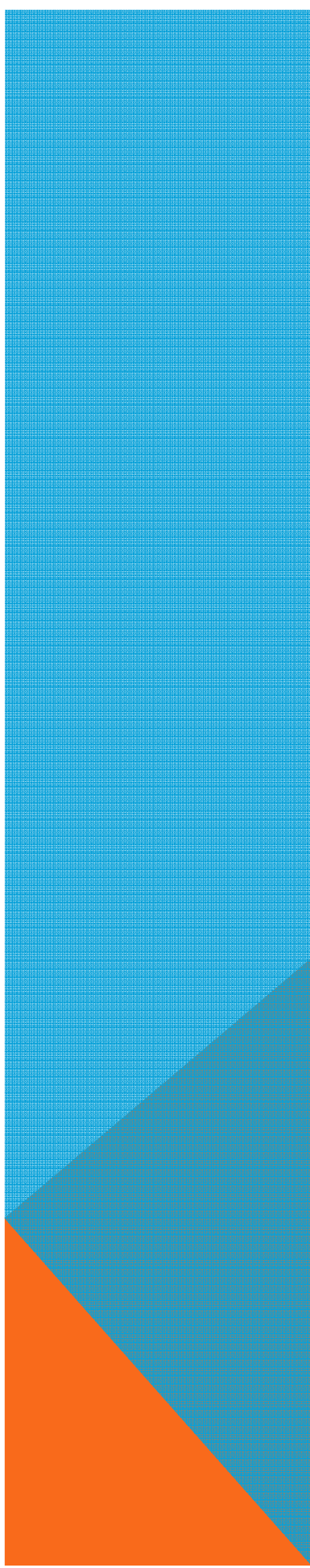


THE ASSOCIATION BETWEEN BREASTFEEDING AND SELF-REPORTED POSTPARTUM DEPRESSIVE SYMPTOMS IN OREGON MOTHERS

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PRESENTED TO THE DEPARTMENT OF PUBLIC HEALTH AND
PREVENTIVE MEDICINE
OREGON HEALTH AND SCIENCE UNIVERSITY
IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PUBLIC HEALTH

INTRODUCTION



BREASTFEEDING

For mothers:

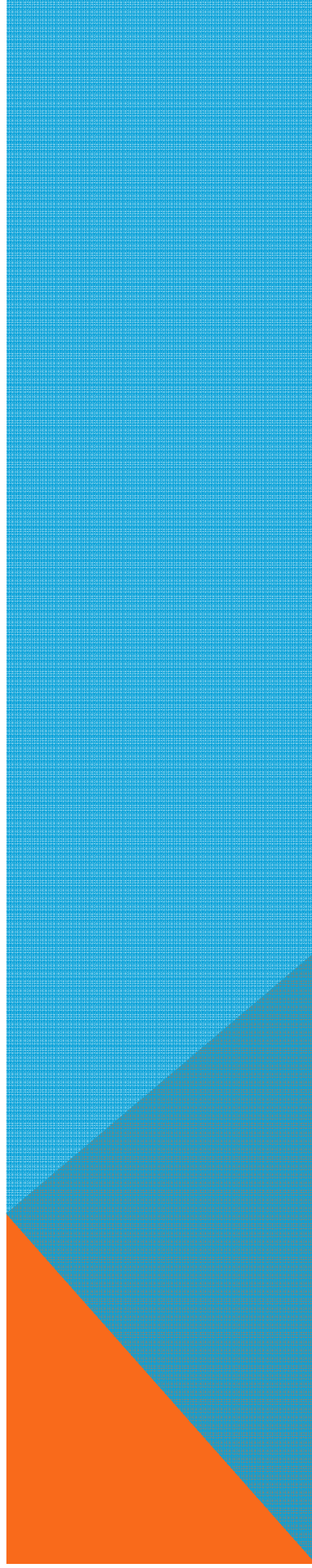
- Reduces the risk of type 2 diabetes, rheumatoid arthritis, cardiovascular disease, breast, and ovarian cancer, weight loss

For infants:

- Otitis media, upper and lower respiratory tract infections, asthma, RSV, necrotizing enterocolitis, atopic dermatitis, gastroenteritis, obesity, celiac disease, diabetes, leukemia and sudden infant death syndrome

Categorizations: Exclusive vs Any vs None; Duration

The Oregon 2011 breastfeeding report card: 91.2% of mothers initiated breastfeeding; 62.5% breastfeed at least 6 months.



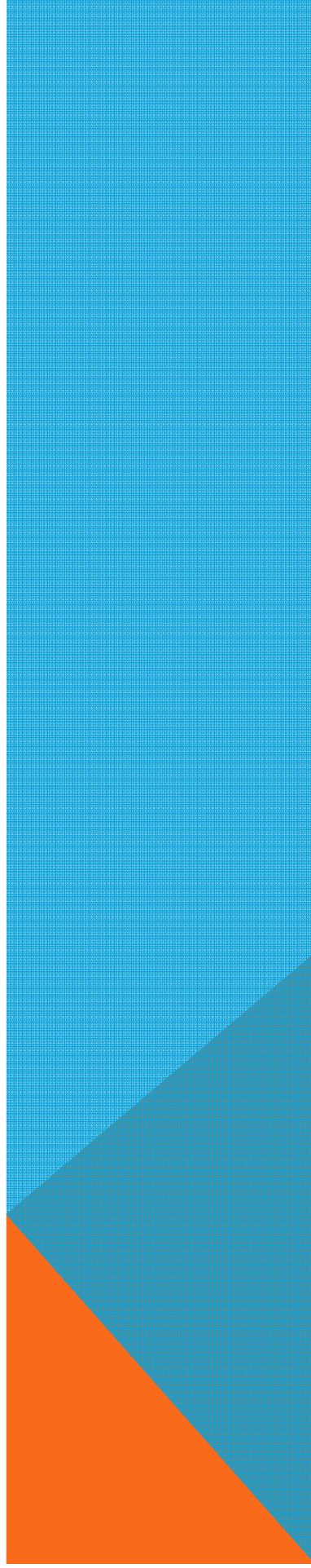
POSTPARTUM DEPRESSION

Depression occurring in the first year after birth
diagnosed using questionnaire and clinical
consultation

Approximately 10-15% of mothers will experience PPD

Symptoms include sadness, lack of energy, trouble
concentrating, anxiety, and feelings of guilt or
worthlessness, which can inhibit maternal bonding

In children PPD associated with inhibited language
development, emotional and behavioral problems



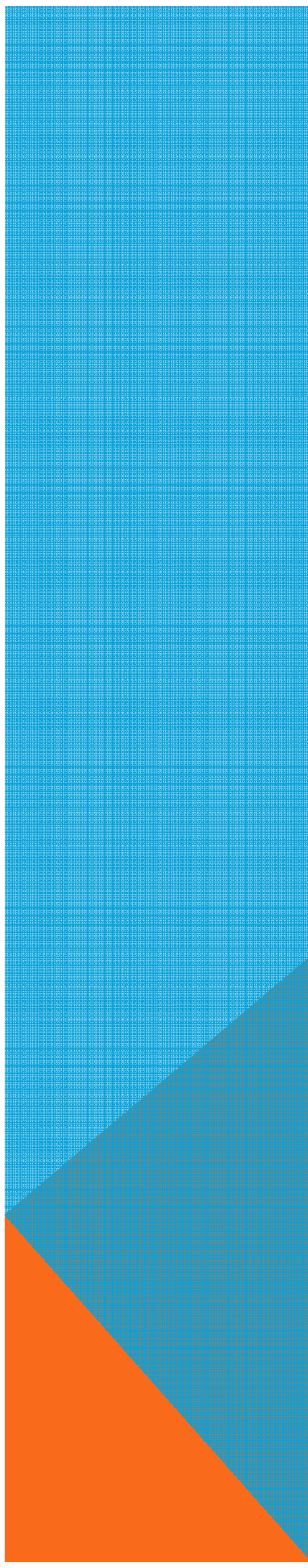
SPECIFIC AIMS

SA1: To describe the prevalence of breastfeeding at least 8 weeks and self-reported postpartum depressive symptoms in the 2007 sample of Oregon mothers with live births.

