HHS Public Access

Author manuscript

Obstet Gynecol. Author manuscript; available in PMC 2017 May 01.

Published in final edited form as:

Obstet Gynecol. 2016 May ; 127(5): 917–925. doi:10.1097/AOG.0000000000001403.

Improved Perinatal Depression Screening, Treatment, and Outcomes With a Universal Obstetric Program

Lyndsay A. Avalos, PhD, MPH[a], **Tina Raine-Bennett, MD, MPH**[a], **Hong Chen, MPH**[a], **Alyce S. Adams, PhD**[a], and **Tracy Flanagan, MD**[b]

[a]Division of Research, Kaiser Permanente Northern California, Oakland, California

[b]The Permanente Medical Group, Regional Offices, Kaiser Permanente Northern California, Oakland, California

Abstract

OBJECTIVE—To evaluate whether universal prenatal and early postnatal screening for depression leads to increased detection, subsequent intervention, and improved depressive symptom outcomes.

METHODS—We conducted a population-based retrospective cohort study of 97,678 pregnant Kaiser Permanente Northern California members during three phases of the Universal Perinatal Depression Screening Program (Pre-Implementation, Roll-Out, Fully-Implemented) from 2007 through 2014. Depression screening scores (PHQ-9), depression diagnoses, individual counseling visits, demographic characteristics and medication dispensings were extracted from electronic health records and pharmacy databases. The percentage of women screened, new depression diagnoses, and women receiving treatment were compared between the three phases (tests of trend). Changes in depressive symptom scores up to 6 months postpartum were assessed (Roll-out and Fully-Implemented phases).

RESULTS—A significant increase emerged in the percentage of women screened over the three phases ranging from <1%(n=122)(Pre-Implementation) to 98%(n=41,124)(Fully-Implemented) ($p<0.001$). Identification of a new depression diagnosis increased from 8%(n=1,341)(Pre-Implementation) to 12%(n=4,943)(Fully-Implemented)($p<0.001$). Although the observed percentage of women receiving treatment decreased (60.9%(Pre-Implementation) to 47.1%(Fully-Implemented)), significant increases in the expected percentage of women receiving treatment emerged (42.6%(Pre-Implementation) to 47.1%(Fully-Implemented);$p<0.05$). Similar trends were noted for women with PHQ-9 scores of 15 or greater (greater severity), highlighting an increase in expected percentage of women receiving treatment (5.9%(Pre-Implementation) to 81.9%(Fully-Implemented);$p<0.05$). In the Fully-Implemented Phase, improvements in depressive symptoms up to 6-months postpartum were noted.

Corresponding Author: Lyndsay Ammon Avalos, 2000 Broadway, Oakland, CA 94612, Phone: 510-891-3426, Lyndsay.A.Avalos@kp.org.

Financial Disclosure

The authors did not report any potential conflicts of interest.

CONCLUSION—These data provide evidence of benefit for universal perinatal depression screening programs regarding depression identification and treatment receipt and suggest improvement in symptom outcomes for women in screening programs, especially among integrated healthcare systems.

Graphical Abstract

Precis: Universal perinatal depression screening in obstetric care is associated with increased identification of depressive symptoms and depression, treatment and improved symptom outcomes.

Introduction

Depression is the leading cause of disability in women[1]. Perinatal depression which includes both major and minor depressive episodes is estimated to impact between 12-20% of pregnant and postpartum women within the first year after delivery[2]. The consequences of maternal depression can range from preterm delivery[3], negative maternal-infant interaction[4], child behavioral problems[5] and in severe cases suicide and infanticide[6].

Perinatal depression is underdiagnosed[7] and can often go unrecognized as women may not report their symptoms. Screening for depression with a validated tool compared to not screening increases the rate of detection of depression[8], and, it stands to reason that treatment may improve outcomes. Yet, many obstetricians or primary care physicians do not screen for perinatal depression for several reasons ranging from insufficient training to lack of knowledge regarding where to refer[9-11]. In May of 2015, the American College of Obstetricians and Gynecologists (the College) recommended that clinicians screen patients at least once during the perinatal period for depression symptoms using a validated tool[12]. However, the College acknowledged the evidence supporting universal screening to identify and treat perinatal depression to improve outcomes is limited. The US Preventive Services Task Force also recommended universal perinatal screening based on limited evidence (level B). More evidence is needed on outcomes associated with universal perinatal depression screening programs.

Kaiser Permanente Northern California recently implemented a region-wide universal perinatal depression screening program. The objective of this study was to evaluate whether universal prenatal and early postnatal screening for depression leads to increased detection, subsequent intervention, and improved depressive symptom outcomes.

