

A systematic review of home-based interventions to prevent and treat postpartum depression

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Abstract This systematic review evaluated randomized controlled trials assessing home-based psychological interventions to prevent and treat postpartum depression (PPD). Six studies meeting inclusion criteria were identified, five assessing treatments for PPD and one assessing a preventive intervention for PPD. Interventions used cognitive behavioral, psychodynamic, and non-directive counseling approaches. Of the six studies reviewed, four reported statistically significant treatment effects on PPD following the intervention. Each of the three types of psychological interventions were shown to reduce levels of maternal depression. Recommendations for future development and evaluation of home-based psychological interventions for PPD are discussed. These include identification of mediators and moderators of intervention efficacy, exploring strategies for prevention of PPD, and targeting high-risk groups.

Keywords Postpartum depression · Review · Home-based · Home visiting · Interventions

Postpartum depression (PPD) affects approximately 10 to 15% of new mothers after childbirth (Gaynes et al. 2005; O'Hara and Swain 1996), and the average prevalence rate of non-psychotic postpartum depression symptomatology has been estimated at 13% (O'Hara and Swain 1996). Like episodes of depression at other points in the lifespan, depression during the postnatal period has negative consequences both for women and their families. Data indicate that women experiencing postpartum depression are less likely than non-depressed women to breastfeed, play and talk with their newborns, or comply with immunizations and well-child visits (McLearn et al. 2006; Chung et al. 2004; Mandl et al. 1999; Minkovitz et al. 2005). Children of women with PPD are at risk for poor developmental outcomes, including emotion regulation problems, social interaction difficulties, and attachment insecurity (Cogill et al. 2005; Grace et al. 2003; Hipwell et al. 2000; Murray et al. 1999; Sohr-Preston and Scaramella 2006), in part due to poor maternal parenting practices (Goodman and Gotlib, 1999). The high prevalence of PPD and its negative impact on women and children constitute a significant public health problem.

Home-based interventions during the perinatal period (defined as pregnancy through the child's first birthday) have increased in variety and scope in recent years (e.g., Olds et al. 2000). While home-based intervention models and goals vary, all home-based interventions deliver services in clients' homes rather than expecting families to seek out services. Home visiting—one type of home-based intervention—involves regular home visits to pregnant women or new mothers by health or mental health professionals or paraprofessionals and may be

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guided by different models or approaches. Such visits may target birth or infant outcomes, as well as maternal health, mental health, or parenting skills. Recent reviews of home visiting programs have found that they have a modest impact in promoting positive parenting behavior and reducing child abuse and neglect (Sweet and Appelbaum 2004). There is relatively little research regarding the impact of home-based interventions, including home visiting, on the prevention and treatment of PPD.

Home-based interventions have considerable potential to address PPD effectively for several reasons. First, few people who experience depression seek treatment (Fortney et al. 1998; U.S. Department of Health and Human Services 2001). The Surgeon General's report on Mental Health cited treatment-seeking rates as low as 25% in people with diagnosed disorders (U.S. Department of Health and Human Services 2001) and rates for low-income, minority populations may be even lower (Miranda et al. 1998). Research suggests that although pregnant women may interact with the health care system more than at any other time in their lives, detection and treatment of depression remains a problem (Kelly et al. 2001; Lumley et al. 2004; U.S. Department of Health and Human Services 2001). Home-based interventions for women who have recently delivered have the potential to introduce mental health services to women who do not tend to seek out such services.

Second, home-based interventions, particularly home visiting, typically serve high-risk, low-income families who may have the greatest need for mental health services yet face significant barriers to obtaining mental health care. The few studies that have examined prevalence of depression in low-income women show higher levels of depression among these women compared to women with greater financial resources (Bennett et al. 2004; Hobfoll et al. 1995; Holzman et al. 2006). Studies among women of low socio-economic status (SES) have reported depression symptom prevalence ranging from 29 to 51% (Administration for Children and Families 2006; McKee et al. 2001; Bolton et al. 1998; Da Silva et al. 1998; Seguin et al. 1995) and one study of low SES women found that 16% experienced a major depressive episode in their second trimester (Hobfoll et al. 1995), a prevalence nearly double the pooled prevalence rate for middle-class samples reported by Bennett et al. (2004). This doubling of risk for depression for low-income, minority perinatal women was mirrored in studies of women drawn from Women, Infant, and Children (WIC) clinics (Cordero and Kurz 2006; Kurz 2005; Kurz and Hesselbrock 2006).