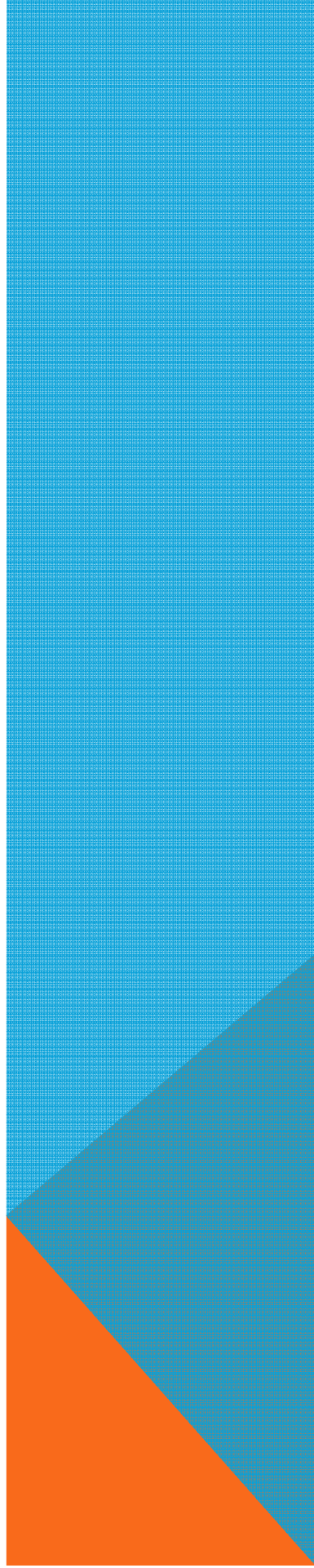
SA2: To measure the association between breastfeeding and self-reported postpartum depressive symptoms while adjusting for potential confounders and to examine the potential presence of effect modification using logistic regression.

- Examine additional risk factors that may influence the primary relationship between breastfeeding and self-reported postpartum depressive symptoms including income, race/ ethnicity, education, and marital status, parity, maternal age, insurance, smoking status, maternal body mass index, and stressful life events.

SA3: To determine if directionality and causality can be determined using these results combined with current literature on the association between breastfeeding and self-reported postpartum depressive symptoms.



METHODS



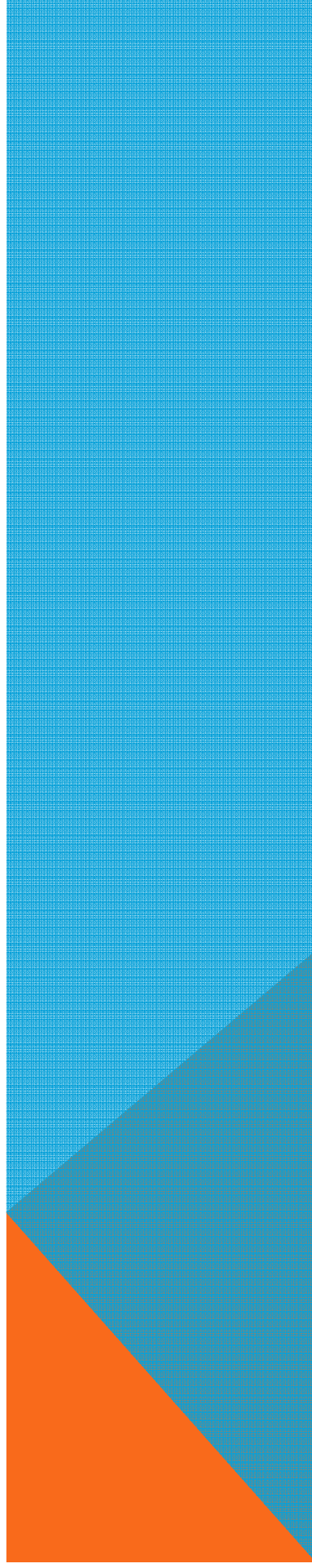
PREGNANCY RISK ASSESSMENT MONITORING SYSTEM

2007 PRAMS survey data

PRAMS is an epidemiologic survey used to evaluate maternal health behaviors with the goal of improving the health outcomes of mother and infants.

Weighting: oversampling of underrepresented racial/ethnic populations, low birth weight infants and non-respondents.

Sampled 3067 mothers with 1894 completing the survey: a weighted response rate of 67%



PRIMARY DEPENDENT VARIABLE

Self-Reported Postpartum Depressive Symptoms

PRAMS Questions:

1. “Since your new baby was born, how often have you felt down, depressed, or hopeless?”
2. “Since your new baby was born, how often have you had little interest or little pleasure in doing things?”

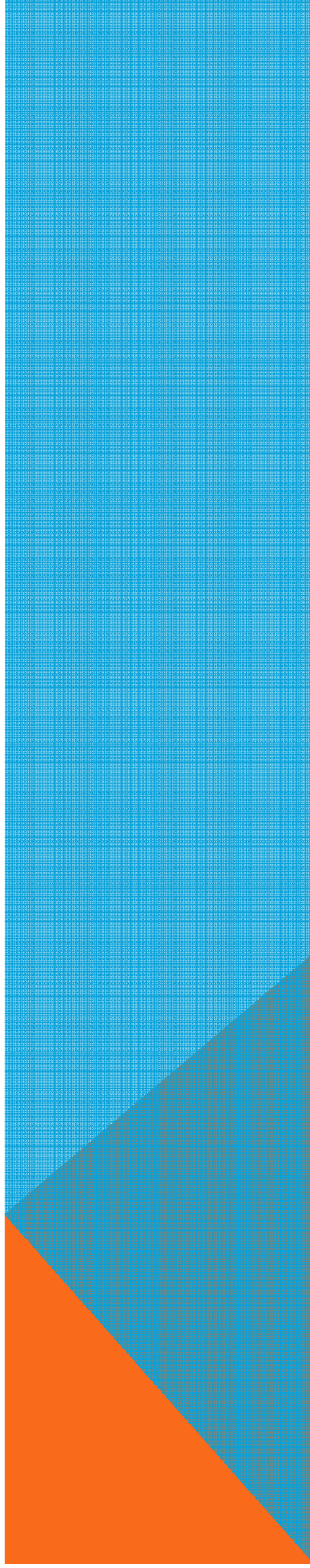
Possible Responses: Always, Often, Sometimes, Rarely, Never

Classification:

Present: Response of Always or Often to either question

Absent: Response of Sometimes, Often, Never to both questions

Missing: No response or response of Sometimes, Often, Never to one question and no response on other