Materials and Methods

The setting for this study is Kaiser Permanente Northern California, a large group practice within an integrated health care delivery system that provides comprehensive medical services to over 3.6 million members and has approximately 37,000 pregnancies and deliveries in a 14-county region. Kaiser Permanente Northern California employs more than 500 obstetric physicians and nurse practitioners and over 100 Certified Nurse-Midwives. All 15 regional medical centers (with 48 associated office facilities) have Obstetrics and Gynecology, Adult Family Medicine, Pediatric, and Behavioral Medicine/Psychiatry

Departments. Coverage is provided for approximately 30% of the northern California population and is similar demographically, racially and ethnically to the population living in the geographic area. Information on diagnoses, procedures, hospitalizations, outpatient visits, laboratory tests, and prescribed medications are maintained within administrative and comprehensive electronic health records (EHR).

From 2009 to 2012, Kaiser Permanente Northern California progressively implemented a universal perinatal depression screening program, with women being screened three times using the Patient Health Questionnaire (PHQ-9): twice during pregnancy (first prenatal visit and 26-28 weeks/the glucola visit) and 3-8 weeks postpartum. Details about the development and implementation of the screening program are described in detail elsewhere[13]. Briefly, prior to 2009 women were not screened routinely, generally only if they were symptomatic, but depression diagnoses during pregnancy and postpartum were recorded in the EHR.

In 2009 three medical centers began piloting universal perinatal depression screening with screening during at least of one of three pregnancy and postpartum periods (early pregnancy, late pregnancy andpostpartum). From 2009-2012, referred to as the “roll-out phase”, several guidelines for the program were developed and implemented. Medical assistants asked patients to complete the PHQ-9 form at rooming at the designated visits and the clinician reviewed the form during the visit. If a woman's PHQ-9 score was 10 or higher, the guideline recommendations included symptom assessment and review of related current and past medical history. Using their clinical judgement, if indicated, the clinician documented a depression diagnosis in the EHR for screen positive women. Perinatal Depression Champions and Chiefs were responsible for educating clinicians and staff at the sites. Medical centers developed varying collaborations with Behavioral Health to facilitate referrals for treatment for screen positive women. Over this time the guidelines evolved to include reassessments of women identified with depression with a subsequent PHQ-9 evaluation during a follow-up encounter (office visit, online encounter or telephone visit) within 120 days. By 2010, all medical centers region-wide conducted screening during at least one of the pregnancy and postpartum periods.

By 2012, all obstetric offices in the region had implemented the universal perinatal depression screening program, which included screening at all three time periods, referring for treatment or providing treatment, and conducting follow-up assessments. This is referred to as the Fully-Implemented Phase.

The PHQ-9 has been validated in many studies as an instrument for screening for depression with high sensitivity (> 88%) and specificity (> 88%) in obstetric patients[14-18], as well as a tool to establish depression severity and outcome[19]. The nine question screener scores range from 0-27. A score of 1-4 suggests minimal depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression and 20-27 suggests severe depression. The PHQ-9 was chosen as the single screening instrument, to enable its use across the obstetric, adult family medicine, and behavioral health departments, knowing that this choice balanced out many factors including scientific validity and feasibility for a large scale population-based screening program.

A population-based retrospective cohort study of pregnant women aged 18 years and older was conducted and included women who had at least one obstetric visit during each of the following *three periods of pregnancy and postpartum*: the first 20 weeks of pregnancy (early pregnancy), 20 weeks of pregnancy through delivery (late pregnancy), and three months postpartum (postpartum). Inclusion criteria also required the first prenatal visit to occur during one of the *three distinct phases* in relation to the implementation of the Universal Perinatal Depression Screening Program: 1) Pre-Implementation-first prenatal visit date after April 1, 2007 and birth date prior to January 1, 2009; 2) Roll-out- first prenatal visit date after April 1, 2009 and birth date prior to January 1, 2012; 3) Fully Implemented- first prenatal visit date after April 1, 2012 and birth date prior to October 1, 2014. The timeframes for each phase were established to minimize the possibility of a woman's prenatal and postpartum visits crossing two phases and confounding the ability to attribute results to one phase. If a woman had more than one pregnancy during the study period, only the first pregnancy was included to avoid non-independent observations. The final study population included 97,678 pregnant women. This study was approved by the Kaiser Permanente Northern California Institutional Review Board.

