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Prenatal depression screening : practices in Oregon, 2014

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Prenatal Depression Screening: Practices in Oregon, 2014

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THESIS

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CERTIFICATE OF APPROVAL

This is to certify that the Master's thesis of

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1. FRONT MATTER

a. List of Tables

b. List of Abbreviations

ACA	Affordable Care Act
ACNM	American College of Nurse-Midwives
ACOG	American Congress of Obstetricians and Gynecologists
ADHD	Attention Deficit Hyperactivity Disorder
BDI	Beck Depression Inventory
BME	Board of Medical Examiners
CES-D	Center for Epidemiologic Studies Depression scale
CNM	Certified Nurse Midwife
DO	Doctor of Osteopathic medicine
DSM	Diagnostic and Statistical Manual of mental disorders
EMR	Electronic Medical Record
EPDS	Edinburgh Postnatal Depression Scale
FM	Family Medicine
IM	Internal Medicine
IRB	Institutional Review Board
L&D	Labor and Delivery
MA	Medical Assistant
MD	Medical Doctor
MH	Mental Health
MPH	Masters of Public Health
NICU	Neonatal Intensive Care Unit
NP	Nurse Practitioner
OB	Obstetrics
OB/GYN	Obstetrician Gynecologist
OCTRI	Oregon Clinical & Translational Research
OHSU	Oregon Health & Science University
OMB	Oregon Medical Board
PDSS	Postpartum Depression Screening Scale
PHQ2	Patient Health Questionnaire – 2 questions
PHQ9	Patient Health Questionnaire – 9 questions
PRAMS	Pregnancy Risk Assessment Monitoring System
REDCap	Research Electronic Data Capture
ROC curve	Receiver Operating Characteristic curve
RUCA	Rural Urban Commuting Area Codes
USPSTF	United States Preventive Services Task Force
Z-SDS	Zung Self-Rating Depression Scale

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2. ABSTRACT

a. BACKGROUND

The perinatal time is a period of psychological vulnerability with depression and anxiety having been reported in up to 44% of pregnant women, leading to morbidity to both mother and baby. No consensus has been reached by any official organization about the specifics of perinatal depression screening, and current screening practices vary widely. The current study evaluates prenatal depression screening among obstetrics providers in Oregon.

b. METHODS

This is a cross-sectional survey of OB/GYNs and FM physicians licensed by the Oregon BME as well as CNMs licensed with the ACNM who provided prenatal care in Oregon in 2014. A REDCap link for a self-administered online survey was emailed to 569 providers. Descriptive statistics were compiled for each provider subgroup. Associations in the CNM subgroup were analyzed by Fisher's Exact testing, significant at an alpha of 0.05. The survey period ran from October to December, 2014.

c. RESULTS

Of the 535 providers who received the survey, 106 responded (19.8%). Of these, 75 (71%) had provided prenatal care in the year prior to survey. 92% of respondents reported screening for prenatal depression. Most providers who screened reported using a standardized tool (75%), the majority using the EPDS on most prenatal patients.

Mental health follow-up was most often to an outside provider, though a large proportion of respondents reported in-house services.

Further analysis focused on CNM care. Among CNMs, 94% reported screening for prenatal depression, the majority with a standardized tool on most patients. The timing of screening was quite variable, including a third of providers with no predefined screening time. Mental health referral was to external providers, and there was only marginal and non-significant association between the proportion of prenatal patients screened and the availability of in-house mental health (p-value=0.10). Screening did not appear associated to geography, patient volume, in-house mental health, practice size, age, or years in practice. Use of a standardized tool was significantly associated with urban practices (p=0.02) and medium-sized practices (p=0.02) but not with patient volume, in-house mental health, age, or years in practice. The most often cited barriers to prenatal depression screening were availability of mental health, insurance constraints and physician time. The small group of respondents who did not screen noted that lack of time was the biggest barrier to screening.

d. CONCLUSION AND DISCUSSION

This is one of the first studies to evaluate CNM prenatal depression screening practices, and the first study of Oregon providers. The proportion of CNMs screening was quite high, although as a self-administered survey, this study is prone to selection bias and may overestimate this proportion. Though mental health availability, insurance

constraints, and physician time were considered the most important barriers to screening, few respondents reported not screening. Additional studies are recommended to evaluate non-screeners for perceived limitations. More studies are also needed to more comprehensively evaluate practice differences among OB providers with respect to prenatal depression screening. Based on the low response rate among physicians, future studies should use a different delivery method to increase response rate.

3. INTRODUCTION & BACKGROUND

a. Depression during pregnancy

Though anecdotal evidence sometimes cites the protective effect of pregnancy (Cohen, Evans), the perinatal period is an especially vulnerable time when women undergo increased psychological and biological stress that can reveal or exacerbate depression and anxiety. Studies estimate prenatal depression prevalence between 10-25% (Buist, Field). Postpartum depression may develop in as many as 21% of postpartum women (Buist). A study of 5 urban and socioeconomically diverse prenatal clinics in the Midwest estimated that 44% of its pregnant patients screened positive for depression, much higher than most other estimates (Lindgren). Recent PRAMS data from Oregon show that 36% of pregnant women admitted having felt “down, depressed, hopeless” at least “sometimes” during their pregnancy (Oregon Health Authority 2008), though the proportion of women who screened positive or were diagnosed with depression is unknown.

Numerous studies have found that increasing gestation correlates with increasing depression and anxiety, particularly in the 3rd trimester (Dipietro, Evans, Field, Josefsson), though a few other studies have found no such progression (Bennett). In one study, the proportion of women depressed during late pregnancy was 17%, compared to postnatal depression proportion of 13% (Josefsson). In another, the highest proportion of women with depression was found with testing at 32 weeks gestation (13.5%), compared to 18 weeks gestation (11.8%) and 8 weeks and 8 months

postpartum (9.1% and 8.4% respectively); of the women who did not meet criteria for depression at 18 weeks gestation, 8.4% of these became screen positive at 32 weeks gestation (Evans).

As expected, those with a history of depression are especially vulnerable. One study noted that 68% of those who stopped taking antidepressants around conception relapsed; half of these relapses occurred by the end of the first trimester, and almost all relapses had occurred by the end of the second trimester (Cohen). Another study found that pregnant women were five times as likely to screen positive for depression during pregnancy if they had a history of depression, compared to peers without this history (Records). Other risk factors for prenatal depression have been identified and include unplanned pregnancy, poor social support, and adverse social circumstances (Lusskin). Multiparas seem more at risk for depressive symptoms during pregnancy, likely a result of more complex responsibilities (Dipietro).

b. Prenatal depression as risk factor for multiple maternal and fetal morbidities

Prenatal depression poses a health risk for both mother and fetus, especially if depression occurs in the second and third trimesters (Muzik). The associated effects on the fetus include a 13% greater incidence of premature birth and a 15% greater incidence of low birthweight (Diego). Newborns tested for neuroendocrine markers showed levels that paralleled those of their depressed mothers, with higher cortisol and

norepinephrine, and lower dopamine (Field, Muzik). Depression has also been associated with increases in placental abnormalities, spontaneous abortion, and NICU stays, and puts pregnant women at an estimated 2.5 times the preeclampsia risk (Lusskin).

The etiology of these morbidities may be due to the association of depression with poor self-care. Depressed mothers may participate in fewer clinic visits and engage in substance use (Evans, Muzik). Pregnant patients with more depressive symptoms report poorer health and functional status including limited prenatal care (Lindgren, Lusskin). Health was self-reported as fair or poor by 25% of women screening positive for depression compared to 14.5% of those who did not screen positive (Orr). During pregnancy, disturbed maternal-fetal bonding, depression, and poor health choices interrelate: depression accounted for 3% of variance in maternal-fetal attachment in one study, and maternal-fetal attachment predicted 5% of variance in health practices in one model (Lindgren).

c. Implications for the postpartum period

Adverse postpartum outcomes are also associated with prenatal depression: children born to pregnant women with depressive symptoms have shown poorer cognitive, motor, social, and emotional development, and are at increased risk for depression and anxiety later in life, even when there is no formal diagnosis of major depressive disorder (American College of Obstetricians and Gynecologists 2010, Field, Marcus, Muzik).