PRIMARY DEPENDENT VARIABLE

Self-reported postpartum depressive symptoms (SRPPDS):
Subset: 9.83% reported postpartum depressive symptoms

“Since your new baby was born, how often have you felt down, depressed, or hopeless?”					
	Present	Absent	Missing	Total	
“Since your new baby was born, how often have you had little interest or little pleasure in doing things?”	Present	101	94	0	174
	Absent	73	1586	9	1682
	Missing	0	2	29	38
Total		195	1668	31	1894
SRPPDS Total					
Combined	Overall	Present	Absent	Missing	Total
		268	1586	40	1894

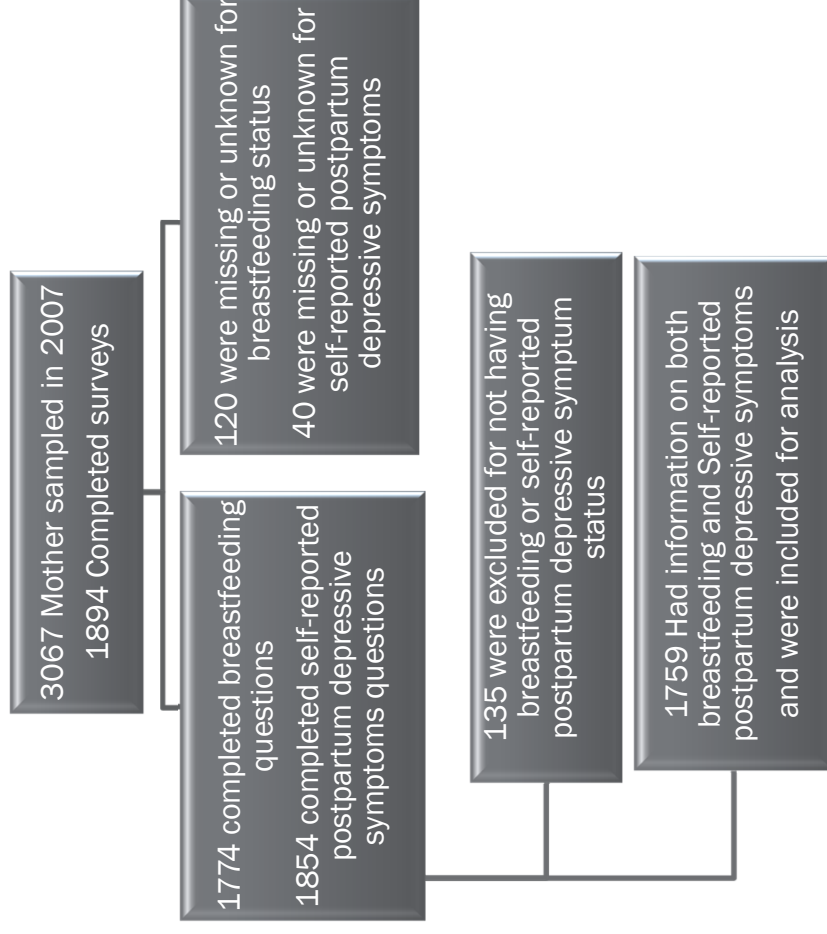
PRIMARY INDEPENDENT VARIABLE

Any breastfeeding at least 8 weeks

77% of the sample population breastfed at least 8 weeks

Question	Yes	No	Missing	Total
Is your baby alive now?	1808	26	60	1894
Is your baby living with you now?	1800	7	61	1868
Did you ever breastfeed or pump breast milk to feed your new baby after delivery?	1661	133	6	1800
Are you still breastfeeding or feeding pumped milk to your new baby?	1096	555	10	1661
How many weeks or months did you breastfeed or pump milk to feed your baby?	< 1 week >= 1 week Missing			47 498 10
Total valid for analysis Missing/ Unknown				1774 120

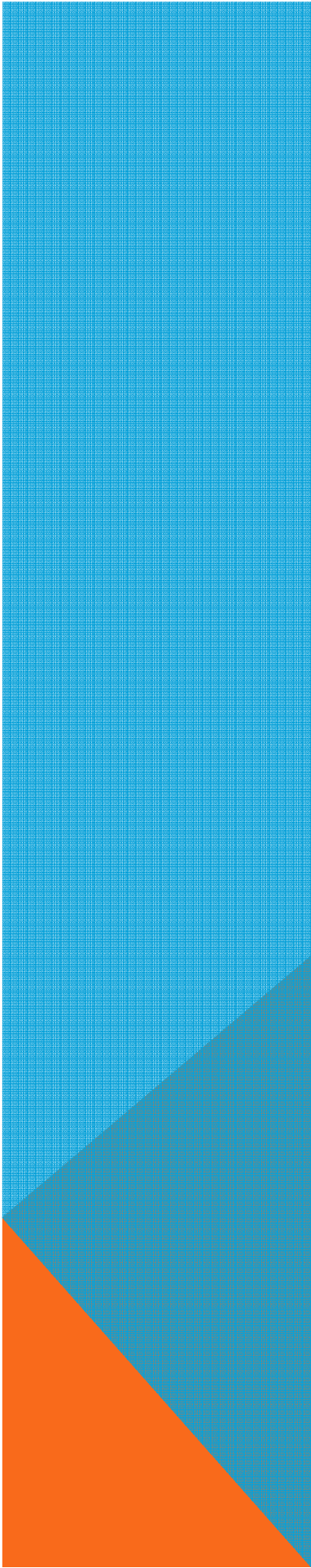
INCLUSION/ EXCLUSION



CONFOUNDERS

Methods

Demographic Variables	Possible Responses	Coding for Analysis
Maternal Age (BC)	Continuous	0= >=25 1= <25
Marital Status (BC)	Married, not married	0=Married 1=Not Married
Maternal race/ethnicity (BC) (EM)	Hispanic, NH White, NH African American, NH Asian/Pacific Islander, NH American Indian/ Alaskan Native	0=Non Hispanic White, 1=Hispanic, 2=Non Hispanic African American, 3=Non Hispanic Asian/Pacific Islander, 4= Non Hispanic American Indian/ Alaskan Native
Maternal Education (BC)	Less than 12 th grade, 12 th grade/ GED, Greater than 12 th grade	0= >= 12 th grade 1= 12 th grade/GED 2=<12 th grade or 0= >12 th grade 1= <=12 th grade



SOME MORE CONFOUNDERS

PRAMS Measures	Possible Responses	Coding for Analysis
Pregnancy Intention (PR)	I wanted to be pregnant sooner, I wanted to be pregnant later, I wanted to be pregnant then, I didn't want to be pregnant then or any time in the future	0=No if response is "I wanted to be pregnant later" or "I didn't want to be pregnant then or any time in the future" 1=Yes if response is "I wanted to be pregnant sooner" or "I wanted to be pregnant then"
Family Income (PR)	Less than \$10,000, \$10,000-\$14,999, \$15,000-19,999, \$20,000-24,999, \$25,000-\$34,999, \$35,000-\$49,999, \$50,000 or more	0= 0% - 200% Federal Poverty Level 1= 200% Federal Poverty Level or greater
Insurance before pregnancy (PR)	No Yes	0= Yes 1= No
Parity (PR)	First child, second child, third child, fourth child, fifth child or more	0=First child 1= Second child 2= Third or more
Smoking Now (PR)	41 or more cigarettes 21-40 cigarettes 11-20 cigarettes 6-10 cigarettes 1-5 cigarettes Less than 1 cigarette 0 cigarettes	0= 0 cigarettes 1=1 or more cigarettes
Body Mass Index (PR)	A ratio of weight before pregnancy and height without shoes	0=<25 BMI 1=25 or greater BMI
Stressful Life Events (PR) (EM)	No Yes	0=0 Events 1=1-2 Events 1=3 or more Events