Women were considered to have a new depression diagnosis if they had at least one depression ICD-9 diagnosis codes (296.20-296.25, 296.30 - 296.35, 298.0, 300.4, 309.0, 309.1, 648.4, or 311) during pregnancy or up to three months after delivery and no depression diagnosis or antidepressant drug dispensing in the year prior to their last menstrual period. Treatment for a new depression diagnosis was defined as having at least one antidepressant medication dispensed or at least one individual counseling visit or attendance at a group class that occurred on the same date or after the new depression diagnosis through 6 months postpartum. Antidepressant medications were predominantly SSRIs (citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine, and sertraline) but also included tricyclic acids (amitriptyline, clomipramine, desipramine, nortriptyline, doxepin, imipramine, protriptyline, and trimipramine), SNRIs (desvenlafaxine, duloxetine, milnacipran, and venlafaxine), monoamine oxidase inhibitors (phenelzine and tranylcypromine), and others (trazodone, bupropion, atomoxetine, mirtazapine, nefazodone, and vilazodone).

Data on maternal demographic and socioeconomic characteristics including age at delivery, marital status, race/ethnicity, and Medicaid status during pregnancy, as well as previous mental health diagnoses any time prior to their last menstrual period were ascertained.

Data are reported as frequencies and percentages. Tests of trend were conducted to compare overall PHQ-9 screening rates, and rates of depression diagnoses across each of the three phases of the universal perinatal depression screening program (Pre-Implementation, Roll-Out and Fully-Implemented) while chi-square tests were used to compare PHQ-9 scores (<10, 10-14, 15+) and screening rates for each pregnancy and postpartum period (i.e., early pregnancy, late pregnancy, and postpartum). Treatment rates and type of treatment received were also compared across the three phases of the program, for all women with a depression diagnosis and separately for women with a PHQ-9 score of 15 or greater indicating moderately severe to severe depression. Additional analyses were conducted to address limitations in comparing the percentage of women receiving treatment across the phases

including: 1) the increasing number of women in each phase, 2) under ascertainment of depression diagnoses prior to the screening program and thus a smaller number of women identified as needing treatment, 3) the potential that women diagnosed with depression prior to the screening program were more severe. Under the assumption that the screening program more accurately identified the true percentage of women with depression in the population, the percentage of women with depression in the Fully-Implemented phase was used to calculate the expected number women with depression in the other two phases. An expected percentage of treatment was then calculated using the observed number of women in treatment as the numerator and the expected number of women with a depression diagnosis in the denominator (Pre-Implementation and Roll-out Phases). This was conducted for both new depression diagnosis and new depression diagnosis and PHQ-9 score of 15 or greater. A Cochran-Armitage test for trend was conducted.

Improvement in depressive symptoms was assessed within each phase of the program through three metrics: 1) the percentage of women whose PHQ-9 score improved by 50% or more; 2) the percentage of women with a final PHQ-9 score less than 10; and 3) the percentage of women with a 5-point or greater drop in PHQ-9 score from the highest PHQ-9 to the final PHQ-9 score up to 180 days postpartum, which was considered to indicate clinical improvement[19,20]. Improvement in depressive symptoms was evaluated overall and separately for women with high severity (PHQ-9 score of 15 or greater).

Additional Chi-square analyses were conducted using the Fully-Implemented Phase to address potential bias. First we compared women in our sample to women excluded due to not having a prenatal or postpartum visit during all three time periods. Among women with a depression diagnosis or PHQ-9 scores of 15 or greater, we also compared those with a follow-up PHQ-9 to those without. Analyses were performed using SAS 9.3 (Cary, NC, USA; 2012).

Results

A total of 97,678 women were included in the analyses and their characteristics are shown in Table stratified by phase (Pre-Implementation, Roll-Out, Fully-Implemented).

A surge in the percentage of women screened for depression at least once occurred over the three phases of the implementation of the program, ranging from less than 1% in the Pre-Implementation Phase to 97.5% once Fully-Implemented (Table 2). There were markedly higher rates of screening in each of the *three perinatal time periods* by the time the universal perinatal depression screening program was fully-implemented (49.0%) compared to the pre-implementation (0%) and roll-out (25.1%) phases after adjusting for all characteristics listed in Table 1 (test of trend, $p<0.001$). When fully implemented, on average, women were screened 2.5 times during their pregnancy. Finally, identification of new perinatal depression diagnoses significantly increased over the three phases from 8.2% (Pre-Implementation) to 9.5% (Roll-Out Phase) to 11.7% (Fully-Implemented) (test of trend, $p<0.001$).