Third, home-based programs are a natural place to integrate the prevention and/or treatment of PPD because such programs already serve large numbers of pregnant and recently delivered women. Recent years have seen a

proliferation in the number of home visiting programs with this trend likely to continue. There are home visiting programs in all states; some states have taken specific models to scale (e.g., Nurse-Family Partnership, Parents as Teachers, Healthy Families America, Healthy Start), with programs in nearly every community statewide. Congress recently considered legislation to expand and improve home-based parenting services through the Education Begins at Home Act (U.S. Department of Health & Human Services 2008).

Existing interventions for PPD occurring in the home have taken one of two approaches: prevention or treatment. Preventive interventions are designed to reduce the development of a mental disorder and therefore are implemented before the onset of a disorder (Mrazek and Haggery 1994). Within the prevention paradigm, interventions are further classified into three levels which are defined by the populations they target: universal, selective, and indicated. Universal preventive interventions target the general population or a whole population group without regard to individual risk for a mental disorder, selective preventive interventions target individuals or a subgroup of the population who have risk factors which increase the likelihood of developing a mental disorder, and indicated preventive interventions target individuals at high risk for developing a mental disorder who have detectable signs or symptoms of a mental disorder but do not currently meet criteria for a disorder (Mrazek and Haggery 1994). Treatment interventions, on the other hand, target individuals who already meet criteria for a mental disorder and focus on decreasing the severity and/or duration of a mental disorder and reducing risk for future episodes of the disorder.

This manuscript reviews what is known about home-based interventions' impact on the prevention and treatment of PPD. Although three reviews of interventions to prevent and treat PPD have been published (Dennis and Creedy 2004; Dennis and Hodnett 2007; Lumley et al. 2004), those reviews do not focus specifically on the impact of home-based interventions on PPD. Given the potential of home-based interventions to address PPD and increasing use of home-based interventions during the perinatal period, this review provides the first in-depth examination of home-based interventions' impact on preventing and treating PPD. We focus our review on psychological interventions given research suggesting that many mothers prefer non-pharmacological interventions (Dennis and Chung-Lee 2006) and our belief that these interventions may have the greatest potential to impact PPD. Psychological interventions refer to an array of structured approaches that incorporate psychological methods (e.g., cognitive-behavioral therapy, interpersonal psychotherapy) to reduce psychological distress or promote adaptive functioning.

Methods

PubMed, PsycInfo, Embase, and CINAHL databases were searched from their inception to February 2008 using combinations of the terms *home-based*, *home visiting*, *home visitation*, *home visit*, *depression*, *postpartum depression*, *postnatal depression*, *perinatal depression*, *prevention*, *treatment*, *intervention*. The search was limited to peer-reviewed studies published in English. In addition, studies referenced in relevant published articles and reviews (Dennis and Creedy 2004; Dennis and Hodnett 2007; Lumley et al. 2004) were assessed.

To be selected for inclusion, a study was required to meet the following criteria: (1) assessment of a home-based psychological intervention in which prevention or treatment of PPD was a primary or secondary goal, (2) study sample of pregnant women or women with a child < 1 year old, (3) randomized controlled trial design, and (4) publication in a peer-reviewed journal. Literature reviews, meta-analyses, and case studies were excluded.

Our initial search yielded 24 abstracts that appeared to meet the specified inclusion criteria; those articles were obtained and reviewed. Upon closer review of those 24 studies, seven were excluded because they reported on non-psychological interventions (Armstrong et al. 1999; Armstrong et al. 2000; Fraser et al. 2000; Gelfand et al. 1996; Morrell et al. 2000; Navaie-Waliser et al. 2000; Roman et al. 2007), one was excluded because the sample was not restricted to mothers of children less than 1 year old (Beeber et al. 2004), one was excluded because there was no comparison group (Ammerman et al. 2005), two were excluded because assignment to intervention or control was not randomized (Austin et al. 1999; Cullinan 1991), two were excluded because they combined results for home-based and clinic-based services (Wickberg and Hwang 1996; Zayas et al. 2004), and another four studies were excluded because there was not enough information given to determine the specific type of intervention employed (Koniak-Griffin et al. 2002; Marcenko and Spence 1994; Marcenko et al. 1996; Tezel and Gözüm 2006). An overview and critique of the six articles meeting criteria for inclusion in the review are presented below.