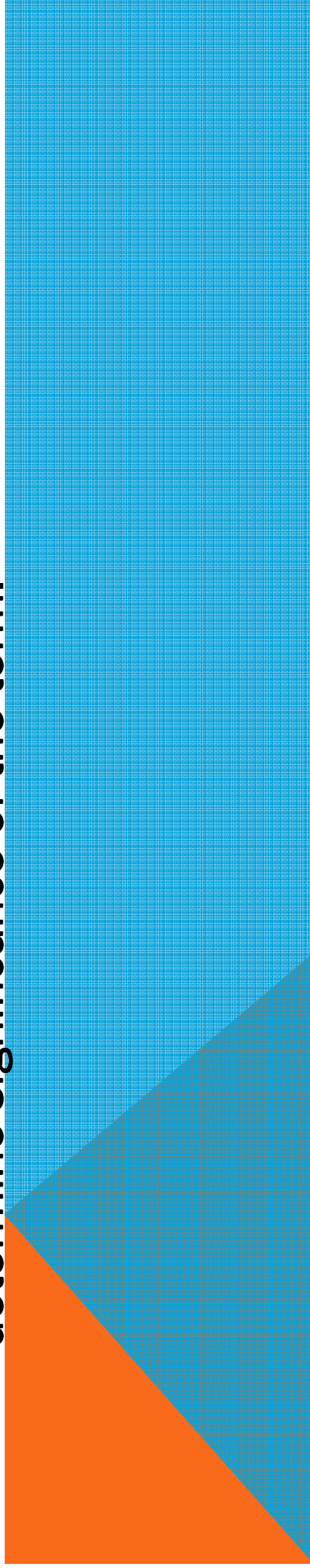
LOGISTIC REGRESSION ANALYSIS

Bivariate analysis used to determine significant confounders for multivariate logistic regression analysis and ensure correct variable categorization

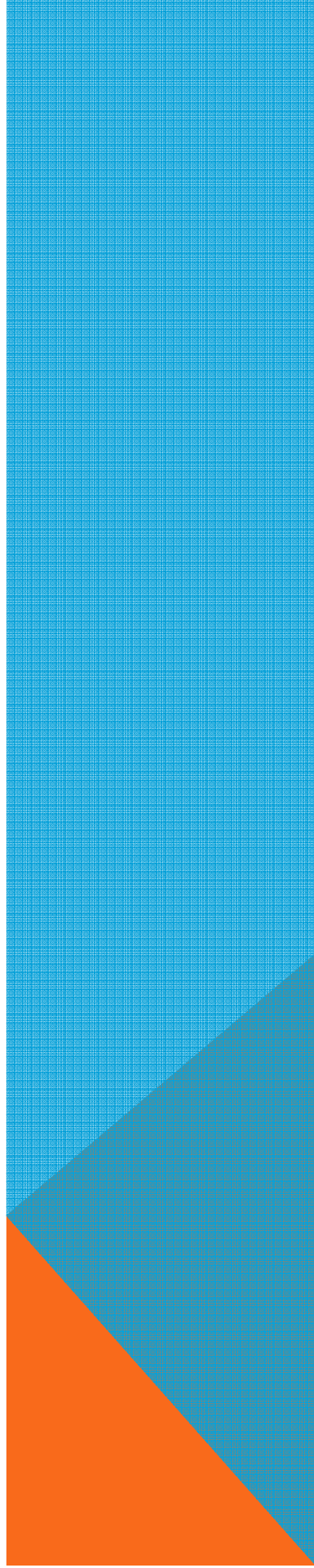
Multiple logistic regression considered significant variables from bivariate analysis for inclusion

Forward stepwise model building confirmed with backward stepwise elimination

Effect modification was considered via interaction term with breastfeeding. “Testparm” was used to determine significance of the term.



RESULTS



BIVARIATE ANALYSIS

Variable	N (total 1759)	Unweighted % Reporting Depression	Weighted % Reporting Depression	Weighted Univariate OR	95% CI	p-value
Any breastfeeding At least 8 weeks						
Yes	1271	11.17	7.9	Referent		
No	488	19.47	16.2	2.245	1.37, 3.67	0.003
Missing	0					
Pregnancy Intention						
Yes	1042	11.42	8.27	Referent		
No	497	16.79	12.49	1.58	1.25, 2.01	0.001
Missing	20					
Family income (%FPL)						
<200%	957	16.72	13.67	2.81	1.97, 3.99	<0.001
>=200%	681	7.49	5.34	Referent		
Missing	127					
Marital Status						
Married	1070	10.93	8.22	Referent		
Not Married	689	17.42	13.28	1.71	1.01, 2.89	0.046
Missing	0					
Maternal Age						
<25	590	18.98	15.91	2.48	1.62, 3.80	<0.001
>=25	1169	10.69	7.08	Referent		
Missing	0					
Maternal Education						
<=High School Diploma/GED	947	16.37	12.56	Referent		
>High School Diploma/ GED	802	9.98	7.1	1.879	1.09, 3.22	0.025
Missing	10					

BIVARIATE ANALYSIS

Variable	N (total 1759)	Unweighted % Reporting Depression	Weighted % Reporting Depression	Weighted Univariate OR	95% CI	p-value
Maternal Race						
Hispanic	415	11.81	11.87	1.43	0.845, 2.42	0.171
NH White	588	12.24	8.61	Referent		
NH API	293	10.58	11.52	1.38	0.49, 3.92	0.523
NH African American	203	20.69	20.24	2.72	1.59, 4.67	0.001
NH AI/AN	258	16.28	16.55	2.10	1.16, 3.82	0.018
Missing	2					
Insurance Before Pregnancy						
Yes	951	10.45	8.22	Referent		
No	796	17.09	12.22	1.55	0.55, 4.42	0.387
Missing	6					
Parity						
1 st	739	12.58	8.99	Referent		
2 nd or more	1018	14.15	10.4	1.17	0.64, 2.17	0.588
Missing	0					
Smoking Now						
Yes	238	23.11	16.63	2.04	1.55, 2.69	<0.001
No	1494	11.78	8.91	Referent		
Missing	27					
Body Mass Index						
Normal <25	873	11.45	6.91	Referent		
All other ≥25	743	15.61	12.42	1.91	1.46, 2.48	<0.001
Missing	146					
Stressful Life Events						
0	529	6.62	6.05	Referent		
1-2	696	10.78	9.18	1.57	0.72, 3.43	0.241
3 or more	521	23.61	15.12	2.77	0.68, 11.31	0.146