Over the three phases the observed percentage of women with a new depression diagnosis who received treatment decreased from 60.9% (Pre-Implementation) to 47.1% (Fully-

Implemented) ($p<0.05$). The percentage of women receiving treatment among those expected to have had a new depression diagnosis increased significantly from 42.6% (Pre-Implementation) to 47.1% (Fully-Implemented) ($p<0.001$) (Figure 1a).

The percentage of women with a PHQ-9 score of 15 or more (indicating moderate or severe depression) receiving treatment declined over time between the three phases from 100% Pre-Implementation to 81.9% in the Fully-Implemented Phase ($p<0.05$) (Figure 1b). However, our sensitivity analyses demonstrated a significant increase in the percentage of women receiving treatment among the expected number of women with a depression diagnosis and PHQ-9 score of 15 or greater from 5.9% (Pre-Implementation) to 81.9% (Fully-Implemented) (test of trend, $p<0.001$)(Figure 1b). This analysis did not identify any woman with suicide, suicide attempt, or infanticide or attempt.

Significant improvements in depressive symptoms up to six months (180 days) post diagnosis were noted for women in the Roll-Out Phase and Fully-Implemented phase (Table 3). Results are not shown for the Pre-Implementation Phase due to fewer than 10 women receiving a follow-up PHQ-9. Once the program was Fully-Implemented, 81.7% of the women had PHQ-9 scores less than 10 on their final follow-up PHQ-9 and 60.2% of the women's PHQ-9 scores decreased by a minimum of 50%. Additionally, 48.7% of the women demonstrated a minimum 5-point improvement in their PHQ-9 scores.

Of those with a PHQ-9 score of 15 or greater, 57.3% had depression scores less than 10 on their final PHQ-9 follow-up (Table 4). Similarly, 56.1% of the women's PHQ-9 scores improved by 50% or more. Overall, 74.8% of the women demonstrated a minimum 5-point improvement in their PHQ-9 scores.

We found similar percentages of women with a new depression diagnosis (12.0% vs. 11.7%) and higher severity symptoms (PHQ-9 score of 15 or greater; 6.2% vs. 5.3%) for women in our sample and not due to not having a prenatal or postpartum visit during all three time periods. However, we did note slightly higher rates of treatment overall (47.1% vs. 38.2%) as well as for women with a PHQ-9 score of 15 or greater (81.9% vs. 76.4%) in our sample compared to not.

Among those with a depression diagnosis Black women (14.1% vs. 10.7%, $p<0.01$) and women on Medicaid (9.1% vs. 7.6%, $p<0.01$) were less likely to have a follow-up. Among those with severe depression (PHQ-9 greater than 15), women on Medicaid during pregnancy were less likely to have a follow-up PHQ-9 (9.9% vs. 7.4%, $p<0.05$). No other significant differences emerged.

Discussion

Our findings demonstrate the effectiveness of universal screening for enhancing detection and treatment of perinatal depression. While symptoms improved for a majority of the women in the Fully-Implemented Phase, our ability to assess the effect of the program on symptom improvement was limited due to the lack of follow-up PHQ-9s during Pre-Implementation. Our findings suggest support for recommendations by the College and US Preventive Task Force that clinicians screen patients at least once during the perinatal

period[21]. Kaiser Permanente Northern California's large universal perinatal depression screening program provided a valuable opportunity for assessing the effectiveness of obstetric office-based screening programs.

Screening significantly increased over the three phases. Once fully implemented, nearly all women were screened during at least two of the pregnancy and postpartum periods. Identification of depression and depressive symptoms also increased significantly with the use of a validated screening tool. The higher proportion of women receiving treatment prior to full implementation may be due to a greater severity of depression among women identified prior to implementation of the screening program. Our analyses evaluating whether the program was successful at improving the percentage of women receiving treatment for those expected to need it noted a significant increase over the three phases. In the Fully-Implemented Phase, 5% of all pregnant and postpartum women, nearly half of the women with a new depression diagnosis and 82% with severe depression received treatment at Kaiser Permanente. Comparatively, treatment rates for women with severe depression in the Fully-Implemented Phase were similar to rates reported by Dietz et al[22] yet eclipse those of national samples of pregnant or postpartum women screened for major depression. These studies report a range of treatment receipt for depression between 14%-50%[23,24]. Other samples of women identified with depression in obstetric or hospital-based settings have also reported low rates of treatment (14%-20%)[25-27].