One of the most significant risks associated with prenatal depression is postpartum mood disorders. In one study, 23% of patients with postpartum depression had become depressed during pregnancy (Evans). In another, 45% of women who had positive depression screening postpartum had had positive depression screening prenatally as well (Josefsson). The potential morbidities associated with postpartum depression include ADHD, anxiety, and behavioral problems (Lusskin) as well as delays in cognitive and motor development and three times the risk of serious emotional problems (Gjerdingen). As for the postpartum period, maternal-infant bonding is also disrupted by depression. Risk to the postpartum mother can be substantial: the most common cause of maternal death in the first postpartum year is suicide (Lusskin).

d. Effectiveness of prenatal depression screening

Studies of depression screening have found that official screening tools improve detection of depressive symptoms, though most of the literature evaluates postpartum screening rather than prenatal. Among the literature on prenatal depression, one study found that obstetricians correctly identified only 26% of their patients who screened positive and only 12% of their patients who endorsed suicidal ideation (Smith). In another study, only 2% of those who screened positive for prenatal depression and 12% of those with suicidal ideation were identified by their providers (Records). Similarly, a blinded study of perinatal depression revealed that only 15% of pregnant women who

had screened positive using the EPDS had chart notes related to mental health issues (Goodman).

The picture is similarly bleak in the postpartum literature. In a study of low-income, ethnically diverse North Carolina women, providers identified depression in 6.3% of their postpartum patients, whereas screening and diagnostic evaluation identified 35.4% of this population as have postpartum depression. A similar discrepancy was found among Hispanic and African American postpartum patients: based on clinical judgment, providers estimated that 13% were at risk for postpartum depression but 22% of these patients screened positive (Gjerdingen, Morris-Rush).

Screening positive for depression does not guarantee diagnosis of major depression and as expected, the proportion of patients who are diagnosed with major depressive disorder is smaller than those who screen positive (Gjerdingen, Lusskin). However, the risks to mother and fetus or infant remain even for the pregnant woman with depressive symptoms who do not qualify for major depressive disorder (American College of Obstetricians and Gynecologists 2010).

Unfortunately, screening programs may not be effective in altering outcomes (Muzik, Yonkers). A study of depression screening in the general population concluded that using a standardized screening program significantly improved identification of depression but not the extent of intervention: the risk ratio for detection was estimated at

2.66 (95% CI 1.78 – 3.96) but the estimate was only 1.35 (95% CI 0.98 – 1.85) for intervention. In this population, the proportion of screen positives who were properly followed and treated might be as low as 23% (Gjerdingen). Barriers to follow up are likely exacerbated during pregnancy, where potential risks to the fetus complicate treatment options: as many as 86 to 90% of women screening positive for prenatal depression were not being treated (Flynn, Muzik), and one study found that providers discussed depression with their screen-positive prenatal patients only 67% of the time (Flynn).

e. Screening tools

Prenatal depression has no formal DSM definition, though its diagnostic criteria are commonly defined in the same terms as major depressive disorder (Lusskin). As mentioned above, screening for prenatal depression necessarily overestimates the proportion of women with depression meeting these diagnostic criteria. Available screening tools include the Beck Depression Inventory (BDI), the Postpartum Depression Screening Scale (PDSS), the Center for Epidemiology Studies Depression Scale (CES-D), the Edinburgh Postpartum Depression Scale (EPDS), the Patient-Health Questionnaire-9 (PHQ-9), and the Zung Self-Rating Depression Scale (Z-SDS). Characteristics of these scales are summarized in the table below:

TABLE 1: Standardized Screening Tools

	# Items	Sensitivity	Specificity	PPV
EPDS	10	59-100%	49-100%	19-92%
PDSS	35	91-94%	72-98%	33-88%
PHQ2	2	--	--	--

PHQ9	9	75%	90%	52%
BDI	21	42-82%	86-89%	34-53%
BDI-II	21	56-57%	97-100%	74-100%
CES-D	20	60	92	53%
Z-SDS	20	45-89%	77-88%	36-37%

(RC Boyd, ACOG) (PPV based on estimated 13% prevalence)

The most widely used tool for peripartum depression is the Edinburgh Postnatal Depression Scale (EPDS), developed to address the limitations of other available scales that relied on report of somatic symptoms, even though these kinds of symptoms are often a natural part of the perinatal time (Cox). The tool was originally designed for the detection of postpartum depression, and was subsequently validated for use in the prenatal period as well as in the general female population (Buist).

The EPDS is a 10-question scale filled out by the patient, with each question scoring 0-3, and with overall scores possible from 0-30. It has been translated into at least 58 languages (Cox). The usual threshold for major depression is a score of at least 10. (Josefsson), though this can vary along with sensitivity and specificities (Lusskin). This tool has been shown to have low impact on workflows and workloads in provider practices, and is provided free of charge for perinatal use. Estimated cost savings in the general adult population is between $10,000 and $35,000 per person per year, with estimated costs accounted for primarily by the cost of follow-up and treatment if deemed necessary, not by up-front patient and provider screening costs (Buist). The positive predictive value may be low in the general population, however, perhaps less than 50%, suggesting a predominance of false positives (Boyd).

The Beck Depression Inventory tools (BDI, BDI-II) were designed to evaluate depression severity as well as used for serial monitoring over time, though its use has been limited in the peripartum period (Breedlove). It has been translated fairly extensively, but is limited in the peripartum period due to its reliance on somatic symptoms in determining depression status (Bennett). The BDI-II was developed to improve the BDI's adherence to DSM-IV depression criteria and has better validity with postpartum depression. Unfortunately, the population studied in validating this tool is primarily in an affluent European-American population, so generalizability may be limited (Boyd).

The Center for Epidemiological Studies Depression Scale (CES-D) applies more broadly to general community populations and has been translated widely. It has been used extensively in research about peripartum depression (Breedlove); however, it may miss as many as 40% of postpartum depression (Boyd). In addition, though it is fairly sensitive and was found to identify more potentially depressed peripartum women than the EPDS, the CES-D is less ideal for serial screening and for detecting major depression when there are coexisting psychiatric disorders (Breedlove).

The Patient Health Questionnaire-9 (PHQ-9) tool was originally developed for detection of depression in the general population but was recently validated for use in the prenatal period (Sidebottom). There has been some suggestion that its shorter counterpart, the

PHQ-2, might also be acceptable, and much shorter and quicker than either the PHQ-9 or any of the other screening tools listed (Bennett).

The Postpartum Depression Screening Scale (PDSS) is a more recent tool, which focuses on depression in the postpartum context of new mothers. It has been translated into Spanish and was written at a 7th grade reading level, so is available for a less educated population. However, it was developed in a European-American population and is not yet validated for more diverse community groups (Boyd).

Finally, the Zung Self-Rating Depression Scale (Z-SDS) is designed to be all-inclusive in its screening of depression and has been translated in a limited number of languages. Unfortunately, it is not particularly strong in sensitivity and positive predictive value, and there are no studies of test reliability, so its validity in the perinatal population is unknown (Boyd).

f. Timing of screening

Some studies have suggested that depression scores on screening tests reach a peak around 32 weeks gestation (Dipietro, Evans, Field, Josefsson), and that brief depressive mood episodes in the first trimester are predictive of third trimester depression (Records). Other studies argue that the second trimester and postpartum periods represent the time at which depressive symptoms are most pronounced (Lusskin), or that the three trimesters and postpartum period may be equally affected (Bennett). As

there is no real consensus on whether a peak depressive period exists, there is also no consensus on the best time for screening during pregnancy to optimize detection of depressive symptoms early enough during pregnancy to avoid potential complications to mother and fetus (American College of Obstetricians and Gynecologists 2010), while distinguishing between true depressive symptoms and normal temporary distress of early pregnancy (Matthey). In a study of serial screening during early pregnancy, half the women who screened positive for prenatal depression were found to have only transient rather than enduring distress, though these women were not followed to determine whether they developed depression later in pregnancy (Matthey).

g. Trends and guidelines

Studies report that 80% of pregnant and postpartum women are comfortable with perinatal depression screening (Gjerdingen); however, actual screening rates and detection of depression have historically been low. The literature on perinatal depression screening concentrates primarily on screening practices in the postpartum period. One study suggests that at least 37% of new mothers reported never having discussed postpartum depression screening though they did report that they would have appreciated such a discussion (Freed). Oregon PRAMS data suggests better screening, with nearly 80% of women reporting discussions of perinatal depression with a provider at a prenatal visit (Oregon Health Authority 2011).