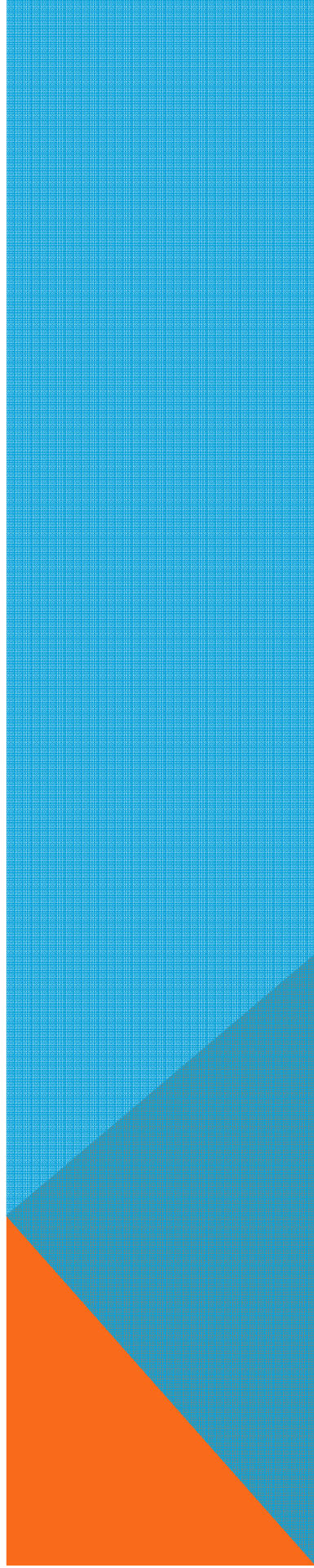
FORWARD STEPWISE MODEL BUILDING

Characteristic*	Stage 1 OR (T-stat) P-value	Stage 2 OR (T-stat) P-value	Stage 3 OR (T-stat) P-value	Stage 4 OR (T-stat) P-value	Stage 5 OR (T-stat) P-value
Family income <200% FPL 200% FPL or more	2.81 (6.15) <0.001 <i>Referent</i>	2.66 (5.97) <0.001 <i>Referent</i>	2.46 (3.80) 0.001 <i>Referent</i>	1.93 (2.46) 0.024 <i>Referent</i>	1.96 (2.23) 0.039 <i>Referent</i>
Smoking Now Yes No		1.73 (5.82) <0.001 <i>Referent</i>	1.69 (6.98) <0.001 <i>Referent</i>	1.44 (4.06) 0.001 <i>Referent</i>	1.43 (4.43) <0.001 <i>Referent</i>
BMI BMI <25 (Ref) BMI ≥25			<i>Referent</i> 1.80 (4.06) 0.001	<i>Referent</i> 1.99 (5.12) <0.001	<i>Referent</i> 2.04 (5.23) <0.001
Maternal age <25 years 25 years or older				2.15 (2.96) 0.008 <i>Referent</i>	2.19 (3.16) 0.005 <i>Referent</i>
Marital status Married Not Married					Not significant <i>Referent</i> -0.17 (0.870)
Maternal education ≤12 th /GED >12 th /GED					Not significant -1.75 (0.098) <i>Referent</i>

FORWARD STEPWISE MODEL BUILDING

Characteristic*	Stage 1 OR (T-stat) P-value	Stage 2 OR (T-stat) P-value	Stage 3 OR (T-stat) P-value	Stage 4 OR (T-stat) P-value	Stage 5 OR (T-stat) P-value
Pregnancy Intention					
Yes					Not significant
No					<i>Referent</i> -0.23 (0.823)
Maternal race/ Ethnicity					
Hispanic					Not significant
NH White					-0.31 (0.764)
NH API					<i>Referent</i> 2.11 (0.049)
NH African American					1.61 (0.124)
NH AI/AN					1.14 (0.270)
Insurance before pregnancy					
Yes					Not significant
No					<i>Referent</i> 0.78 (0.445)
Parity					
1 st Child					Not significant
2 nd or more					<i>Referent</i> 1.64 (0.117)
Stressful life events					
0 Events					Not significant
1-2 Events					<i>Referent</i> 0.58(0.571)
3+ Events					1.40(0.180)

DISCUSSION

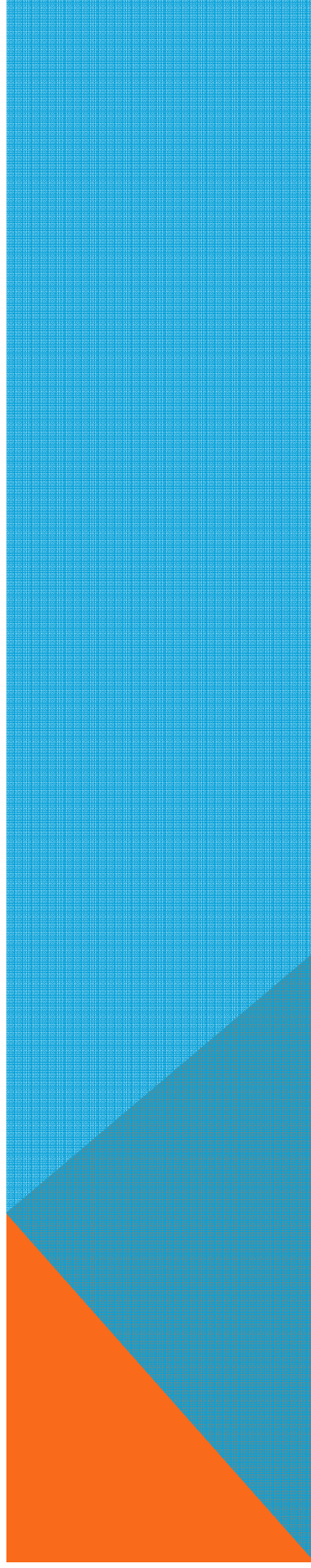


FINAL MODEL

The odds of self-reported postpartum depressive symptoms in women who breastfed less than eight weeks was 1.60 times the odds of self-reported postpartum depressive symptoms in women who breastfed at least eight weeks (95% CI: 1.004, 2.57)

- Confounders: Maternal age, Family income, Current smoking status, Body Mass Index,
- Effect Modifier: Stressful life events

No Stressful life events: OR: 4.81 (95%: 2.28-10.17)



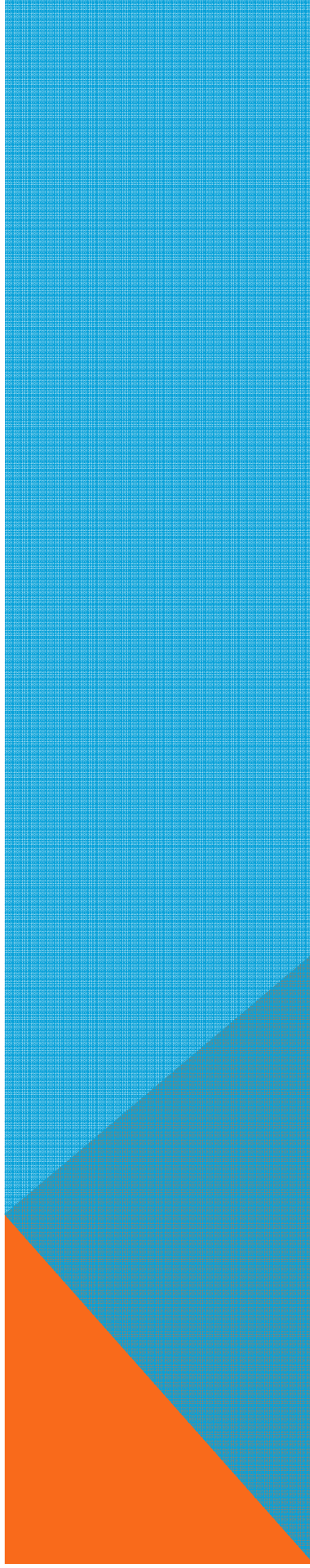
STRENGTHS AND LIMITATIONS

Strengths:

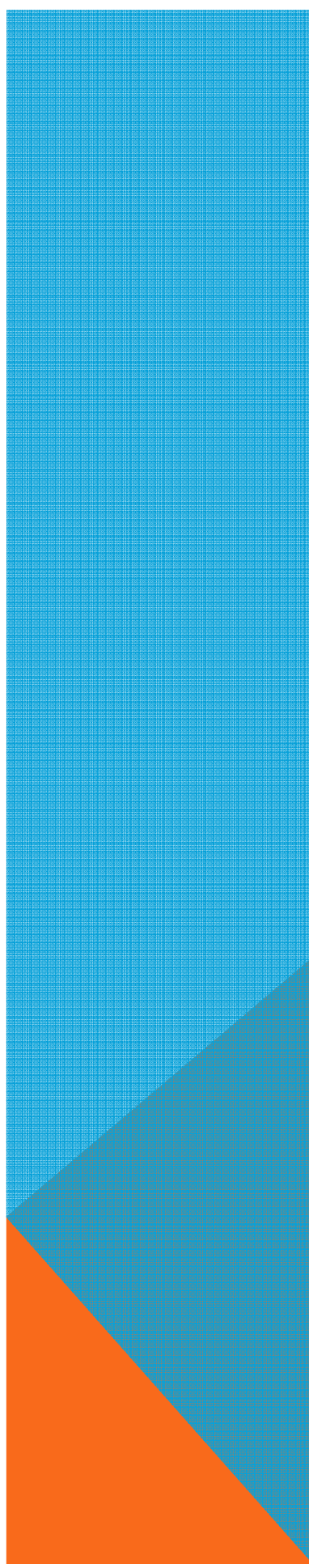
- Large stratified random sample
- Weighting to assess often overlooked populations
- Variety of behavioral and demographic variables

Limitations:

- Cross-sectional PRAMS data- cannot assess directionality
- Response rate of 67% may have biased results
- Recall bias of socially undesirable traits possible
- Limited definition of main variables

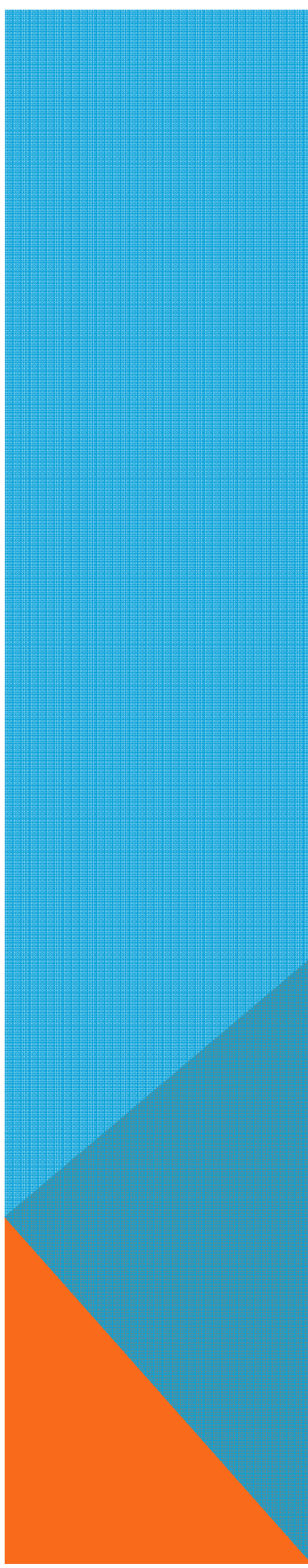


CAUSALITY



HILL'S CRITERIA FOR CAUSE

1. Strength of the Association
2. Specificity of the Association
3. Consistency of the Association
4. Biological Plausibility
5. Temporal Relationship
6. Dose Response effect
7. Intervention effect



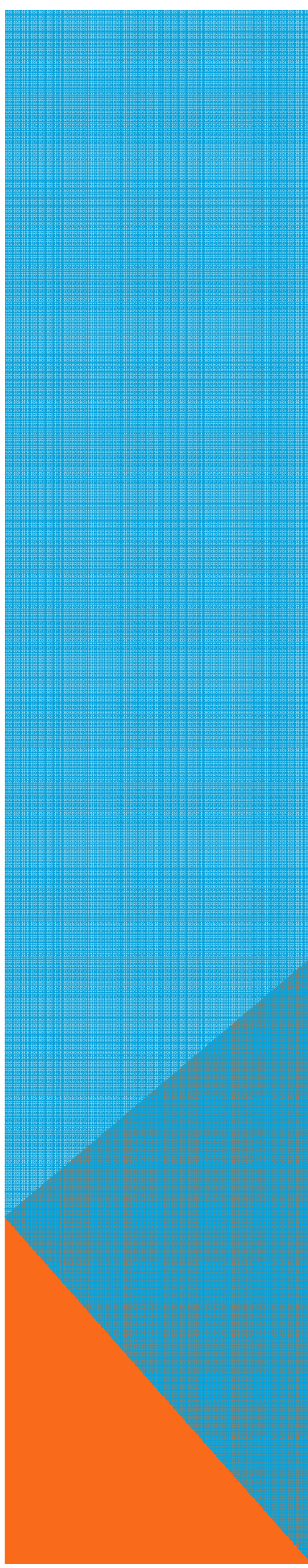
KNOWN ASSOCIATION

Bi-directional association:

- Breastfeeding linked to multiple measures of depressive symptoms
- Depressive symptoms linked to breastfeeding cessation

Common confounders:

- Maternal age, Education, Race/ Ethnicity, Parity, Socioeconomic status, Marital status, Income, Body Mass Index, Pregnancy Intention, Smoking