It is not known if women who did not receive treatment were offered treatment, or improved without need. Challenges exist in getting women to engage in treatment including logistical challenges, stigma, child care and time constraints[28,29]. Also our study did not capture care obtained outside of Kaiser Permanente Northern California (through secondary insurance) or through community or religious resources. We found a majority of the women with higher severity symptoms and likely in greater need of help, accessed mental health services.

Improvement in depressive symptoms by six months post-diagnosis was observed for a majority of women in the Fully-Implemented Phase. Women on Medicaid and Black women (with a depression diagnosis) were less likely to have a follow-up which may have impacted results. We note however, that the differences in percentage of women with a follow-up and not were minimal. A strength of Kaiser Permanente Northern California's universal perinatal depression screening program is the collaboration with mental health care specialists to support and provide treatment. Our rates of improvement exceed those from clinical trials that relied on trained family medicine providers for treatment of pregnant women[20,30,31]. Taken together, these studies underscore the importance of having treatment services whether in mental health or through primary care, available for women. The greater treatment response in our study may underscore the importance of collaborations with behavioral or mental health specialists to support and provide treatment. Smaller scale practices should consider developing alliances and agreements with “in network” and community behavioral health clinicians and resources.

Few differences were found between women who did not have a prenatal or postpartum visit during all three time periods and the women in our sample. Women in our sample had slightly higher rates of treatment. This might be expected given that women who do not

attend all of the recommended perinatal health care appointments may be less likely to utilize services in general. The equivalent rates of depression may suggest populations to target for treatment.

Lastly this study is a retrospective, observational study and not a randomized controlled trial. While randomized controlled trials are generally considered the gold-standard to measure efficacy, our study's strength is the ability to measure the effectiveness of universal perinatal depression screening.

Our findings highlight the effectiveness of universal perinatal depression screening, demonstrating it's potential for success in real-world settings. This study complements the recent systematic review of randomized control trials supporting the efficacy of universal screening[32]. The Kaiser Permanente Northern California experience demonstrates the capacity of clinicians to screen, identify and help women obtain treatment in collaboration with mental/behavioral health services leading to improved depressive symptoms. Finally, our findings suggest support for the College's and US Preventive Task Force's recent recommendations for screening pregnant and postpartum women for depression.

Acknowledgements

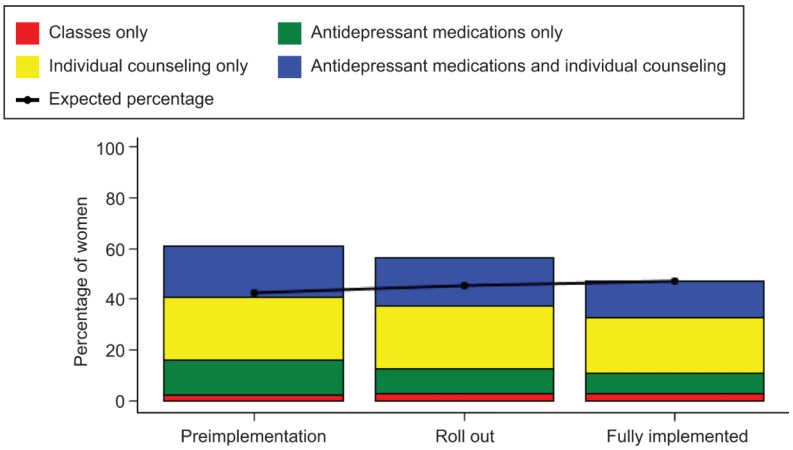
Participation on this study by Lyndsay Ammon Avalos was funded by UCSF-Kaiser/DOR Building Interdisciplinary Research Careers in Women's Health (BIRCWH) Program (K12HD052163, NICHD/NIH, Guglielmo, PI) and K01MH103444 awarded by the National Institute of Mental Health (NIMH).

