussed your situation with the research team and we feel it would help you and your family to get some extra support such as… (mention name of support and contact number). If the mother refuses a referral from a Public Health Nurse, the Peer Mentor should notify the PI who will document this on the Trial Progress Notes Form.

Responsibility to report an infant or child in need of protection: The main purpose of Ontario’s Child and Family Services Act (CFSA) is to protect and promote the best interests of children. According to the CFSA, if a person has reasonable grounds to suspect that an infant or child is in need or may be in need of protection, that person must immediately report directly to the mother's local Children's Aid Society (CAS) / Child Welfare Agency. The person with the reasonable grounds to suspect harm to an infant must not rely on anyone else to report to CAS/Child Welfare on his/her behalf: "Reasonable grounds" refers to the information that an average person, using normal and honest judgment, would need in order to decide to report.1

Professional confidentiality: The duty to report overrides the provisions of any other provincial statute, specifically, those provisions that would otherwise prohibit disclosure by the professional or official.2

6. Only after complete consultation of the outlined steps above, and if advised, should the PI and Peer Mentor contact CAS or a Public Health Nurse. If the mother refuses a referral from a Public Health Nurse, the PI will document the incident on the Referral to Public Health Nurse Form.

7. The PI will complete follow-up notes (eg: what happened afterward – has the mother continued the peer mentoring sessions? Withdrawn from the study? etc)

MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

STEPS:

During data collection, if the mother scores positive (1, 2, or 3) on self-harm item # 10 on the EPDS, the following steps should be taken by the RA (or PI if this is a baseline EPDS assessment):

1. The RA should complete the Positive Response on EPDS Self-Harm Question Form which includes completing a risk of suicide assessment and document course of action taken.

2. If the RA believes there is an immediate danger for the mother, the RA should confirm the mother’s exact location and address, remain on the telephone line with the mother, and on a separate telephone line, DIAL 911.

3. The RA should introduce herself to the 911 operator and say something such as: “My name is (your first and last name) and I am a University of Toronto research assistant involved in a research study for teen mothers. I currently have a mother on another cell phone line who just informed me that... (explain emergency situation to operator, e.g., she is about to kill herself, her baby or others right at this moment)”.

4. The RA should provide the mother’s name and address to the operator when prompted.

5. The RA should wait on the cell phone line with the mother and operator until local support arrives.

6. After the mother has received emergency support, the RA should contact the PI (Barbara Chyzzy) immediately at 647-292-6521 or 905-737-1793. If the PI is unavailable, the RA should contact the Research Study Supervisor (Dr. Cindy-Lee Dennis) at 416-946-8608 or 416-485-0808. The PI will debrief the incident with the research team and document action taken at bottom of the Positive Response on EPDS Self-Harm Question Form.
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Research Assistant Protocol if Mother Indicates Harm to Infant

STEPS:

During data collection with the research assistant (RA), if the mother discloses thoughts or plans to harm her infant, the following steps should be taken:

1. If the situation is an immediate safety issue, the RA should confirm the mother’s exact location and address, remain on the telephone (business) line with the mother, and on a separate telephone (business) line, DIAL 911.

2. The RA should introduce herself to the 911 operator and say something such as: “My name is (your first and last name) and I am a University of Toronto research assistant involved in a research study for teen mothers. I currently have a mother on another cell phone line who just informed me that... (explain emergency situation to operator, e.g., she is about to kill herself, her baby or others right at this moment).”

3. The RA should provide the mother’s home address to the operator when prompted.

4. The RA should wait on the cell phone line with the mother and operator until local support arrives.

5. The RA should also tell the mother that she will immediately notify the research team to inform them about the emergency situation and that she will also contact the Children’s Aid Society (CAS) as required by law (see point 8 for further discussion).

6. After the mother has received emergency support and before contacting CAS, the Peer Mentor should contact the PI (Barbara Chyzzy) immediately. If the PI is unavailable, the Peer Mentor should contact the Research Study Supervisor (Dr. Cindy-Lee Dennis).

7. The RA should document all details about the incident on the Infant Harm Documentation Form and inform CAS as required by law (see below). The PI should be contacted immediately.

Responsibility to report an infant or child in need of protection: The main purpose of Ontario’s Child and Family Services Act (CFSA) is to protect and promote the best interests of children. According to the CFSA, if a person has reasonable grounds to suspect that an infant or child is in need or may be in need of protection, that person
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

must immediately report directly to the mother's local Children's Aid Society (CAS) / Child Welfare Agency2. The person with the reasonable grounds to suspect harm to an infant must not rely on anyone else to report to CAS/Child Welfare on his/her behalf. "Reasonable grounds" refers to the information that an average person, using normal and honest judgment, would need in order to decide to report.1

Professional confidentiality: The duty to report overrides the provisions of any other provincial statute, specifically, those provisions that would otherwise prohibit disclosure by the professional or official2.

8. The PI will send the Infant Harm Documentation Form to her PhD Research Supervisor, Dr. Cindy-Lee Dennis and each of the PhD committee members (Dr. LaRon Nelson, Dr. Jennifer Stinson and Dr. Simone Vigod).