Results

Table 1 displays the location, dates, intervention approach (i.e., prevention or treatment), sample description, intervention design, intervention provider, and control condition(s) for each of the six articles reviewed. Only one study reported on a home-based intervention to prevent PPD (Wiggins et al. 2005); the remaining five studies described home-based interventions to treat PPD (Appleby et al. 1997; Chabrol et

al. 2002; Cooper et al. 2003; Holden et al. 1989; Prendergast and Austin 2001). Most studies recruited community-based samples, with only one trial recruiting a sample of women determined to be at high risk for depression as a function of neighborhood socioeconomic deprivation (Wiggins et al. 2005). Intervention length ranged from 5 weeks to 1 year with most lasting 6 to 8 weeks. Three studies used health visitors as interventionists (Appleby et al. 1997; Holden et al. 1989; Wiggins et al. 2005), one used nurses to deliver the intervention (Prendergast and Austin 2001), one used masters-level therapists (Chabrol et al. 2002), and one used a combination of mental health clinicians and health visitors (Cooper et al. 2003).

Two studies employed non-directive counseling, also commonly referred to as “listening visits”, as their intervention (Holden et al. 1989; Wiggins et al. 2005). Non-directive counseling is based on principles of Rogerian therapy and the assumption that talking to a supportive professional “will help people take a more positive view of themselves and their lives” (Holden et al. 1989, p. 224). The role of the counselor in non-directive counseling is to aid in exploration and understanding of feelings but not to offer judgment or advice (Dennis and Hodnett 2007). Three studies assessed interventions that used cognitive behavioral therapy (CBT) techniques (Appleby et al. 1997; Chabrol et al. 2002; Prendergast and Austin 2001). CBT techniques include modification of negative and dysfunctional thoughts, as well as strategies to increase pleasant activities and decrease behaviors leading to low mood (Beck et al. 1979; Lewinsohn et al. 1986). One study compared non-directive counseling to CBT and psychodynamic therapy (Cooper et al. 2003). Psychodynamic therapy is a broad-based category that includes diverse treatments and explanatory models derived from Freudian and post-Freudian theories (Gibbons et al. 2008). Psychodynamic approaches generally emphasize exploration of early experiences and attachments to provide insight into current functioning.

Study findings are described below. Table 2 presents a summary of study results, as well as depression measures used and analyses conducted (e.g., intention-to-treat).

Non-directive counseling studies

One of the two non-directive counseling interventions was reported to be effective in preventing or treating PPD. The first trial of non-directive counseling was conducted by Holden and colleagues in 1989. Women who scored > 12 on the Edinburgh Postnatal Depression Scale (EPDS; Cox et al. 1987) 6 weeks after delivery, and met research diagnostic criteria for minor or major depression 12 weeks after delivery on Goldberg’s Standardized Psychiatric Interview (Goldberg et al. 1970), were randomized to

Table 1 Characteristics of included studies

Study	Location/dates	Study type	N	Sample description	Intervention condition	Intervention provider	Control condition
Appleby et al. 1997	South Manchester, England May 1993–Feb 1995	Treatment	87	Urban, community sample	Placebo + 6 biweekly CBT sessions	Psychologist	3 control groups: C1: Fluoxetine+I CBT session C2: Fluoxetine +6 CBT sessions C3: Placebo+I CBT session Routine care
Chabrol et al. 2002	Toulouse and Narbonne, France Dec 1999–Mar 2000	Treatment	48	Community sample	5–8 weekly CBT sessions incorporating elements of supportive, educational, and psychodynamic therapies	Master's Degree level therapists	Routine care
Cooper et al. 2003	Cambridge, England Jan 1990–Aug 1992	Treatment	193	Community sample	10 weekly sessions of either CBT, psychodynamic therapy, or non-directive counseling	Specialists in each of the three treatments or non-specialist health visitors	Routine care
Holden et al. 1989	Edinburgh and Livingston, Scotland NR	Treatment	55	Community sample	8 weekly sessions of non-directive counseling	Health visitors	Routine care
Prendergast and Austin, 2001	Eastern Sydney, Australia NR	Treatment	37	Community sample	6 weekly CBT sessions	Early Childhood Nurses	6 weekly support sessions
Wiggins et al. 2005	London, England Mar 1999–Nov 2000	Prevention	731	Urban, high-risk, community sample	1 year of monthly non-directive counseling sessions	Health visitors	Routine care