References

1. Organization, WH. The World Health Report 2001: Mental Health: New Understanding, New Hope. Geneva: 2001.
2. Gavin NI, Gaynes BN, Lohr KN, Meltzer-Brody S, Gartlehner G, Swinson T. Perinatal depression: a systematic review of prevalence and incidence. Obstetrics and gynecology. 2005; 106:1071–83. [PubMed: 16260528]
3. Li D, Liu L, Odouli R. Presence of depressive symptoms during early pregnancy and the risk of preterm delivery: a prospective cohort study. Hum Reprod. 2009; 24:146–53. [PubMed: 18948314]
4. Beck CT. The effects of postpartum depression on maternal-infant interaction: a meta-analysis. Nurs Res. 1995; 44:298–304. [PubMed: 7567486]
5. Murray L. The impact of postnatal depression on infant development. J Child Psychol Psychiatry. 1992; 33:543–61. [PubMed: 1577898]
6. Barr JA, Beck CT. Infanticide secrets: qualitative study on postpartum depression. Can Fam Physician. 2008; 54:1716–7. e5. [PubMed: 19074717]
7. Pearlstein T. Perinatal depression: treatment options and dilemmas. Journal of psychiatry & neuroscience : JPN. 2008; 33:302–18. [PubMed: 18592032]
8. Smith MV, Rosenheck RA, Cavaleri MA, Howell HB, Poschman K, Yonkers KA. Screening for and detection of depression, panic disorder, and PTSD in public-sector obstetric clinics. Psychiatric services. 2004; 55:407–14. [PubMed: 15067153]
9. LaRocco-Cockburn A, Melville J, Bell M, Katon W. Depression screening attitudes and practices among obstetrician-gynecologists. Obstetrics and gynecology. 2003; 101:892–8. [PubMed: 12738146]
10. Olson AL, Kemper KJ, Kelleher KJ, Hammond CS, Zuckerman BS, Dietrich AJ. Primary care pediatricians' roles and perceived responsibilities in the identification and management of maternal depression. Pediatrics. 2002; 110:1169–76. [PubMed: 12456915]

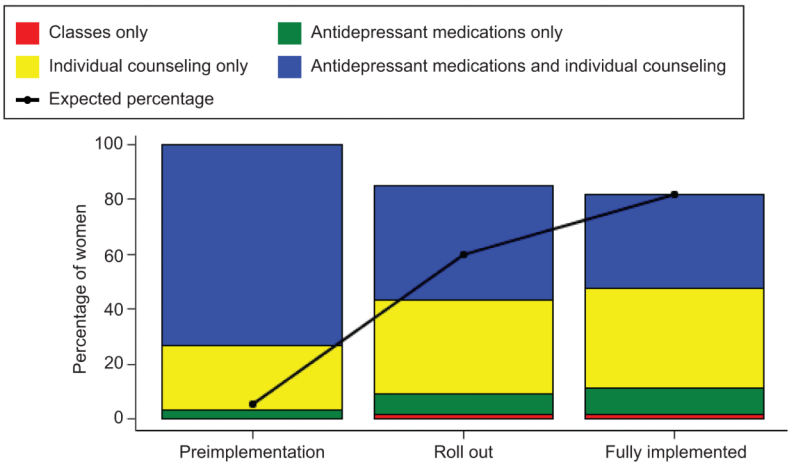
11. Foundation NIfHCMI. Identifying and Treating Maternal Depression: Strategies & Considerations For Health Plans. National Institute for Health Care Management Institute Foundation; 2010.
12. The American College of Obstetricians and Gynecologists Committee Opinion no. 630. Screening for perinatal depression. Obstetrics and gynecology. 2015; 125:1268–71. [PubMed: 25932866]
13. Flanagan T, Avalos LA. Perinatal Obstetric Office Depression Screening and Treatment: Implementation in a Healthcare System. under review.
14. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16:606–13. [PubMed: 11556941]
15. Spitzer RL, Williams JB, Kroenke K, Hornyak R, McMurray J. Validity and utility of the PRIME-MD patient health questionnaire in assessment of 3000 obstetric-gynecologic patients: the PRIME-MD Patient Health Questionnaire Obstetrics-Gynecology Study. Am J Obstet Gynecol. 2000; 183:759–69. [PubMed: 10992206]
16. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. Jama. 1999; 282:1737–44. [PubMed: 10568646]
17. Gilbody S, Richards D, Brealey S, Hewitt C. Screening for depression in medical settings with the Patient Health Questionnaire (PHQ): a diagnostic meta-analysis. J Gen Intern Med. 2007; 22:1596–602. [PubMed: 17874169]
18. Wittkampf KA, Naeije L, Schene AH, Huyser J, van Weert HC. Diagnostic accuracy of the mood module of the Patient Health Questionnaire: a systematic review. Gen Hosp Psychiatry. 2007; 29:388–95. [PubMed: 17888804]
19. Lowe B, Unutzer J, Callahan CM, Perkins AJ, Kroenke K. Monitoring depression treatment outcomes with the patient health questionnaire-9. Med Care. 2004; 42:1194–201. [PubMed: 15550799]
20. Yawn BP, Dietrich AJ, Wollan P, et al. TRIPPD: a practice-based network effectiveness study of postpartum depression screening and management. Ann Fam Med. 2012; 10:320–9. [PubMed: 22778120]
21. Myers, ER.; Aubuchon-Endsley, N.; Bastian, LA., et al. In: Efficacy and Safety of Screening for Postpartum Depression. Rockville (MD): 2013.
22. Dietz PM, Williams SB, Callaghan WM, Bachman DJ, Whitlock EP, Hornbrook MC. Clinically identified maternal depression before, during, and after pregnancies ending in live births. AmJPsychiatry. 2007; 164:1515–20.
23. Ko JY, Farr SL, Dietz PM, Robbins CL. Depression and treatment among U.S. pregnant and nonpregnant women of reproductive age, 2005-2009. Journal of women's health. 2012; 21:830–6.
24. Vesga-Lopez O, Blanco C, Keyes K, Olfson M, Grant BF, Hasin DS. Psychiatric disorders in pregnant and postpartum women in the United States. Arch Gen Psychiatry. 2008; 65:805–15. [PubMed: 18606953]
25. Kelly R, Zatzick D, Anders T. The detection and treatment of psychiatric disorders and substance use among pregnant women cared for in obstetrics. The American journal of psychiatry. 2001; 158:213–9. [PubMed: 11156803]
26. Marcus SM, Flynn HA, Blow FC, Barry KL. Depressive symptoms among pregnant women screened in obstetrics settings. Journal of women's health. 2003; 12:373–80.
27. Flynn HA, Blow FC, Marcus SM. Rates and predictors of depression treatment among pregnant women in hospital-affiliated obstetrics practices. General hospital psychiatry. 2006; 28:289–95. [PubMed: 16814627]
28. Dennis CL, Chung-Lee L. Postpartum depression help-seeking barriers and maternal treatment preferences: a qualitative systematic review. Birth. 2006; 33:323–31. [PubMed: 17150072]
29. Goodman JH. Women's attitudes, preferences, and perceived barriers to treatment for perinatal depression. Birth. 2009; 36:60–9. [PubMed: 19278385]
30. Cooper JE. Detection and management of psychiatric disorders in primary care. Br J Psychiatry. 2003; 182:1–2. [PubMed: 12509308]
31. Holden JM, Sagovsky R, Cox JL. Counselling in a general practice setting: controlled study of health visitor intervention in treatment of postnatal depression. BMJ. 1989; 298:223–6. [PubMed: 2493868]