9. The PI will arrange a meeting or teleconference with PhD Research Supervisor, Dr. Cindy-Lee Dennis and each of the PhD committee members (Dr. LaRon Nelson, Dr. Jennifer Stinson and Dr. Simone Vigod) to debrief the situation.

Research Assistant Protocol for EPDS Score > 12

STEPS:

During data collection, if the mother has an EPDS score > 12, the following steps should be taken by the RA (or PI if this is a baseline EPDS assessment):

1. The RA should complete the *Referral to Public Health Nurse Form* which documents the following information:
   - Date of referral to Public Health Nurse (PHN)
   - Participant’s study ID
   - Whether mother consents to contacting a PHN
   - Reason for referral
   - Further comments

2. The RA should notify the PI of the referral and send the PI the completed *Referral to Public Health Nurse Form*. 
Peer Mentor Concerns Checklist

Study Title: Mobile Phone Based Peer Support to Prevent Postpartum Depression Among Adolescent Mothers: A Pilot Randomized Controlled Trial

Name of Principle Investigator: Barbara Chyzzy, RN, BN, MN

If a participant mentions by phone or text any of the following concerns, please contact Ms. Chyzzy immediately by texting or calling. You will be asked to briefly describe your concerns. If you have other concerns which are not listed below, please contact Ms. Chyzzy 24 hours per day.

CONCERNS CHECKLIST:

During your voice or text message conversation, did the participant report:

- 1. Thoughts of self-harm?
- 2. Thoughts of suicide?
- 3. Thoughts of harm to infant?
- 4. Threats to other people?
- 5. Feelings of hopelessness?
- 6. Inappropriate behaviour for adults?
- 7. Feelings of being bullied?
- 8. Any other concerns about participant safety?

If you checked any of the above boxes, please contact:

Barbara Chyzzy, RN, BN, MN
647-292-6521 or 905-737-1793

If Ms. Chyzzy is not available, please contact:
Dr. Cindy-Lee Dennis, RN, PhD (supervisor)
416-946-8608 or 416-485-0808
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Issue of Safety Documentation Form

INSTRUCTIONS: This form is to be completed by the PI if peer mentor calls the PI to report:

- Participant who reveals thoughts of harm to self, infant or child or
- Participant who reveals thoughts of harm from others to mother

Participant Study ID: 

Today’s Date: 

Peer Mentor ID: 

Participant Location: Toronto ✅ Peel ✅ Halton ✅ York ✅ Durham ✅

PI to document details of safety issue (as described by the peer mentor) including:
1) date/time of contact between peer mentor and participant;
2) full description of the safety issue (who was involved, which concern the peer mentor had on the concerns checklist, overview of discussion with mother);
3) whether CAS or 911 was contacted (why or why not)
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

**Documentation:**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was 911 called?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was CAS notified?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was referral given?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If Yes, to where was the referral made? If referral to a Public Health Nurse is refused by the mother, PI should document this on the Trial Progress Notes Form

- Community Mental Health
- Family Doctor
- Public Health Nurse
- Young Parent Agency
- Other referral: ______________________________

**Follow-up notes for PI to complete**

<table>
<thead>
<tr>
<th>Date (yyyy/mm/dd)</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

**Indicate follow-up with Participant:**

- [ ] Continued peer support sessions
- [ ] Dropped out of peer support therapy but consents to follow-up data collection
- [ ] Withdrew from study

**Incident discussed with:**

- [ ] PhD Research Supervisor (Dr. Dennis)
- [ ] PhD Committee Member (Dr. Nelson)
- [ ] PhD Committee Member (Dr. Stinson)
- [ ] PhD Committee Member (Dr. Vigod)
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Positive Response on EPDS Self-Harm Question Form

Participant Study ID: __________

Today’s Date: ____________ ____________ ____________

Questionnaire administered by: Principal Investigator □ Research Assistant □

Assessment Period: Baseline □ 12-week □

INSTRUCTIONS: This form is to be completed if a participant scores positive (1, 2, or 3) on self-harm item # 10 on the EPDS

| For the EPDS Item 10: The thought of harming myself has occurred to me..... |
|------------------|----------------|
| Yes, quite often  | 3              |
| Sometimes         | 2              |
| Hardly ever       | 1              |
| Never            | 0              |

Immediately assess the risk for suicide, using the questions below (which have been adapted from Holden, 1994 as cited in Ross, Dennis, Blackmore & Stewart, 2005):

1. How often do you have thoughts of harming yourself?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

2. How severe are these feelings/ How much have they been bothering you?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

3. Have you had these kinds of feelings before? If so, what happened? How did you cope?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

4. Have you made any previous suicide/self-harm attempts?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

5. Have you thought about how you would harm yourself?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

6. What support do you currently have at home?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

7. (If she has a partner) Have you talked about how you are feeling with him/her?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

8. Are you close to your parents/other family members? Do they know how you have been feeling?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

9. Can you count on your partner and/or family members to give you emotional support?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