NR not reported

Table 2 Depression measures, type of analysis, and results of included studies

Study	Depression measures	Intention-to-treat analysis	Results
Appleby et al. 1997	EPDS HAM-D Revised Clinical Interview Schedule	Yes	Immediately post-intervention, all 4 groups showed significant improvement on the Revised Clinical Interview Schedule 6 sessions of CBT were more effective than 1 session on the Revised Clinical Interview Schedule and HAM-D but not on the EPDS
Chabrol et al. 2002	BDI EPDS HAM-D	Yes ^a	Immediately post-intervention, women in the intervention group had reduced scores on all measures compared to women in the control group There was a 60% difference in recovery rate between the intervention and control groups favoring the intervention
Cooper et al. 2003	EPDS	Yes	Immediately post-intervention, women in all 3 intervention groups had lower EPDS scores compared to women in the control group and women in the psychodynamic therapy group had lower rates of depression compared to women in the control group At 9, 18, and 60 months postpartum, none of the intervention groups differed significantly from the control group on either measure
Holden et al. 1989	EPDS Structured Clinical Interview for DSM-III-R	No	Immediately post-intervention, women in the intervention group had a significant reduction in mean scores from baseline on both measures compared to women in the control group There was a 32% difference in recovery rate between the groups favoring intervention
Prendergast and Austin, 2001	EPDS Goldberg's Standardized Psychiatric Interview MADRS	No	There were no significant differences between the groups on any of the measures immediately or 6-months post-intervention
Wiggins et al. 2005	EPDS GHQ	Yes	There were no significant differences between the intervention and control groups immediately or 6-months post-intervention

BDI Beck Depression Inventory; *EPDS* Edinburgh Postnatal Depression Scale; *GHQ* General Health Questionnaire; *HAM-D* Hamilton Depression Rating Scale; *MADRS* Montgomery-Asberg Depression Rating Scale

^aAll subjects in both groups completed the treatment protocol and were re-assessed post-intervention

intervention or routine care. Women in the intervention group received an average of 8.8 sessions of non-directive counseling for at least 30 min delivered by a health visitor trained in the methods of this psychological intervention. Immediately post-intervention, results indicated that 69% of women in the intervention group and 38% of women in the control group had recovered from depression. In addition, women who received the intervention had a significant reduction in mean scores on the EPDS and Goldberg's Standardized Psychiatric Interview compared to women receiving routine care. However, some participants were taking antidepressants during the study period, and antidepressant use was not controlled in analyses, possibly leading to bias in these results. In addition, the authors did not conduct intention-to-treat analyses.

Findings from a larger trial of non-directive counseling conducted by Wiggins et al. (2005) differed from those reported by Holden et al (1989). In this selective preventive intervention, women living in deprived areas of London were randomized to routine care or an intervention condition consisting of monthly home-based non-directive counseling sessions delivered by health visitors. Over the 12-month duration of the study, women in the non-directive

counseling intervention group received an average of 10 h of support in seven home visits and additional contacts over the phone. Immediately post-intervention, there were no differences in depressive symptoms, as assessed by the EPDS, between women randomized to the home-based non-directive counseling intervention and women randomized to routine care. The same results were found six-months post-intervention when depressive symptoms were measured with the General Health Questionnaire (GHQ; Goldberg and Williams 1988). However, neither the use of routine health visiting services available to women in the control condition nor baseline depressive symptoms or sociodemographic characteristics were accounted for in the analyses, and different measures were used to assess depressive symptoms immediately post-intervention and at the 6 month follow-up.