32. O'Connor E, Rossom RC, Henninger M, Groom HC, Burda BU. Primary Care Screening for and Treatment of Depression in Pregnant and Postpartum Women: Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 2016; 315:388–406. [PubMed: 26813212]



	N	N	N
Treatment	816	2,083	2,326
Depression diagnosis (observed)	1,341	3,700	4,943
Depression diagnosis (expected)	1,916	4,585	4,943

A



	N	N	N
Treatment	30	723	1,071
Depression diagnosis (observed)	30	849	1,307
Depression diagnosis (expected)	507	1,212	1,307

B

Figure 1.

Treatment receipt for **(A)** women with a new depression diagnosis (regardless of screening status) and **(B)** women with a Patient Health Questionnaire (PHQ-9) score of 15 or greater in the three phases of the Universal Perinatal Depression Screening Program.

Table 1

Descriptive Statistics for Women in the three Phases of the Universal Perinatal Depression Screening Program in Kaiser Permanente Medical Care Program Northern California (N = 97,678)

	Phase 1: Pre-Implementation N (%)	Phase 2: Roll-Out N (%)	Phase 3: Fully-Implemented N (%)	p-value
Total	16,355	39,134	42,189	
Patient Characteristics				
Maternal age at delivery				
≤20	757 (4.6%)	1,655 (4.2%)	1,622 (3.8%)	p<0.001
21-30	7,762 (47.5%)	17,840 (45.6%)	18,478 (43.8%)	
31-40	7,315 (44.7%)	18,432 (47.1%)	20,659 (49.0%)	
>40	521 (3.2%)	1,207 (3.1%)	1,430 (3.4%)	
Race				
White	6,651 (40.7%)	15,162 (38.7%)	16,328 (38.7%)	p<0.001
Black	1,176 (7.2%)	2,596 (6.6%)	2,712 (6.4%)	
Asian	3,387 (20.7%)	9,348 (23.9%)	10,626 (25.2%)	
Hispanic	4,182 (25.6%)	9,832 (25.1%)	10,313 (24.4%)	
Other	959 (5.9%)	2,196 (5.6%)	2,210 (5.2%)	
Marital Status				
Married/partner	13,082 (80.0%)	31,197 (79.7%)	31,562 (74.8%)	p<0.001
Single/divorced/widowed	3,187 (19.5%)	7,812 (20.0%)	10,363 (24.6%)	
Others/Unknown	86 (0.5%)	125 (0.3%)	264 (0.6%)	
Medicaid during Pregnancy				
Yes	706 (4.3%)	1,861 (4.8%)	2,011 (4.8%)	p=0.1658
No	15,585 (95.3%)	37,131 (94.9%)	39,991 (94.8%)	
Unknown	64 (0.4%)	142 (0.4%)	187 (0.4%)	
Previous Mental Health Diagnoses				
Depression	3,198 (19.5%)	7,632 (19.5%)	7,853 (18.6%)	p<0.001
Other mental diagnoses	3,182 (19.5%)	7,408 (18.9%)	7,928 (18.8%)	
None	9,975 (61.0%)	24,094 (61.6%)	26,408 (62.6%)	