It is not clear, however, whether formal screening was performed, what the nature of these discussions was, and how often women were referred or treated. In a study of family physicians, 70% of providers reported screening new mothers for postpartum depression, although only 22% of them indicated that they used a standardized tool (Gjerdingen). Another study found that less than 30% of primary care physicians used a screening tool for maternal depression (Lieferman). Only 22% of OB/GYNs reported feeling comfortable screening and feel adequately trained to recognize depression and 37% felt comfortable prescribing antidepressant medications (Sanders), but the preceding discussion suggests that clinical judgment and usual practice may be inferior in detecting depressive symptoms without a validated tool. Many providers also feel less adequately prepared to manage perinatal mental health issues. In one study, 40% of primary care physicians reported “rarely” or “never” managing maternal depression, and 60% “rarely” or “never” provided counseling or referrals for maternal depression (Lieferman).

Midwife groups represent an understudied sector of the obstetrics provider population. A survey of midwives attending the national ACNM meeting in 2006 found that 83% reported screening for depression but only 59% indicated that they were equipped to manage depression; 25% claimed to screen all patients for depression, though a larger percentage reported screening most patients (58%) (Sanders).

Consensus on perinatal screening does not exist to direct providers on the optimal tool and timing for prenatal depression screening, and the American Congress of Obstetricians and Gynecologists has no formal recommendations. They do, however, strongly encourage perinatal screening with one of the validated tools and recommend implementing a referral process to follow up on screen positives (American College of Obstetricians and Gynecologists 2010).

The U.S. Preventive Services Taskforce (USPSTF) has been similarly reticent in guiding providers in perinatal depression screening. Their screening recommendation for depression in the general adult population is a level B recommendation ("offer service") if referral and support systems exist, and a level C recommendation ("selectively offer service") where such systems do not. Currently, there is no specific guideline for depression during pregnancy, though a systematic review is in process to address this specific time period (U.S. Preventive Services Task Force 2009).

The American College of Nurse-Midwives (ACNM) advocates universal screening for all women, though they do not make more specific recommendations about the nuances of perinatal depression screening or advocate for a particular validated tool or optimal time for screening during pregnancy (American College of Nurse-Midwives).

h. Barriers to identification of prenatal depression

Studies have identified three primary sources of barriers to screening as outlined in the Table 2: problems for patients, for providers, and within systems (Freed, Gjerdingen).

TABLE 2: Barriers to Screening

Patients	**Providers**	**Systems**
Cost	Time	No co-located MH
Insurance	Insurance	No protocol for f/u
Medication exposure	Clinical training	No referral networks
Distrust	Diagnostic trouble	
Social Stigma	Antidepressant side effects	
	CNMs as specialists	

Patients are limited by cost of prenatal care and follow-up on screen positive results, in conjunction with insurance constraints. Insurance coverage also plays a role in access to mental health services (Gjerdingen). In a series of focus groups with pregnant women, researchers identified individual-level barriers to depression management, which included cost and logistics, as well as trepidation about medication exposure and distrust of providers (Kopelman). Social stigma has been cited as a powerful barrier to pursuing depression diagnosis and treatment (Gjerdingen), although the focus groups revealed minimal importance in this category (Kopelman).

Providers must identify perceived barriers in time to gather the relevant information and educate and counsel patients while also dealing with other clinic responsibilities. Payment structure can also serve as an obstacle with insurance and payment restrictions (Gjerdingen). Studies published in 2003-2004 reported that the majority of OB/GYN residents often had no clinical training on depression (80%) or completed continuing medical education on depression treatment (60%) (Dietrich, Smith). Furthermore, 50% of OB/GYNs reported that they did not have enough information about how to diagnose depression in women and felt this was a barrier to screening (Smith). Education is especially important during the prenatal time period when diagnosis is complicated by the incomplete distinction between normal somatic complaints of pregnancy and symptoms of true depression. Incomplete knowledge of the effects of antidepressant medications on the growing fetus has also been cited as a limitation to screening (Gjerdingen). One potential barrier specific to the midwife population is the self-perception that midwives are specialists rather than primary-care providers (Sanders).

Systems-level barriers include the absence of co-location of mental health services with prenatal care specialties, though this is being mitigated by the rise of the integrated health care (Byatt, Creach, Pomerantz). Other barriers in this category include inadequate protocols for follow-up of patients screening positive or diagnosed with depression. One study of prenatal depression screening found that OB/GYNs were not

able to screen effectively until procedures to deal with referral and support had been devised. (Gjerdingen)

i. Study Importance

To date, few studies have evaluated perinatal depression screening practices among obstetrics providers in Oregon. More information is needed to establish current screening practices particularly in the prenatal period, as well as determining potential barriers to screening and treatment. Therefore, we sought to survey OB providers in Oregon to study provider screening practices, including information to assess self-reported provider knowledge of depression screening and screening tools, patient management, and barriers to screening in obstetric practice.

4. MATERIALS AND METHODS

The Oregon Health & Science University Institutional Review Board (IRB) approved this study (IRB 00010518).

a. Study Design

This was a cross-sectional electronic survey of Oregon obstetrics providers for self-evaluation of their current prenatal depression screening practices.

b. Study Population

The target population for this study included any obstetrics provider (OB/GYN, FM, CNM) who practiced prenatal care in Oregon in the year prior to the survey.

Complete provider lists were obtained from the Oregon Medical Board (OMB) and from the Oregon chapter of the American College of Nurse-Midwives (ACNM). The OMB list consisted of all 3,267 MD and DO providers licensed in the state of Oregon and described with any Family Medicine or OB/GYN specialty. Any provider on the complete list who had listed any of the following descriptors for specialty was retained: Obstetrics, Obstetrics and Gynecology, Family Medicine, Family Practice, General Medicine, General Practice. All others were eliminated, including some subspecialists[1]. We also eliminated any provider with a license described as "Administrative", "Temporary Limited Practice", "Volunteer", "Locum tenens", "Military", or "Telemedia", as well as those with licenses under two years old and any provider with no practice address or an address outside Oregon. Finally, duplicate entries and survey pilot testers were removed. There were 226 CNMs on the complete midwife list. We removed all students, associates, and those with a license less than two years old. We also removed pilot testers and those whose practice addresses were not in Oregon. Physician and CNM respondents who had not provided prenatal care in the past year were eliminated at the first survey question, and those who started but did not complete the survey were counted among non-responders (n=5).

[1] List of specialties and subspecialists listed as associated with family medicine and OB/GYN that were removed from the original dataset: acupuncture, addiction medicine, anesthesiology, child psychiatry, critical care, emergency medicine, female pelvic medicine and reconstructive surgery, gynecologic oncology, gynecology (without obstetrics), hospice and palliative medicine, neonatal-perinatal pediatrics, neuromusculoskeletal medicine, pain medicine, pathology, preventive medicine, psychiatry, reproductive endocrinology, sports medicine, undersea/hyperbaric medicine

This left 2186 OB/GYN and FM licensed physicians licensed in Oregon; the ACNM list was left with 178 CNMs. After eliminating providers with email addresses no longer receiving email and those who confirmed relocation to another state or retirement from practice, provider emails considered in the public record were available for 79/460 (17%) OB/GYNs, 294/1726 FM (17%), and 163/178 (92%) of CNMs. The OMB maintains a full email list for FM and OB/GYN providers, but this study was not approved access to this list.

OB providers from Oregon who had public email addresses on file with the Oregon Medical Board and American College of Nurse-Midwives (536 providers) were sent the survey electronically through REDCap (294 FMs, 79 OB/GYNs, 162 CNMs). The start date for the study period was 10/2014 and ended 12/2014.

c. Survey Design

A self-administered electronic survey was designed specifically for this study (Appendix B). Questions drew from previous surveys (Arao, Spatzier) and studies on limitations and barriers to prenatal depression screening (as above). Several pilot groups representing the three provider groups as well as my thesis committee members also helped in development of questions. The survey consisted of 15 questions comprising about 750 words for 11 single-answer, 3 multiple-answer, and 1 open-ended question. Each survey question appeared on its own online survey page.

It was administered online through REDCap, an online system designed at Vanderbilt in 2004 that integrates collection, storage, and export of data. It can be used for survey and EMR-based studies, and is hosted at OCTRI at OHSU.

Providers received an email through REDCap with a personalized cover letter written to convey study importance, gain informed consent implicit in completion of the survey, and convey endorsements from OHSU and the Oregon Health Division. The invitation email also contained a personalized URL for each provider, as well as contact information in case of questions. The survey time was estimated at less than 10 minutes.

Invitations were sent at three separate times. A personalized URL in the first invitation was sent by email along with the cover letter and contact information. Follow-up emails were sent to non-responders at two and five weeks after the initial invitation, and consisted of an abbreviated reminder with personalized URL and contact information. No correspondence with any provider group was made by mail or phone call.