Overall, these two studies suggest that non-directive counseling may be an effective treatment for PPD but may not be as effective when used as a selective preventive intervention. This pattern of findings may reflect design and methodology differences between the Wiggins et al. (2005) study and the Holden et al. (1989) study beyond those due to the different types of interventions employed. First,

Wiggins and colleagues recruited an urban, high-risk sample, a population that may have required more intensive intervention efforts than the sample recruited by Holden et al. (1989). Second, although prevention of PPD was one target of the Wiggins et al. intervention, it was not the sole focus of the intervention as it was in the other study. A third potential reason for the lack of reduction in depressive symptoms is that the protocol of Wiggins et al. involved monthly, rather than weekly, sessions of counseling. However, the results of these studies must also be considered in the context of some limitations. Holden et al. (1989) did not conduct intention-to-treat analyses or assess outcomes longitudinally and while Wiggins et al. (2005) did those two things, they did not use a manualized intervention. Neither study took steps to monitor implementation.

Cognitive behavioral therapy studies

Three studies assessed the use of home-based CBT interventions for treatment of PPD (Appleby et al. 1997; Chabrol et al. 2002; Prendergast and Austin 2001). All three trials reported reductions in depression following the intervention, although only two found statistically significant between-group differences. The first study utilized a factorial design to investigate the use of CBT compared to a pharmacological treatment. Appleby and colleagues (1997) randomized women who scored 10 or higher on the EPDS, 12 or higher on the Revised Clinical Interview Schedule (Lewis et al. 1992), and met research diagnostic criteria for major or minor depression to receive fluoxetine (Prozac) or placebo in combination with either one 60 min session of CBT or one 60 min session plus five biweekly 30 min sessions of CBT delivered by trained health visitors. Immediately post-intervention, women who received six CBT sessions were less likely to meet criteria for depression on the Revised Clinical Interview Schedule and had lower scores on the Hamilton Depression Rating Scale (HAM-D; Hamilton 1960), but not on the EPDS, than women receiving one CBT session. Fluoxetine also proved effective in lowering rates of depression and reducing depressive symptoms but the combination of fluoxetine and CBT did not lead to additional improvement above the effect of either intervention alone. This study excluded women with chronic or treatment resistant depression and reported a high attrition rate (30%), which should be kept in mind when interpreting its findings.

Chabrol et al. (2002) reported that CBT was effective for treatment of PPD. In this two-tier combined prevention/treatment trial, women with symptoms of depression during the first 5 days postpartum were randomized to routine care or a one-hour individual prevention session delivered in an obstetric clinic by a masters-level therapist. Women in both

groups completed the EPDS 4 to 6 weeks postpartum; those in the intervention group who scored 11 or higher and met DSM-IV (American Psychiatric Association 1994) criteria for major depressive episode were asked to participate in a program of between five and eight home visits, those in the control group who met the same inclusion criteria continued to receive routine care. Participants in the intervention group received an average of six weekly, one-hour sessions of a cognitive behavioral treatment program delivered by Master's Degree level therapists in their homes. Significant differences were seen between women randomized to the home-based treatment and women randomized to routine care immediately post-intervention on the EPDS and Beck Depression Inventory (BDI; Beck et al. 1988), and there was a 60% difference in recovery rate favoring the intervention group (66.6% in the intervention group versus 6.6% in the control group) on the HAM-D. Limitations of this study include non-independent outcome assessment, the small sample size, and lack of follow-up.

A third trial evaluated a CBT treatment for PPD delivered by nurses (Prendergast and Austin 2001). Women scoring 12 or higher on the EPDS who met DSM-IV criteria for major or minor depression were randomized to receive six weekly home-based CBT sessions or six weekly clinic visits that incorporated parenting advice and non-specific emotional support also delivered by nurses. Intervention dosage differed between groups; all women in the intervention group received all six sessions of CBT whereas only 45% of women in the control group attended all six sessions. While a reduction in symptoms on the EPDS and Montgomery-Asberg Depression Rating Scale (MADRS; Montgomery and Asberg 1979) was seen for both groups immediately post-intervention, no significant differences were found between the groups, suggesting that the support provided during in-clinic visits was as effective as CBT in reducing symptoms of depression. Six months post-intervention, there was a trend toward CBT being more effective with scores on the EPDS continuing to decrease for women in the CBT condition but not for women in the control condition, but there was no statistically significant difference in scores between the groups. This was a very small trial with only 17 participants in the intervention group and 20 participants in the control group, however, and may not have had enough power to detect differences of small to moderate magnitude between the groups. In addition, women in both groups were taking antidepressants or herbal remedies for depression and this was not taken into account in the analyses. Finally, the authors did not conduct intention-to-treat analyses.