Table 2

Comparisons of Screening for Depression and Identification of Depression for the three Phases of the Universal Perinatal Depression Screening Program in Kaiser Permanente Medical Care Program Northern California (N = 97,678)

	Phase 1: Pre-Implementation (N=16,355)		Phase 2: Roll-Out (N=39,134)		Phase 3: Fully-Implemented (N=42,189)		*Chi-Square*
	N	**%**	**N**	**%**	**N**	**%**	***p-value***
Screened							
Yes	122	0.7%	31,777	81.2%	41,124	97.5%	p<0.001 *
No	16,233	99.3%	7,357	18.8%	1,065	2.5%	
PHQ-9 Screening score +							
15+	40	0.2%	1,701	4.3%	2,556	6.1%	p<0.001
10-14	15	0.1%	2,525	6.5%	3,665	8.7%	
<10	67	0.4%	27,551	70.4%	34,903	82.7%	
Number of Pregnancy/Postpartum Periods Screened							
1 pregnancy/postpartum period	3	0.0%	3,578	9.1%	3,531	8.4%	p<0.001
2 pregnancy/postpartum periods	115	0.7%	18,379	47.0%	16,906	40.1%	
3 pregnancy/postpartum periods	4	0.0%	9,820	25.1%	20,687	49.0%	
Depression Diagnosis							
New Depression Diagnosis (Among women screened)	63	0.4%	3,219	8.2%	4,865	11.5%	p<0.001 *
Any Depression Diagnosis Ever (Includes pregnancy and postpartum; women screened and not screened)	4228	25.9%	10,442	26.7%	11,579	27.4%	p<0.001 *
New depression diagnosis (Among women screened and not screened)	1,341	8.2%	3,700	9.5%	4,943	11.7%	p<0.001 *
Depression Severity							
New Depression diagnosis and PHQ-9 score ≥15	30	0.2%	849	2.2%	1,307	3.1%	p<0.001 *

* Test of Trend (adjusted for maternal age, race, marital status and mental health history)

+ highest score from last menstrual period through 90 days postpartum

Table 3

Depressive symptom improvement measures comparing the highest (up to 90 days postpartum) and last (within 180 days postpartum) PHQ-9 scores for women screened and given a new depression diagnosis, for Phases 2 and 3 of Implementation of the Universal Perinatal Depression Screening Program

	Phase 2: Roll-out	Phase 3: Fully-implemented
Total N with a New Depression Diagnosis	3,219	4,865
Women with a Follow-up PHQ-9	1803	3563
Follow-up PHQ-9 <10	1426(79.1%)	2912(81.7%)
≥50% improvement in symptoms*	1039(59.4%)	2080(60.2%)
Improvement of at least 5 points*	882(50.7%)	1685(48.7%)

*For Phase 2: denominator is 1751 (52 women were excluded due to the highest PHQ-9 score being equal to 0), For Phase 3: denominator is 3454 (109 women were excluded due to highest PHQ-9 score being equal to 0)

Table 4

Depressive symptom improvement measures comparing the first PHQ-9 Score of 15 or greater (up to 90 days postpartum) and the last PHQ-9 given within 180 days Postpartum for Phase 2 and 3 of Implementation of the Universal Perinatal Depression Screening Program

	Phase 2: Roll-out	**Phase 3: Fully-implemented**
Total N with a New Depression Diagnosis	849	1,307
Women with a Follow-up PHQ-9	550	1074
Follow-up PHQ-9 <10	289(52.6%)	615(57.3%)
≥50% improvement in symptoms	294(53.5%)	602(56.1%)
Improvement of at least 5 points	398(72.4%)	803(74.8%)