Data were downloaded from REDCap's encrypted server as an Excel file for initial cleaning. Further cleaning and analysis were performed using Stata/SE 12.0. Participants were assigned an alphanumeric code for use in REDCap. In order to account for those who finished the survey, personal identifying information was associated with this unique survey code. Though REDCap does not have an option to

de-identify responses once the survey is completed, all personal identifiers were kept secured on REDCap and on a password-protected computer.

d. Data analysis

Stata/SE 12.0 (StataCorp LP, College Station, TX) was used for all data analysis and graphs. Patient characteristics were summarized using descriptive statistics. Rural Urban Commuting Areas (RUCA) version 2 codes were used to classify providers by rural or urban designation based on stated practice zip codes.[2] Associations between variables were assessed using Fisher's Exact testing for exploratory purposes. All tests were significant at an alpha level of 0.05.

e. Power and sample size

The proportion of providers who screen for depression during the prenatal period is not well-established. As discussed above, estimates for postpartum depression screening among providers range from 22% to 70%, depending on whether a standardized tool was used. We used this range to estimate that perhaps 50% of providers screened for depression.

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[2] RUCA codes (https://depts.washington.edu/uwruca/ruca-uses.php)
Codes assigned using RUCA criteria dichotomized to Oregon zip codes by the Rural Health Research Center (Categorization D).

Rural: 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, 10.6

Urban: 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, 10.1

Two zip codes available in the dataset were not included in the RUCA codes so were coded based on adjacent zip codes of approximately the same road and population density.

We expected email lists for all providers in our target group (460 OB/GYN, 1726 FM, 178 CNMs). We expected our response rate to be lower than previous studies using mail and paper surveys, so anticipated that 25% of providers would respond: 115 OB/GYN, 431 FM, 44 CNMs. From previous studies of Oregon providers, we anticipated that prenatal care would be reported by about 70% of OB/GYNs, 20% of FM providers, and 95% of CNMs (Arao), giving us an anticipated sample size of 80 OB/GYN, 86 FM, and 41 CNMs. This would lead to a power of 80% to detect a screening difference between OB/GYN and FM groups of 20 percentage points, and a power of 60% to detect this difference between either of the physician groups and the CNM group. We calculated a power of 70% to detect this difference between the overall physician group and the CNM group. This study was originally designed to compare screening rates among provider groups, though such comparisons were not carried out due to the lower than expected response rates in the physician subgroups.

5. RESULTS

a. CHARACTERISTICS OF ALL RESPONDENTS

i. Response Rates

TABLE 3: Response rates, overall and by provider type

Provider Type	**# surveyed**	**# responding (%)**	**# responding with prenatal care (%)**
Physicians	373	46 (12.3%)	22 (47.8%)
OB/GYN	79	10 (12.6%)	7 (70.0%)
FM	294	36 (12.2%)	15 (41.7%)
CNM	162	60 (37.0%)	53 (88.3%)
Total Providers	**535**	**106 (19.8%)**	**75 (70.8%)**

As summarized in Table 3, initial assessment of the responses revealed that overall, 19.8% of surveys sent out garnered a response. Of these respondents, 70.8% provided prenatal care within the past year. Less than half of respondents in FM reported recent prenatal care.

ii. Exploration of bias: Geographic and Provider distribution

TABLE 4: Geographic Distribution, by Provider Type

	Completed			**Not Completed**			**p-value**[1]
	Rural	**Urban**	**Total**	**Rural**	**Urban**	**Total**	
Physicians	16 (35%)	30 (65%)	46 (12%)	86 (26%)	241 (74%)	327 (88%)	0.222
OB/GYN	2 (20%)	8 (80%)	10 (13%)	11 (16%)	58 (84%)	69 (87%)	0.665
FM	14 (39%)	22 (61%)	36 (12%)	75 (29%)	183 (71%)	258 (88%)	0.248
CNMs	6 (10%)	54 (90%)	60 (37%)	12 (12%)	90 (88%)	102 (63%)	0.801
Total	22 (21%)	84 (79%)	106 (20%)	98 (23%)	331 (77%)	429 (80%)	0.698

[1] P-values for completed vs not completed depending on rural vs urban designation.

Table 4 shows that among the 535 providers sent the survey, 106 (19.8%) completed the survey. Overall, 18.3% of rural providers and 25.4% of urban providers completed the survey, which was not a significant difference (p-value=0.698). Comparisons of completion proportion by provider type were also not significant.

However, the distribution of providers was heavily skewed toward the CNM group, who made up 71% of respondents; FM providers (20%) were twice as likely to respond as OB/GYNs (9%), but both physician subgroups were significantly less likely to respond than the CNMs (OB/GYN vs FM vs CNM, p-value < 0.0001; physicians vs CNMs, p-value < 0.0001).

Because of provider bias and because the physician sample sizes were so small, only descriptive statistics were available to describe all provider groups and further exploratory analysis focused on the CNM group.

b. CHARACTERISTICS OF RESPONDENTS WHO PROVIDED PRENATAL CARE

TABLE 5: Responder Characteristics, by Provider Type

	Physicians n (%)	**OB/GYN n (%)**	**FM n (%)**	**CNM n (%)**	**Total n (%)**
Gender					
Female	17 (77%)	5 (71%)	12 (80%)	53 (100%)	70 (93%)
Male	5 (23%)	2 (29%)	3 (20%)	0 (0%)	5 (7%)
Practice Size					
< 5	7 (33%)	3 (43%)	4 (29%)	13 (25%)	20 (27%)
5-10	7 (33%)	2 (29%)	5 (36%)	17 (32%)	24 (32%)
11-20	2 (10%)	0 (0%)	2 (14%)	15 28%)	17 (23%)
> 20	5 (24%)	2 (29%)	3 (21%)	8 (15%)	13 (18%)
Age (years)					
Mean	45.6	48.4	44.2	48.6	47.8
St Dev	10.6	12.4	9.87	12.0	11.6
Min, Max	32, 73	35, 73	32, 62	29, 68	29, 73
Years in Practice					
Mean	14.0	16.7	12.6	15.2	14.9
St Dev	10.5	12.9	9.3	11.9	11.4
Min, Max	2, 41	3, 41	2, 30	2, 42	2, 42
Prenatal Patient Volume (patients per week)					
0-5	7 (33%)	0 (0%)	7 (50%)	2 (4%)	9 (12%)
6-10	6 (29%)	2 (29%)	4 (29%)	2 (4%)	8 (11%)
11-20	4 (19%)	3 (43%)	1 (7%)	13 (25%)	17 (23%)
>20	4 (19%)	2 (29%)	2 (14%)	36 (68%)	40 (54%)

Table 5 summarizes respondent characteristics. Providers were predominantly female (93%); the CNM group consisted exclusively of female providers. Providers tended to work in smaller provider group, with 60% reporting working with 10 or fewer providers. CNMs seemed slightly more likely to work in larger groups, 43% reporting practice size of more than 10 providers, compared to 33% in the physician group reporting this

practice size. The mean age of all respondents was about 48 years old and in practice for an average of 15 years, though a wide range of ages and years of experience was represented. Prenatal patient volume was highest for CNMs, with 68% reporting more than 20 prenatal patients per week. Only 29% of OB/GYNs and 14% of FM physicians reported these volumes.

c. SCREENING AMONG RESPONDENTS WHO PROVIDED PRENATAL CARE

TABLE 6: Screening Characteristics, by Provider Type

	Physicians n (%)	**OB/GYN n (%)**	**FM n (%)**	**CNM n (%)**	**Total n (%)**
Screening					
Yes	18 (86%)	5 (71%)	13 (93%)	50 (94%)	68 (92%)
No	3 (14%)	2 (29%)	1 (7%)	3 (6%)	6 (8%)
Screen Type					
Clinical Judgment	5 (28%)	0 (0%)	5 (45%)	12 (24%)	17 (25%)
Standardized Tool	13 (72%)	5 (100%)	8 (55%)	38 (76%)	51 (75%)
Standardized Tool on Most Prenatal Patients (>90%)					
Yes	11 (79%)	6 (86%)	5 (83%)	24 (63%)	35 (69%)
No	3 (21%)	1 (14%)	1 (17%)	14 (37%)	16 (31%)
Screening Tool					
PHQ2	5 (31%)	1 (25%)	4 (33%)	3 (7%)	8 (14%)
PHQ9	4 (25%)	1 (25%)	3 (25%)	2 (5%)	6 (11%)
EPDS	6 (38%)	2 (50%)	4 (33%)	35 (85%)	41 (72%)
Beck	1 (6%)	0 (0%)	1 (8%)	1 (2%)	2 (4%)
Workflow					
Yes	12 (92%)	5 (100%)	7 (88%)	28 (74%)	40 (78%)
No	1 (8%)	0 (0%)	1 (12%)	10 (26%)	11 (22%)
Workflow Detail[1]					
Support Staff	3 (25%)	1 (20%)	2 (29%)	8 (29%)	12 (30%)
EMR	2 (17%)	0 (0%)	2 (29%)	10 (36%)	14 (35%)