Taken together, these three studies suggest that home-based CBT interventions are effective in reducing symp-

toms of PPD and that a relatively short six-session course of treatment may be sufficient to produce such reductions in PPD symptoms. It is unclear from these studies, however, if the effects of CBT are sustained over time. The one study using CBT that followed participants post-intervention (Prendergast and Austin 2001) found that symptoms of depression continued to decrease in the intervention group but not in the control group 6 months post-intervention, but this finding did not reach statistical significance. The results from these three studies should be interpreted with some caution as several methodological concerns exist. Only Appleby et al. (1997) used independent assessors to evaluate study outcomes and as previously mentioned, only Prendergast and Austin (2001) followed participants over time. In addition, only Prendergast and Austin (2001) and Chabrol et al. (2002) used manualized interventions and attempted to ensure adherence to the treatment protocols.

Comparison of multiple home-based intervention strategies

Cooper et al. (2003) assigned women with an EPDS score of 12 or more who met DSM-III-R criteria for major depression 8 weeks after delivery to cognitive-behavioral therapy, psychodynamic therapy, non-directive counseling, or routine care. Women received 10 weeks of therapy from either a specialist in each of the three intervention conditions or a health visitor trained in two of the three intervention conditions. Post-intervention, women in each intervention group had lower EPDS scores than women in the control group and women in the psychodynamic group also had lower rates of major depressive disorder compared to women in the control group, as measured by the Structured Clinical Interview for DSM-III-R (SCID; Spitzer et al. 1992). At follow-up 9 months, 18 months, and 5 years postpartum, scores on the EPDS did not differ between women in the intervention groups and women who had received routine care, however. Moreover, there were no differences in the rate of major depressive disorder between any of the intervention groups and the control group at the 9 month, 18 month, or 5 year follow-ups. Post-intervention and at follow-up 9 months postpartum, women treated by non-specialists were found to have a greater reduction in EPDS scores than women treated by specialists. One important factor that needs to be considered when interpreting these results is that although the primary goal of the study was to examine the long-term effect of the three psychological interventions on maternal mood, the CBT and psychodynamic interventions were designed to focus more on the mother–infant relationship than on the depression itself. It is possible that if an emphasis had been placed on dealing with the depression, the reduction in symptoms seen immediately post-intervention would have been sustained over time.

Discussion

Our review suggests that home-based psychological interventions are a promising approach for addressing postpartum depression. Of the six studies reviewed, four reported statistically significant improvement in PPD following the intervention (Appleby et al. 1997; Chabrol et al. 2002; Cooper et al. 2003; Holden et al. 1989). Moreover, we found that CBT (Appleby et al. 1997; Chabrol et al. 2002), non-directive counseling (Holden et al. 1989), and psychodynamic (Cooper et al. 2003) interventions each demonstrated positive effects. Given the substantial risk of long-term negative outcomes from untreated depression for both mothers and their families and the large number of home-based interventions delivered during the perinatal period, it is striking that so few home-based interventions specifically target PPD as a primary outcome. Along with an overarching recommendation to increase the number of home-based intervention trials aimed at preventing and treating PPD, there are four areas we believe are critical for advancing research on home-based psychological interventions that address postpartum depression.

Researchers should articulate their theory of change, postulating and measuring mediators and moderators of effectiveness as they design and test intervention approaches Theories of change specify the pathways or mechanisms through which an intervention is expected to produce effects. These hypothesized pathways are often informed by the underlying theoretical approach employed by the research team. For example, a cognitive-behavioral framework views depression as the product of faulty thoughts; therefore, during CBT, the client is encouraged to identify these dysfunctional thoughts and is helped to develop alternative, more positive thoughts. Measuring this more proximal outcome (i.e., changes in dysfunctional thoughts), in addition to the distal outcome (i.e., depressive symptoms) can help us assess fidelity as well as effectiveness. Specifying moderators, such as parity, will also help us better understand which approaches may work better for different subgroups of vulnerable mothers. The studies we reviewed did not frame their research in this way, nor did they assess risk, vulnerability, and protective factors and their hypothesized relationship to postpartum depression. This omission may be due to the fact that small sample sizes limited the ability to detect moderating and mediating influences on PPD. However, inclusion of such models in future studies is needed to increase our understanding of which intervention components are most useful and why. This is particularly important given growing consensus that numerous risk and protective factors within multiple ecological systems influence the onset and chronicity of depression and differences in outcomes (Garber 2006).