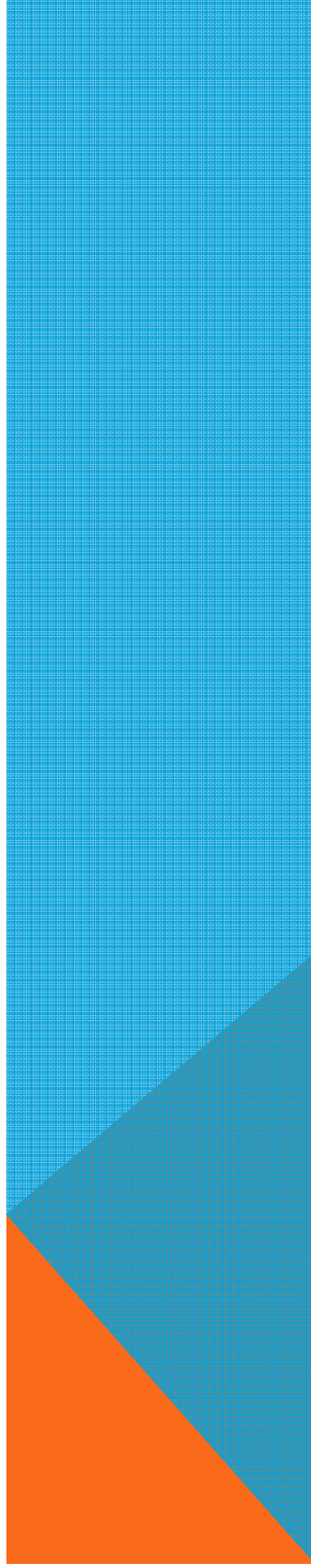
SRPPDS OUTCOMES

Causality

1st Author, Year	Sample Size	Method	Direction	Measure of Association	Time Point of Association	Study contribution
Postpartum Depressive Symptom Outcomes						
Warner 1996	2375	Cross-sectional	Not BF -> EPDS >12	OR: 1.52 (1.12-2.06)	6 weeks	Magnitude of association
Chaudron 2001	465	Longitudinal	Worry about BF -> Diagnosed depression (DSM/treatment)	Relative Risk: 3.0 (1.04-9.22)	4 weeks	Magnitude of association
Yonkers 2001	297	Cross-sectional	Any BF -> EPDS >12	OR: 0.60 (0.44-0.81)	3 weeks	Magnitude of association
Mezzacappa 2002	24	Longitudinal	BF vs not BF-> Neg Mood	ANOVA: t(21)=2.30; p<0.05	During breastfeeding session 1-7 months	Difference in Exposure groups
Groër 2005	183	Cross-sectional	Exclusive BF vs not BF -> Mood Scores, Stress scores	ANOVA t=2.89 p=0.004	4-6 weeks	Difference in Exposure groups
Hatton 2005	185	Longitudinal	Any BF vs not BF -> EPDS ≥14	ANOVA p<0.05	6 weeks	Difference in Exposure groups
Watkins 2011	2185	Longitudinal	Dislike BF -> EPDS >12	OR= 1.42 (1.04-1.93)	8 weeks	Magnitude of association
Tashakori 2012	150	Case-control	Not BF vs BF -> EPDS >12	X2(t=-2.9,df=148); p=0.004	8 weeks	Difference in Exposure groups
Ystrom 2012	42,225	Longitudinal	BF or Mixed BF Form-> Anx & Dep Symptoms	β=0.08(0.05-0.11) (Mixed) β=0.24(0.21-0.29) (Form)	6 months	Difference in amount of BF
Zubaran 2012	89	Cross-sectional	BF self-efficacy -> EPDS >12,	R²=0.125; F(1,87)-12.43 p=0.001	2-12 weeks	Dose-response association

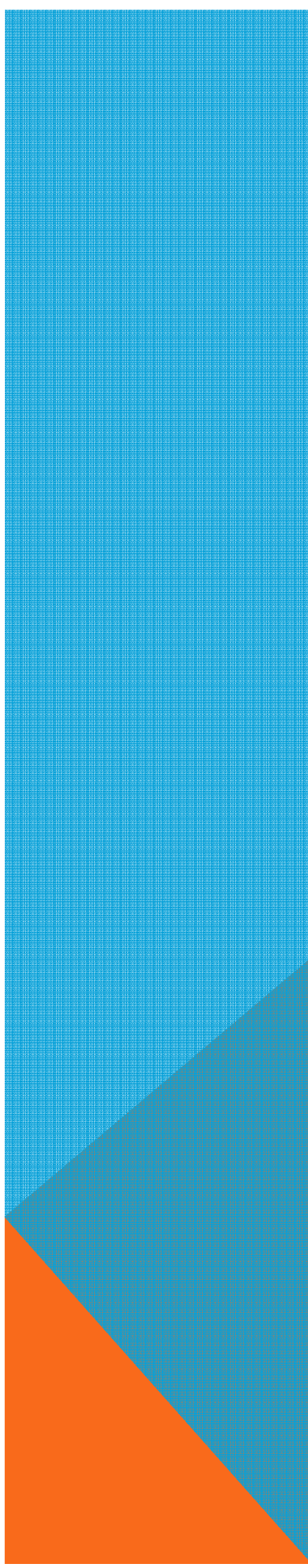
BREASTFEEDING OUTCOMES

1st Author, Year	Sample Size	Method	Direction	Measure of Association	Time Point of Association	Study contribution
Breastfeeding Outcomes						
Henderson 2003	1410	Longitudinal	EPDS > 12 -> BF Cessation	HR=1.25 (1.03-1.52)	Prior to 8 weeks	Magnitude of association
Dennis 2007	594	Longitudinal	EPDS > 12 -> BF discontinuation	OR: 0.57 (0.34-0.95)	EPDS 1-week BF 4-8 weeks	Magnitude of association
Gaffney 2012	1447	Longitudinal	EPDS > 9 -> Low BF intensity	OR: 1.57 (1.16-2.13)	8 Weeks	Magnitude of association



STRENGTH OF THE ASSOCIATION

The association is mildly to moderately strong
Significant p-values and confidence intervals across
studies suggest confidence in significance of the
association
Moderate support for causal relationship



SPECIFICITY

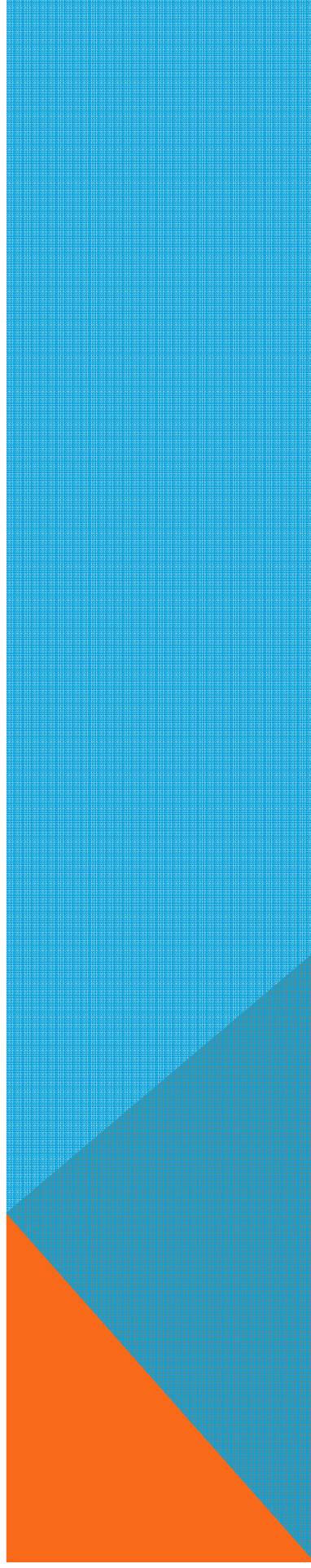
Breastfeeding measures

- Exclusive vs Mixed vs Any vs Not
- Feeling regarding breastfeeding/ Self-efficacy
- Duration, intensity