[1]Among n=40 providers who reported having a workflow

Table 6 summarizes screening characteristics among respondents who provided prenatal care. Among the 75 providers with recent prenatal care, 92% reported

screening for prenatal depression. This was approximately consistent throughout the FM and CNM subgroups, but only 71% of OB/GYNs reported screening. 75% of providers used a standardized tool to screen prenatal patients for depression. FM physicians were less likely to use a tool (55%), whereas all OB/GYNs reported using a tool. The majority of all providers (69%) used a standardized tool to screen nearly all their prenatal patients, most often with the EPDS, which was used for 72% of providers. The FM subgroup was equally likely to use the PHQ2 (33%) or PHQ9 (25%) as the EPDS (33%). Among providers who screened with a standardized tool, the majority (78%) had a screening workflow in place. All OB/GYNs had an established workflow. When asked to describe their workflow, the most common descriptors were involvement of support staff (MA, NP, or other support staff) and use of an EMR. 35% of all providers with a workflow mentioned the utility of the EMR, and 30% mentioned the role of support staff.

d. MENTAL HEALTH REFERRAL AMONG RESPONDENTS WHO PROVIDED PRENATAL CARE

i. Referral provider types and in-house mental health

TABLE 7: Referral Characteristics, by Provider Type

	Physicians n (%)	**OB/GYN n (%)**	**FM n (%)**	**CNM n (%)**	**Total n (%)**
Referral Provider[1]					
In-House MH	11 (69%)	4 (100%)	7 (58%)	11 (22%)	22 (33%)
External MH	4 (25%)	0 (0%)	4 (33%)	26 (52%)	30 (45%)
Social Worker	0 (0%)	0 (0%)	0 (0%)	11 (22%)	11 (17%)
Presence of In-House MH[2]					
Yes	13 (62%)	5 (71%)	8 (57%)	23 (43%)	36 (48%)
No	8 (38%)	2 (29%)	6 (43%)	30 (57%)	38 (51%)

[1] Among those who screen n=66 (FM 12, OB 4, CNM 50)
[2] Among all respondents with prenatal care in the past 1 year (n=75) (FM 14, CNM 53, OB 7)

Of those providers who screen prenatal patients, referral for positive screens was to an external mental health provider (45%). A third of providers reported referral to in-house mental health and 17% to a social worker. However, physicians tended to refer to in-house services whereas CNM referrals were primarily to external mental health. CNMs were also the only group to report referral to social work. Overall, the providers were nearly equally likely to have in-house mental health services available for positive screens as not having in-house mental health. However, physicians seemed slightly more likely to have in-house MH (62%) than CNMs (43%).

ii. In-house mental health by Screening Proportion

TABLE 8: Referral Patterns, by Proportion of Prenatal Patients Screened

Proportion Screened	**Yes, we have In-House MH**	**No, we do not have In-House MH**
> 90% of patients	25 (71%)	10 (29%)
71-90%	3 (38%)	5 (62%)
41-70%	1 (25%)	3 (75%)
11-41%	1 (33%)	2 (67%)
0-10%	0 (0%)	1 (100%)

Providers who screened most patients with a standardized tool (n=51) tended to have in-house mental health services available, whereas providers screening fewer patients were more likely to report no in-house mental health.

iii. In-house mental health by Screening Proportion and by Geography

TABLE 9: Referral Patterns, by Proportion of Prenatal Patients Screened and Geographic Designation

	Yes, In-House MH		**No, no In-House MH**	
	Rural	**Urban**	**Rural**	**Urban**
>90% screened	3	22	3	7
71-90	0	3	0	5

41-70	0	1	1	2
10-40	0	1	0	2
<10	0	0	0	1

Most providers who screen the majority of patients with a standardized tool and have in-house mental health services came from urban practices. Rural providers who screen the majority of patients with a standardized tool were equally likely to have in-house mental health as not to have access to these services in-house, whereas their urban colleagues were more likely to have in-house mental health.

e. EXPLORATORY ANALYSIS FOR MIDWIFE SUBGROUP

Given that the CNM group heavily outweighed the physician groups, and because of low response rates in the physician groups, further assessment was restricted to midwives only.

i. Summary of Screening and Demographic Data

As shown above, of the 162 CNMs surveyed, 60 responded, for a response rate of 37%, though only 53 (88%) reported providing prenatal care in the past year.

TABLE 10: Responder Characteristics, Among CNMs (n = 53)

Gender	
Female	53 (100%)
Practice Size	
< 5	13 (25%)
5-10	17 (32%)
11-20	15 (28%)
> 20	8 (15%)
Age (years)	
Mean	48.6

St Dev	12.0
Range	29, 68
Years in Practice	
Mean	15.2
St Dev	11.9
Range	2, 42
Prenatal Patient Volume	
< 5	2 (4%)
6-10	2 (4%)
11-20	13 (25%)
> 20	36 (68%)

Table 10 is a simplification and reiteration of previous information (Tables 4 and 5) to focus specifically on the midwife subgroup. The geographic distribution of midwives was similar to those of non-responders (rural vs urban, p-value = 0.801). Responders also had the same distribution of gender, since the CNM group is entirely female. There was no predominant practice size, though the largest practice size (more than 20 providers) was least likely to be reported. The average age of respondents was 48.6 years (range 29 – 68 years), and the average years in practice was 15.2 years (range 2 – 42 years). Of CNM respondents who reported providing prenatal care, prenatal patient volume was fairly high, with 68% of CNMs reporting more than 20 patients per week.

TABLE 11: Screening Characteristics, Among CNMs (n = 53)

Screening	Yes	50 (94%)
Standardized Tool[1]	Yes	38 (76%)
Tool for >90% of pts[2]	Yes	24 (63%)
Screening Tool used[2]	PHQ2	3 (7%)
	PHQ9	2 (5%)
	EPDS	35 (85%)
	Beck	1 (2%)
Workflow[2]	Yes	28 (74%)
Workflow Detail[3]	Support Staff	8 (29%)
	EMR	10 (36%)
Referral Provider[1]	In-House MH	11 (22%)
	External MH	26 (52%)

	Social Worker	11 (22%)
Presence of In-House MH[4]	Yes	23 (43%)

[1] Among those who screen
[2] Among those who screen with a standardized tool
[3] Among those reporting a workflow
[4] Among all respondents with prenatal care in the past 1 year

Nearly all CNMs screened for prenatal depression and the majority used a standardized tool, usually on almost all prenatal patients. The most commonly reported tool was the EPDS for 86% of CNMs. Most CNMs using a standardized tool had a workflow in place, and many respondents mentioned support staff and EMR as descriptors for their workflow, as well as use of a prenatal checklist on intake and identifying particular visits where screening was always performed. CNM screening providers tended to refer to external MH services, and respondent CNMs tended not to have in-house MH available.

ii. Timing of screening

TABLE 12: Timing of Screening During Pregnancy, Among 38 CNMs using a standardized tool

	# CNMs (% of n=38)
First trimester only	2 (5%)
Second trimester only	0 (0%)
Third trimester only	13 (34%)
Only on first prenatal visit	3 (8%)
Only on entrance to L&D	0 (0%)
No predefined timing	11 (29%)
Multiple times	9 (23%)

The timing of standardized screening varied across CNMs; 34% always screened in the third trimester, but another 29% had no predefined time for screening. An additional 23% screened multiple times during pregnancy, over half of these respondents reporting that they screened once during the first visit or first trimester and then again during late second or early third trimester.

iii. Factors that may facilitate screening

No factors were found to be significantly associated with screening (table 13). Geographic distribution, patient volume, in-house MH, OB practice size, age, and years in practice were not found to be significant in differentiating screening from non-screening.