Mediators and moderators related to delivering the intervention which may affect the outcome of the study should also be carefully considered. One of the studies reviewed examined the association between type of intervention provider and depressive symptoms and surprisingly, found that immediately post-intervention and at 9 months postpartum, women who were treated by trained non-specialist health visitors had a significantly greater reduction in depressive symptoms than women who were treated by specialists in the treatments employed (Cooper et al. 2003). These findings have important implications for service delivery and while they need to be replicated, suggest that researchers should examine who can best deliver the intervention. In addition, the number of sessions likely to be needed, how long after the intervention participants should be followed, and specifically with respect to preventive interventions, when the intervention should be delivered (i.e., during pregnancy, postpartum, or across both periods), and what level of intervention is most appropriate to meet the needs of the target population should be considered.

Research should expand our knowledge base about the effectiveness of empirically-supported interventions to prevent PPD Only one study we reviewed focused on preventing PPD (Wiggins et al. 2005), with no preventive effects found for the non-directive counseling intervention used by this study. Prevention of mental disorders has gained increasing attention in recent years, given that prevalence of common mental illnesses exceeds available treatment resources (Muñoz 2001). Moreover, the known harmful effects of maternal depression on infant social-emotional development—as well as on subsequent maternal mental health—make pregnant women and new mothers a critical target for prevention efforts (Mendelson and Muñoz 2006). Interventions using CBT approaches to prevent PPD have shown promising results in two studies targeting low-income Latinas in prenatal care settings (Muñoz et al. 2007; Le et al. under review). Interpersonal Psychotherapy (IPT) has also shown promising effects in preventing PPD in a low-income sample when delivered in a prenatal medical clinic (Zlotnick et al. 2006). These findings suggest the need to explore whether CBT and IPT approaches are effective in preventing PPD via home-based interventions.

Additional research on PPD interventions should focus on high-risk groups, especially low-income, ethnic minorities Populations at highest risk for PPD, such as low-income, ethnic minorities, are often underrepresented in research. Only one of the studies reviewed here reported information on the race or ethnicity of their participants (Wiggins et al. 2005) and only three (Cooper et al. 2003;

Holden et al. 1989; Wiggins et al. 2005) provided information on socioeconomic status. The single study focused on low-income women did not affect PPD symptoms (Wiggins et al. 2005). It is unclear whether the failure to achieve desired results in this study was attributable to the focus on a high-risk population or factors such as choice of intervention strategy. However, given the growing body of work suggesting that women with fewer financial resources and/or who are members of minority groups are at elevated risk for PPD (Bennett et al. 2004; Hobfoll et al. 1995; Holzman et al. 2006), and less likely to seek treatment services (Miranda et al. 1998), it is imperative that future interventions focus on addressing the mental health needs of these populations. Women of low socioeconomic status often face substantial barriers to obtaining mental health care, including access to health insurance, transportation, childcare, and stigma regarding use of mental health services. Home-based interventions may be particularly well-suited to overcoming transportation and childcare barriers for low-income populations. Moreover, embedding mental health services and interventions within existing home-based interventions (e.g., home visiting) may also be perceived as more acceptable and less stigmatizing.

When conducting interventions with low-income women from varied racial and ethnic minority groups, consideration must be given to the cultural norms and values that may influence these interventions' applicability and implementation. Interventions developed for and initially tested with middle or upper class, White populations often require adaptation to fit the needs and values of other groups. Such adaptations must balance cultural adaptation with fidelity to the original intervention model (Castro et al. 2004). There is a pressing need for researchers to document how they adapted manualized interventions as they worked with new populations (see, Podorefsky et al. 2001 as an example). Thus, future research on home-based interventions to prevent and treat PPD in low-income women from racial and ethnic minority groups should address what aspects of existing evidence-based interventions need to be culturally adapted to promote their feasibility and acceptability.