10. (If she does not have a partner or family members to give support) Is there anyone else in your life whose support you can call on?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

11. Have you told this person or anyone else about your feelings?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

12. Could you phone this person and would he/she come if you felt you needed support?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Course of Action Taken:

Was mother’s local public health department contacted?
Yes ☐ No ☐

Was 911 called?
Yes ☐ No ☐

Referral given:
Community Mental Health ☐
Family Physician ☐
Postpartum Support Group ☐
Emergency ☐

Other comments/notes:

Follow-up notes (to be completed by the PI). Include date, who was consulted about the incident and further action taken.
MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

Infant Harm Documentation Form

INSTRUCTIONS: If the research assistant (RA) suspects infant harm, please follow the Protocol for Research Assistant if Mother Indicates Harm to Infant and complete the following form. Make sure to notify the Principal Investigator BEFORE contacting CAS about the events and course of action to be taken.

Name of RA: ____________________________

Participant Study ID: ____________

Today’s Date: _________/_______/_______

(yyyy) (mm) (dd)

EPDS score: ______

Was the CAS contacted?  □ Yes  □ No

Was 911 called?  □ Yes  □ No

Other comments/notes (describe nature of safety concern, recommendation for course of action by PI and research team):

____________________________________

____________________________________
Referral to Public Health Nurse Form

INSTRUCTIONS: This form is to be completed by the PI if a referral is recommended to a Public Health Nurse (PHN) for any reason (such as need for community resources or an EPDS score >12)

Participant Study ID: __________

Today’s Date: __________ __________ __________

Peer Mentor ID: __________

Does mother agree for PI to contact PHN for this referral?

Yes ☐ No ☐

Which public health unit was contacted?

Toronto ☐ Peel ☐ Halton ☐ York ☐ Durham ☐

Comments: (reason for referral to PHN and if known, reason for refusal to accept the referral):

Is further follow-up required by PI? Yes ☐ No ☐

Explain details of follow-up required:
## MOBILE PHONE PEER SUPPORT PROGRAM FOR ADOLESCENT MOTHERS

### Intake Numbers for Referral to Children’s Aid Society and Public Health Nurses

<table>
<thead>
<tr>
<th>Name of Health Region</th>
<th>Children’s Aid Contact Information</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Toronto</td>
<td>Children’s Aid Society of Toronto</td>
<td><a href="http://www.torontocas.ca">http://www.torontocas.ca</a></td>
</tr>
<tr>
<td></td>
<td>416-924-4640</td>
<td></td>
</tr>
<tr>
<td>Durham</td>
<td>Durham Children’s Aid Society</td>
<td><a href="http://www.durhamcas.ca">http://www.durhamcas.ca</a></td>
</tr>
<tr>
<td></td>
<td>905-433-1551 or 1-800-461-8140</td>
<td></td>
</tr>
<tr>
<td>Halton</td>
<td>Halton Children’s Aid Society</td>
<td><a href="http://haltoncas.ca">http://haltoncas.ca</a></td>
</tr>
<tr>
<td></td>
<td>905-333-4441 or 1-866-607-5437</td>
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<tr>
<td>Peel</td>
<td>Peel Children’s Aid Society</td>
<td><a href="http://www.peelcas.org">http://www.peelcas.org</a></td>
</tr>
<tr>
<td></td>
<td>905-363-6131 or 1-888-700-0996</td>
<td></td>
</tr>
<tr>
<td>York</td>
<td>York Region Children’s Aid Society</td>
<td><a href="http://www.yorkcas.org">http://www.yorkcas.org</a></td>
</tr>
<tr>
<td></td>
<td>905-895-2318 or 1-800-718-3850</td>
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<table>
<thead>
<tr>
<th>Name of Health Region</th>
<th>Public Health Nurse Information (Health Babies / Healthy Children)</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Toronto</td>
<td>Toronto Public Health</td>
<td><a href="http://www.publichealth@toronto.ca">http://www.publichealth@toronto.ca</a></td>
</tr>
<tr>
<td></td>
<td>Dial 311 or 416-338-760</td>
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<tr>
<td>Durham</td>
<td>Durham Public Health</td>
<td><a href="http://www.durham.ca/health">http://www.durham.ca/health</a></td>
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<tr>
<td></td>
<td>905-666-6241 or 1-800-841-2729</td>
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<td>Halton</td>
<td>Halton Region Public Health</td>
<td><a href="http://www.halton.ca/living_in_halton/public_health/">http://www.halton.ca/living_in_halton/public_health/</a></td>
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<tr>
<td></td>
<td>905-825-6000 or 1-866-442-5866</td>
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<tr>
<td>Peel</td>
<td>Peel Region Public Health</td>
<td><a href="https://www.peelregion.ca/health">https://www.peelregion.ca/health</a></td>
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<tr>
<td></td>
<td>905-779-7700</td>
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<tr>
<td>York</td>
<td>York Region Public Health</td>
<td><a href="http://www.york.ca">http://www.york.ca</a></td>
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<tr>
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<td>1-800-361-5653</td>
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