TABLE 13: Demographic Characteristics, by Screening

	Screening	**Not Screening**	**p-value**
Geography			1.00
Rural	6	0	
Urban	44	3	
# Pregnant Women			0.69
0-5	2	0	
6-10	2	0	
11-20	13	0	
>20	33	3	
In-House MH			1.00
Yes	22	1	
No	28	2	
OB Practice Size			0.45
< 4 providers	12	1	
5-10	17	0	
11-20	14	1	
> 20	7	1	
Years in practice[1]			0.79
< 10	22	2	
10-20	14	0	
> 20	14	1	
Age[2]			0.49
<40 years old	14	2	
40-55	15	0	
> 55	20	1	

[1] Yrs in practice based on categorical variables: <10, 10-20, >20
[2] Age based on categorical variables: <40, 40-55, >55

TABLE 14: Demographic Characteristics, by Type of Screening

	Standard Tool	**Clinical Judgment**	**p-value**
Geography			0.02
Rural	2	4	
Urban	36	8	
# Pregnant Women			0.83
0-5	2	0	
6-10	1	1	
11-20	10	3	
>20	25	8	
In-House MH			0.19
Yes	19	3	
No	19	9	
OB Practice Size			0.02
< 4 providers	6	6	
5-10	13	4	
11-20	14	0	
> 20	5	2	
Years in practice			0.30
< 10	19	3	
10-20	10	4	
> 20	9	5	
Age			0.92
<40 years old	10	4	
40-55	12	3	
> 55	15	5	

Screening with a standardized tool was significantly associated with geographic distribution (p value = 0.02) and OB practice size (p value = 0.02), but not with patient volume, in-house mental health, age, or years in practice (Table 14).

iv. Barriers to Screening

When asked to rank perceived barriers to screening, the most reported barriers included limited availability of mental health services, insurance constraints on mental health services, and lack of time during prenatal visits. When asked to rank strategies for

improvement, the most often reported included a stronger mental health referral network, changes to insurance restrictions on mental health services, and more information on mental health resources in the community.

TABLE 15: Perceived Limitations and Areas of Improvement

		Proportion citing overall	**Proportion citing as #1 barrier**
Limitation			
1	Availability of MH	63.6%	21.8%
2	Insurance constraints	63.6%	20.0%
3	Physician time	49.1%	18.2%
Area of Improvement			
1	Referral	83.6%	20.0%
2	Insurance	69.1%	27.3%
3	Resources	56.4%	7.2%

Among the few providers who do not screen (n=3), the most important perceived barrier to screening is time (100% marked this as most important).

f. SUMMARY

The response rate among all providers was rather poor at 20.0% overall, and was heavily skewed toward one subgroup, the midwives (36.8% response rate). Thus only descriptive statistics were provided for all responders, and exploratory analysis was restricted to that group. No analysis to compare provider groups and their screening practices could be performed. Of midwife responders, the majority (94.5%) reported screening for prenatal depression with a standardized tool (76.9%). Geography, practice size and volume, and in-house mental health services were not significant factors in screening. However, in univariate analyses, geography and practice size were significantly associated with the use of a standardized tool. Urban providers were more

likely to use a screening tool than their rural counterparts, and medium to large practices more likely to use a screening tool than those with small practices.

Although in-house mental health was not a significant factor for screening, survey respondents cited mental health availability as the most important perceived limitation to screening, suggesting that the study was underpowered to detect a significant difference. Insurance constraints and limited physician time were nearly equally important perceived limitations. These are potential areas of intervention to increase the screening for prenatal depression.

6. DISCUSSION

a. Summary of important findings

The response rate for this study was 19.8%, of whom 71% reported recent prenatal care experience. Of respondents, 92% reported screening for prenatal depression, though only 71% of OB/GYNs reported screening. Most providers who screened reported using a standardized tool (75%), most commonly the EPDS, though FM providers also used the PHQ2 and PHQ9. Mental health follow-up was most often to an external MH provider, though a large proportion of respondents reported availability of in-house services.

Because of the low response rate particularly among surveyed physicians, further analysis focused on CNM practices. 94% of CNMs reported screening for prenatal

depression, the majority with a standardized tool on most patients. Timing of screening was variable, and for many there was no predefined screening. Referral for positive screens was to external providers, and there was only marginal association between the proportion of patients screened and the availability of in-house mental health services (p-value=0.10). Screening did not appear associated to geography, patient volume, in-house mental health, practice size, age, or years in practice. Use of a standardized tool was significantly associated with urban practices (p=0.02) and medium-sized practices (p=0.02) but not with patient volume, in-house mental health, age, or years in practice. The most often cited barriers to prenatal depression screening were availability of mental health, insurance constraints and physician time. The small group of respondents who did not screen noted that lack of time was the biggest barrier to screening.

b. Screening proportion

The proportion of CNMs in this sample who reported screening for prenatal depression was 94.4%, somewhat higher than the 83% reported in previous research on midwives (83%, Sanders), but much higher than studies of physicians. There are several explanations, including sample bias, changing trends since most studies were done, and true differences between provider screening practices.

It is likely that this study has succumbed to selection bias. Because this was a self-administered survey that respondents voluntarily took, it is likely that providers who

screened were more likely to respond to the survey than those who did not screen, which would artificially and substantially increase the screening proportion. This is a problem common to the prior CNM study, which was based on a survey given to a convenience sample of CNMs attending a national conference (Sanders). On the other hand, it is also possible that providers who believe screening is important but who do not currently screen might be interested in contributing to the literature on this topic, thereby decreasing the screening proportion; however, this likely makes much less an impact on the study results. These forms of selection bias would need to have been present on this study and the previous CNM study (Sanders) and not on the physician studies to have a differential effect.

Most of the literature exploring prenatal depression screening was formulated in the early 2000s. With the rise in awareness of prenatal and postpartum depression that these studies inspired, providers may be more likely to screen now than a decade ago. Furthermore, with the implementation of the Affordable Care Act (ACA) in 2010, colocation of mental health services in provider spaces has made mental health issues, including prenatal depression, more present in providers' minds. This does not, however, explain the apparent difference between CNMs and physicians, and would not explain the high screening proportion in a prior study from 2006 (Sanders).

It is possible that CNMs truly screen more often than physicians. Though there is no current profile of Oregon's CNM workforce, a recent study of Massachusetts CNMs may

shed light on potential practice features that would allow CNMs to screen more for prenatal depression. The Massachusetts study revealed that the majority of respondents worked in hospital clinics or medical centers, including community health centers and multispecialty medical organizations, while very few CNMs work in birth centers or midwife-owned practices. 84% of CNMs described “group practices”, which were usually described as consisting of fewer than 10 CNMs and approximately 11-20 physicians. Although formal training on psychiatric conditions was reported by less than half the CNM workforce, 75.6% of CNMs said they were comfortable screening and referring for psychiatric issues. Full-time CNMs in this study were working an average of 41 hours per week, with less than half that time dedicated to ambulatory care when a third of respondents saw 13-18 patients per day and another third saw 19-24 patients per day. For new obstetrics patients, CNMs reported initial appointments of 40 to 90 minutes and follow-up appointments of 15 minutes in length, though with managed care reforms in Massachusetts, visits have become shorter. Finally, nearly all CNM respondents subscribed to the Midwife Model of Care, which prioritizes “monitoring the physical, psychological, and social well-being of the mother throughout the childbearing cycle.” This overt and explicit stance on psychological well-being may make CNMs more attuned to potential depression than physicians (Kelleher), which would explain the high screening proportion in our study and the previous CNM study (Sanders).

c. In-house mental health

Surprisingly, although availability of mental health services was cited as a major barrier to screening, the presence of in-house mental health services was not significantly associated with screening. This may have to do with inadequate power of the study. However, as mentioned above, this may also have to do with perceived rather than actual barriers, especially given that our study population consisted largely of CNMs who screened. It would be helpful to evaluate non-screeners further and explore their perceived barriers to screening more fully.

Similarly, a higher proportion of providers than expected reported having in-house mental health available for referral. This may be explained by selection bias: those with effective screening systems in place were more likely to respond to the survey than those who did not. The true proportion of providers with in-house mental health may be much lower than in this study, but this question has not been researched, particularly since the implementation of the ACA. The same bias may play a role in our finding that in-house mental health availability was not geography-dependent, that rural and urban areas seemed to have these services at similar frequency. At a national level, mental health service shortages persist in rural areas, which comprise over 85% of federally designated mental health professional shortage areas (Bird). The availability of mental health resources is certainly an important issue as the purpose of screening programs relies on the assurance that screen-positives will have access to adequate follow-up diagnostic and treatment services.