Future research should use standardized methods of reporting findings to improve the quality of published experimental reports The Consolidated Standards of Reporting Trials (CONSORT) statement (Moher et al. 2001), which has been widely adopted by the medical field for reporting results of randomized controlled trials, is gaining increased acceptance among social science researchers as well. Future reports of home-based interventions for PPD would benefit from including the CONSORT flow diagram, which illustrates participant

progress through the phases of a randomized trial, and elements of the CONSORT checklist such as recruitment and follow-up procedures, method and implementation of randomization, baseline participant demographic and clinical characteristics, sample size determination, and statistical methods used for analyses (Moher et al. 2001). Quality of future published studies can also be improved by providing sufficient detail about the intervention that would allow it to be replicated with fidelity and reporting statistical information needed to calculate effect sizes. Finally, to bring home-based PPD intervention research to the attention of policy makers and increase the likelihood of its wider adoption, future studies would benefit from reporting cost data and cost-effectiveness analyses.

While this review represents the first synthesis of the array of home-based interventions aimed at preventing and treating PPD, there are several limitations that must be noted. First, we were not able to conduct a meta-analysis of the studies in our review, as only three of the six studies provided sufficient information to permit effect size calculation (Chabrol et al. 2002; Cooper et al. 2003; Prendergast and Austin 2001). Second, it is unclear whether interventions that showed more immediate benefits in treating PPD continue to benefit women subsequently. Previous research has documented that among adults who recover from depression, 25% experience a recurrence of disorder within the first year and 60% within 5 years (Solomon et al. 2000). Only three (Cooper et al. 2003; Prendergast and Austin 2001; Wiggins et al. 2005) of the six studies followed participants post-intervention and in the one study that showed an effect of the intervention and followed participants over time, the effects were not maintained (Cooper et al. 2003). Third, differences across the studies in intervention duration and content, intervention providers, depression measures, assessment time frames, and study samples create challenges for comparing findings across studies. For instance, interventions ranged in duration from six weekly sessions (Prendergast and Austin 2001) to 1 year of monthly sessions (Wiggins et al. 2005) and only three studies used trained therapists or intervention specialists (Appleby et al. 1997; Chabrol et al. 2002; Cooper et al. 2003). Furthermore, study sites included settings in England, France, Scotland, Australia, and Sweden, therefore encompassing women of varied cultural norms and diverse environmental stressors. As a result, the generalizability of these study findings to other settings may be limited. Fourth, there were methodological limitations among the studies reviewed, including high attrition levels (Appleby et al. 1997), inclusion of women taking antidepressants without accounting for the effects of those medications (Holden et al. 1989; Prendergast and Austin 2001), and failure to report intent-to-treat analyses (Wickberg and Hwang 1996). In addition, only half of the

studies used a manualized intervention (Chabrol et al. 2002; Holden et al. 1989; Prendergast and Austin 2001), conducted independent assessments (Appleby et al. 1997; Cooper et al. 2003; Holden et al. 1989), and took steps to ensure adherence to the intervention protocol (Chabrol et al. 2002; Cooper et al. 2003; Prendergast and Austin 2001). These methodological limitations require that the results of these studies be interpreted with caution. Finally, our review only included studies that used a RCT design. Promising findings have emerged from other home-based interventions to treat PPD, including the work of Ammerman et al. (2005) who used an adapted form of CBT to treat PPD among women enrolled in paraprofessional and nurse home visitation programs.

In spite of these limitations, we believe this review addresses an important gap in our knowledge about the opportunities to reduce the burden of postpartum depression in women and their families. We see the growth of home-visiting programs—especially those targeted at populations with increased risk for depression and disproportionate rates of untreated depression—as a way to decrease disparities in access to evidence-based mental health prevention and treatment services. Partnerships with mental health professionals may offer an important tool to home-visiting programs seeking to demonstrate their own value and effectiveness. The evidence-based interventions delivered in the homes of pregnant and recently postpartum women reviewed here show promise. We hope our recommendations for future work in this area will encourage more high-quality studies to elucidate the factors associated with positive outcomes for women at risk for postpartum depression.

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