Finally, it is also possible that the answers to this question were misinterpreted. Though we intended “in-house mental health” to indicate mental health services that were available in the same clinical setting as obstetrics care, it is possible that “in-house” was interpreted as “in-home”, especially given that some CNMs practice home visits.

d. Screening tool

One interesting result from this study was the high use of the EPDS over other standardized tools for prenatal depression screening, except in the FM subgroup. Although the literature does not support any one particular standardized tool over another, ACOG includes the EPDS in its official perinatal depression toolkit and features the EPDS prominently on its Committee Opinion bulletin (American College of Obstetricians and Gynecologists, District II/NY 2008, American College of Obstetricians and Gynecologists 2010). ACOG does not officially endorse this tool, but providers are likely to follow these cues when making decisions about perinatal depression screening. Furthermore, several studies note that the EPDS is the most widely used tool for postpartum depression (Boyd, Gibson), so its use during the prenatal period may not be particularly surprising.

Though difficult to assess given the small sample size, the FM subgroup may use the PHQ2 or PHQ9 more than other tools, suggesting that they may screen differently from other providers. Though not as widely used as the EPDS for perinatal depression, the

simpler PHQ2 may be similarly effective for assessing depression risk during the prenatal and postpartum periods. One study found that in comparison with the EPDS, for 15 and 30 weeks gestation and postpartum, the PHQ2 had a sensitivity of 93%, 82%, and 80% and a specificity of 75%, 80%, and 86% with respect to these perinatal time points, and had a ROC curve suggesting similar diagnostic validity (Bennett "Efficiency of a Two-Item Pre-Screen"). A more recent study has corroborated this conclusion (Smith 2010).

e. Study design and response rate

The response rate garnered by this study was fairly low at 20%. Prior studies using surveys of physicians and healthcare providers were often much higher, perhaps due to differing methodologies. A 2006 study of Oregon OB and FM providers resulted in a 42% response rate using initial survey mailer followed by a reminder postcard and a second complete mailer (Hunsberger). Two Oregon MPH thesis projects conducted in 2008 and 2011 were also surveys of OB and FM physicians. In one, using email reached a 26% response rate, and using mail, a 59% response rate where email was sent only to those who had an address on file (Frederick). In the other, the complete survey was mailed at the beginning of the study period, and was then followed by a postcard reminder and follow-up phone, fax or email as necessary, and resulted in an overall response rate of 46% (Arao). Finally, a 2011 Ohio study involved both mailing and emailing complete surveys to all subjects and produced response rates between 33% and 62% (IM 33%, FM42%, OB 57%, CNM 62%) (Ko). Given this context of lower

response rates for email, higher for mailing and mixed-mode delivery, it is worth exploring the value of electronic surveying and possible ways to increase response rate.

Survey format has been studied extensively to determine what mode of delivery recruits the most respondents. Mailing surveys has long been the standard and best-studied mode of delivery, but as technology has made electronic access easier to obtain and more widespread in use, research has explored how electronic survey response rates compare. The allure of the electronic survey is that the study population might find it simpler to click through an online survey than fill in responses by hand and mail in a paper survey. And from a survey administration standpoint, an electronic mode has the advantages of being easy to deliver to subjects, easy to import and manage data from respondents, and low in cost (McPeake). For example, one study found that mail-only survey cost more than 8 times as much as an electronic-only survey per response, based on printing, envelopes, postage, computer programing and hosting as relevant (Kaplowitz).

A review of electronic surveys targeting health professionals found that response rates were highly variable, from 9% to 94%, and that reminders increased response rate (Braithwaite). Still, electronic surveys continue to underperform when directly compared to mailers, as evidenced by the review of research provided above. One study showed mail-only response rate of 31.5% while email-only was significantly lower at 20.7% (Kaplowitz). A meta-analysis comparing electronic to postal survey concluded that the

response rate for electronic surveys was an average of 11 percentage points lower than for postal survey (95% CI 6-15 percentage points) (Lozar).

There are a variety of explanations for why electronic forms of delivery are problematic. Survey emails may bypass inboxes due to junk mail and spam filters (Kaplowitz). Whereas physical addresses tend to stay consistent and reliable and usually have a 12-month forwarding address if an individual moves, email addresses are more fluid with no forwarding address unless the user specifically defines one. One study found that nearly 10% of emails in a one-year-old contact list were undeliverable, their users having closed or abandoned their accounts (McPeake). Furthermore, slight errors in reporting of an email address can render a survey undeliverable whereas there is usually enough room for error in written mailing addresses that mail can usually find its way to the correct individual (Cobanoglu, McPeake). Other barriers to response include internet unfamiliarity, unreliable access especially rurally, and survey oversaturation whereby individuals are too often asked to fill out surveys online and end up simply ignoring these requests entirely (McPeake). Any of these explanations could have significantly reduced the receipt of survey invitations to our target population.

Nonetheless, strategies have been devised to increase response rates. One study found that by sending a preliminary postcard notifying subjects of a forthcoming email, response rates for the electronic survey nearly equaled those achieved by a mail-only survey without significant increases in cost; other multi-modal combinations were less

effective, including postcard both before and after email, and postcard following but not preceding email (Kaplowitz). Personalized electronic prenotification seems to have made little impact on online survey response rate (Hart), and giving subjects the choice of delivery method did not seem to make much difference either (Couper 2008, Millar).

On the other hand, incentives may help increase response rates. Incentives for survey completion have been studied extensively for mailed surveys. It has been more problematic for online surveys, especially those for which the invitation to participate is also electronic. One meta-analysis of electronic surveys found that response rate increased by about 3 percentage points when cash incentive was given in advance; the downside to this method is that the initial invitation would still need to be provided by mail. However, this incentive method has been shown more effective than gift certificate, Paypal electronic deposit, or even entering subjects into a drawing for completing the survey (Millar).

For the current study, though we initially pursued survey delivery by mail to a random sample of providers, we eventually settled on an electronic survey sent to the entire target population of providers to compensate for the anticipated lower response rate. Unfortunately, we did not anticipate the limited and partial access to the email lists for physicians. In future studies of Oregon physicians, unless complete email lists can be obtained, it would be prudent to rely instead on other delivery systems such as mail-only, or emails to those on file and mail to all others and email non-responders. It may

also be helpful to include advance cash incentives where budgets allow. Periodic reminders or prenotification should also be considered.

At this time, there are no studies evaluating the efficacy of REDCap in administration of surveys. This is an area of future interest as survey appearance has been well studied for paper-based surveys, and website design may have implications for response rate and quality.

f. Bias due to Delivery Mode

Because we used an electronic-only delivery mode for the survey, it is possible that selection bias played a role in our results, and we may have surveyed a population that was not quite the same as our target population. Individuals who have available email addresses and who respond to the survey might be more likely to own a computer, more educated, more urban, and more technologically savvy. It is unknown how this bias would affect our results, and there is some research to suggest that data collected online is not actually different from that collected on paper (Ahern, Couper 2000). Furthermore, these characteristics describe the target population for this study, further suggesting that there is minimal risk for this potential bias.

There are other reasons to think that this kind of technology-related selection bias may be minimal. Recent data gathered by the United States Census Bureau on the prevalence of technology in the home is promising. After conducting face-to-face

interviews of nearly 50,000 households in a one-month period, census researchers concluded that 83.8% of households have internet available at home, dramatically increased from studies in the early 2000s in which it was found that less than half the homes in the United States had internet. Moreover, for the highest education bracket and in the income bracket over $150,000 per year, internet in the home was present for over 90% of the population. Substratification of the overall population by age revealed an age bias, with those over 65 years old having much lower use; however, age was not evaluated for the education and income subgroups that had the highest home internet, so it is unknown how this would affect our sample. Finally, stratifying by state showed that Oregon has a higher prevalence of home internet availability than the national average. (Census)

g. Strengths and limitations

This is the first study to examine prenatal depression screening practices among Oregon providers, and fills a gap in the literature particularly with respect to CNM providers. It does, however, have some limitations. As discussed extensively above, our low response rate led to inadequate sample size for the physician subgroups, such that we were not able to assess whether different provider groups have significantly different screening practices. Furthermore, since we were not able to address our primary question, we were not able to do formal hypothesis testing; rather, this study is exploratory in nature.

Also discussed above, this study may succumb to selection bias and results may be inflated representations of the true nature of screening practices among Oregon providers. Providers who have screening programs in place and adequate mental health resources to follow-up may have responded more than providers who do not.

Information bias may also have played a role. Given that this is a self-administered survey, reported practices are only as accurate as the respondents can recall. Furthermore, providers may be reporting desired practice rather than actual practice, answering according to what they feel they should be doing rather than what they are doing. This would inflate results to suggest that a larger proportion of providers are screening with a standardized tool for a larger percentage of their patients than they actually are.

It would also inflate our data on screening proportion if providers misunderstood that survey questions were to reflect practices on prenatal depression rather than postpartum. Several pilot testers reported initially answering survey questions for postpartum screening, and one survey respondent's free-response answers made it clear that the timing of screening had been misunderstood. It is impossible to know how many other respondents may have made the same mistake, since verification of understanding was not built into the survey. Future survey design may want to incorporate this type of question.

On the other hand, this study's estimate of the screening proportion may have misclassified some providers as non-screeners when in fact they were screening. Some prenatal intake forms may have embedded depression-screening questions that could follow simple tools such as the PHQ2, which would mean that providers are not necessarily aware that they are screening. Were this the case, the proportion of screening taking place during the first trimester might be an underestimate of the true proportion.

h. Recommendations

Because of small sample size, this study cannot determine whether physicians adequately screen for prenatal depression. However, the data from CNMs seem to indicate that they are almost always screening almost all prenatal patients for depression. Since our study likely includes a component of selection bias, and because we had very few respondents who did not screen, it would be helpful to design a future study to evaluate non-screeners for barriers and limitations to screening. As discussed extensively above, survey delivery would need to be adjusted to capture a large proportion of the target population, particularly the physician population, which the current study was not able to assess.

The essential question of what providers should be doing in their practices has yet to be answered. To be effective, screening programs must have adequate follow-up and treatment options. The perceived barriers from this study highlight mental health

availability and insurance, the bedrocks of follow-up and treatment, as major constraints. Therefore it would seem that making mental health referral more accessible and minimizing insurance constraints would increase the value of depression screening during pregnancy; current moves by the ACA to collocate mental health services and provide better insurance coverage may be a step in the right direction. However, this study did not fully address the extent of mental-health availability in screeners and non-screeners, only whether in-house mental health was available and whether mental health availability and treatment options were perceived limitations. Future studies might ask these questions more extensively and explicitly to better characterize access to follow-up and treatment, including questions about how often providers manage depression on their own without referral.

The other major perceived constraint to screening was limited physician time. Though providers will need extra time following up on positive screens, efficient screening programs could be mitigated by integrating workflows into the prenatal care routine and enlisting support staff to administer screening tests.

The literature seems clear that clinical reasoning is not as sensitive or specific as the many established tools for prenatal depression screening; however, there is no consensus on which tool to use. There is also no real consensus on the timing of screening: depressive symptoms seem not to follow any predictable path. With this in

mind, it might be prudent to screen once early in pregnancy and again midway through pregnancy to capture various time courses, though more studies are needed.

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8. APPENDICES

a. Cover Letter

October 23, 2014

PARTICIPANT ID NUMBER: <id>

<Name>

Dear <Name>:

Oregon Health & Science University (OHSU) in conjunction with the Oregon Public Health Division, is conducting a study to identify barriers to prenatal depression screening among Oregon obstetrics providers. The American College of Obstetricians and Gynecologists estimates that between 14 and 23 percent of women exhibit symptoms of depression while pregnant, and that these symptoms can have untoward consequences for both mother and fetus. **We invite you to participate in this study** so that we may include your valuable input and experience on how these issues are identified and managed in your practice.

If you are willing to participate, please complete the questionnaire by November 23rd using the link below. Your participation in this study is voluntary and completion of this survey constitutes your consent to participation. In order to protect your confidentiality, the survey does not include any record of your name or address; instead, you will use the randomly-assigned participant ID number above. The key linking this number to your information will be kept on a secure, password-protected OHSU service. Survey and personal information will not be shared with anyone outside the study and will be destroyed upon completion of the study. Though we have made strong efforts to protect your privacy, there is remote risk of loss of confidentiality. There is no incentive or benefits for survey completion, but you will be helping OHSU and the Oregon Public Health Division better understand mental health issues for pregnant women.

If you have questions about this study, contact Katie Rompala or Nicole Cirino at the email addresses or phone numbers below.

Thank you in advance for participating in this study.

Sincerely,

Nicole Cirino
cirino@ohsu.edu
503.494.9665

Katie Rompala
rompala@ohsu.edu
503.799.0369

b. Survey

Prenatal Maternal Depression Screening Practices Among Oregon Providers

THIS SURVEY IS ONLY 15 QUESTIONS AND WILL TAKE LESS THAN 10 MINUTES.

This survey concerns prenatal care (also called antenatal care or care during pregnancy). While we recognize the importance of postpartum depression, the questions in this particular survey refer to depression screening *during* pregnancy only; in other words, only prenatal (also called antenatal) care should be considered.

Survey Questions:

1) Did you provide any prenatal care within the past 12 months?
- __ Yes
- __ No → End Survey. Please go to question 15.

2) What type of provider are you?
- __ Family Medicine Physician
- __ Certified Nurse Midwife
- __ Obstetrician
- __ None of the above → End Survey. Please go to question 15.

3) How many pregnant women do you see in a typical week?
- __ 0-5
- __ 6-10
- __ 11-20
- __ 21 or more

4) Do you screen women for depression during their pregnancies?
- __ Yes
- __ No → Go to question 11

5) How do you screen women for depression during their pregnancies?
- __ I use clinical judgment and/or past medical history only → Go to question 10
- __ I use a standardized tool for depression screening (such as PHQ or Edinburgh) in addition to any clinical judgment

6) Which standardized tool do you use? (Check all that apply)
- __ PHQ2
- __ PHQ9
- __ Edinburgh Postnatal Depression Scale (EPDS)
- __ Other (*please specify*) _____

7) Does your practice have a workflow in place for antenatal depression screening? This may include an EMR prompt, a chart note, or other system.
- __ Yes (*please describe workflow*) _____
- __ No

8) Among your pregnant patients, how many of them do you screen for depression using a standardized tool *at least once* during their pregnancy?

__ Almost all of them (91-100%)
__ Most of them (71%-90%)
__ Some of them (41-70%)
__ A few of them (11-41%)
__ Almost none of them (0-10%)

9) When **during pregnancy** do you screen pregnant women for depression using a standardized tool?

__ First trimester only
__ Second trimester only
__ Third trimester only
__ Only when she first comes in for prenatal care
__ Only when she comes in for labor/delivery
__ I have no pre-defined timing for depression screening during pregnancy
__ Multiple times during pregnancy (*please specify timing*) _____
__ Other (please describe): _____

10) If you refer positive screens to another provider, to whom do you refer?

__ In-house mental health provider (please specify type): _____
__ External mental health practice
__ Social worker
__ Case worker
__ Other (*please specify*) _____

11) Does your practice have an in-house mental health care provider to whom you could refer patients who screen positive for prenatal depression?

__ Yes
__ No

12) Do you consider any of the following to be barriers to screening or management of prenatal depression in pregnant women? (*Please rank any that apply and number those in order of importance*.)

__ lack of staff
__ lack of time during prenatal visits
__ limited knowledge about prenatal depression
__ limited knowledge or comfort in prescribing medication during pregnancy
__ lack of validated guidelines
__ doesn't fit with practice's priorities
__ limited knowledge of mental health referral services
__ limited availability of mental health services
__ insurance constraints on mental health services
__ prenatal depression isn't a common problem in the community
__ language or cultural barriers prevent screening or management
__ there are no barriers
__ other (*please specify*) _____

13) Would any of the following improve your screening of pregnant women for prenatal depression? (*Please mark all that apply in order of importance*.)

__ more education on prenatal depression
__ more time during prenatal visits
__ more education of treatment options
__ more education on medications
__ validated guidelines from a professional organization
__ information on mental health resources in the community
__ stronger mental health referral network
__ educational materials for patients
__ changes in insurance restrictions on mental health services
__ other (*please specify*) _____

14) Are there any other comments or observations that you would like to make related to prenatal depression screening? _____

15) Please provide the following information:

Age _____
Years in practice _____
Male or female? _____
Primary practice zip code _____
Total size of your OB practice (Family medicine OB providers + OBs + midwives); select the appropriate range:

___ < 4 providers
___ 5 – 10 providers
___ 11 – 20 providers
___ > 20 providers

End of survey. Thank you for your time and participation!