Depressive symptoms measures

- EPDS >9 or >12
- Mood scores

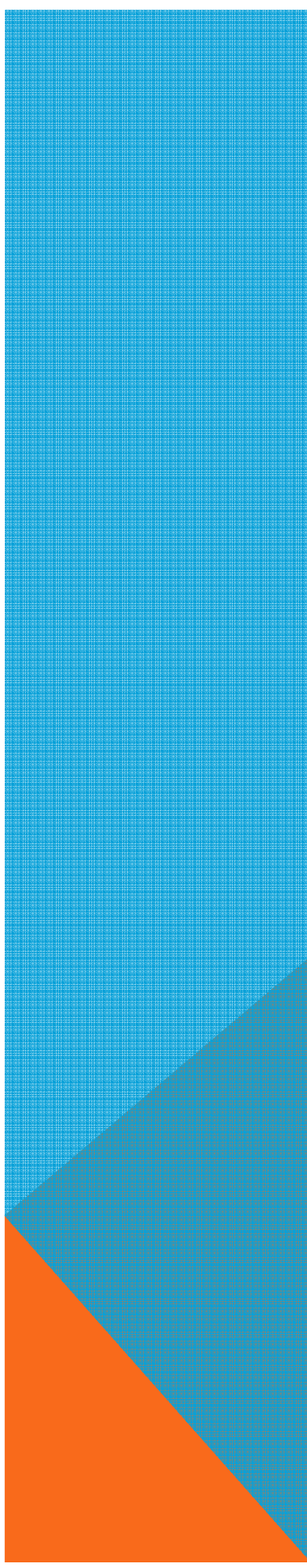
Mild to moderate support



CONSISTENCY

Relationship between measures of breastfeeding status and measures of depressive symptoms found consistently across studies

Consistency provides moderate support for a causal relationship



BIOLOGICAL PLAUSIBILITY

Oxytocin

- Lactation and mood regulation

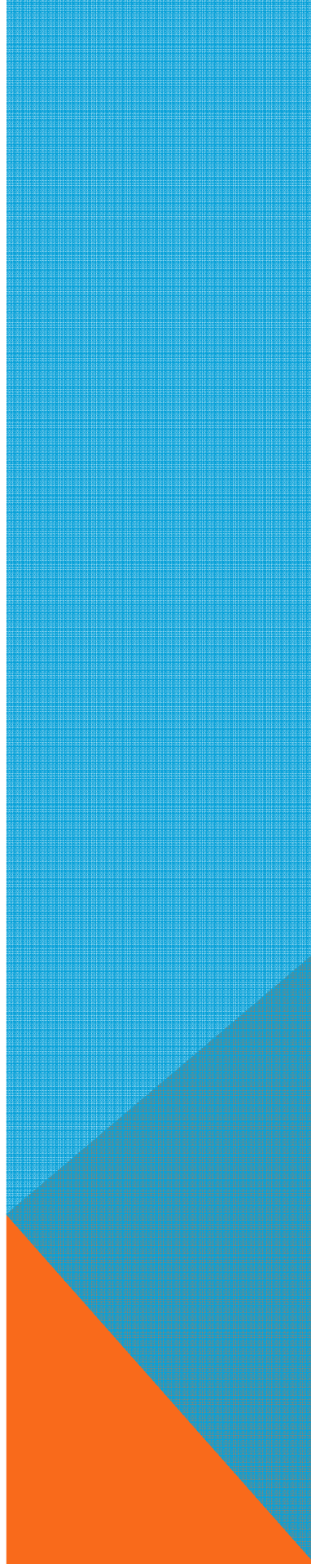
Prolactin

- Increases with breastfeeding
- Low levels associated with increased negative mood

Stress

- Inflammation triggers depression
- Induced via sleep deprivation
- Breastfeeding reduces stress levels

Provides moderate to strong support



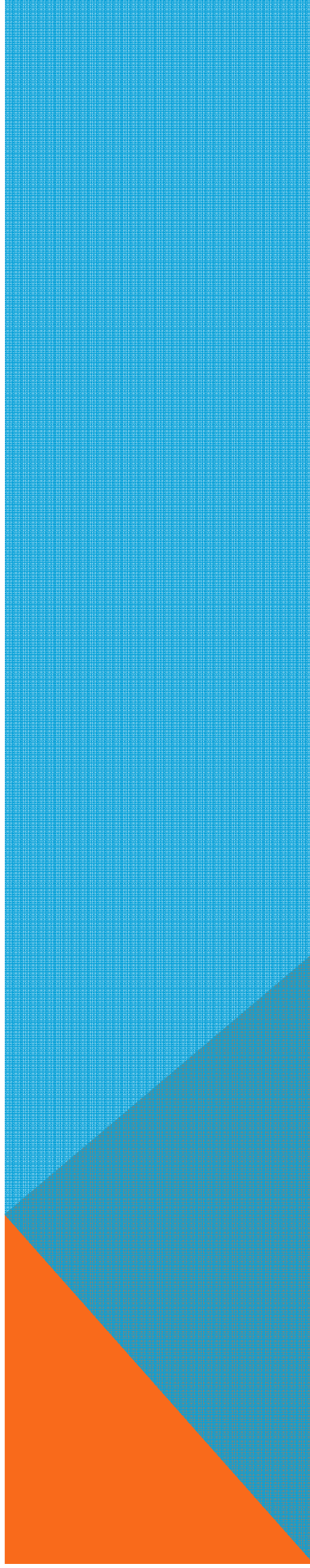
TEMPORALITY

Breastfeeding → Depressive symptoms

- Watkins 2011: Women with severe breastfeeding pain in the first day, first week, and second week more likely to be depressed at two months
- Ystrom 2012: Adjusting for depressive symptoms at 30 weeks gestation, postpartum depressive symptoms at 6 months were predicted by increased bottle-feeding and mixed breastfeeding in the months prior. Additionally women with depressive symptoms during pregnancy had higher levels of depressive symptoms postpartum compared to women with out depressive symptoms during pregnancy.
- Mezzacappa 2002: From 10 mins before to 10 mins after breastfeeding, mothers reported a statistically significant decrease in negative mood compared with bottle-feeding. Breastfeeding mothers

Depressive symptoms → Breastfeeding

- Henderson 2003: Women who experienced postpartum depression at anytime in the year after birth were more likely to stop breastfeeding and in most cases, onset of depressive symptoms preceded breastfeeding cessation



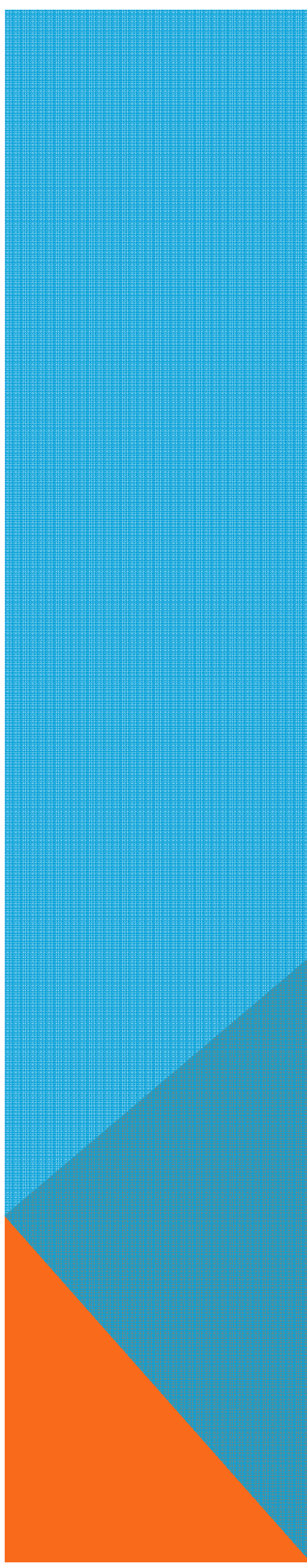
DOSE-RESPONSE & INTERVENTION

Ystrom 2012:

- Bottle feeding higher risk factor for postpartum depressive symptoms than mixed breastfeeding

Provides Mild support

No intervention effect noted in these studies



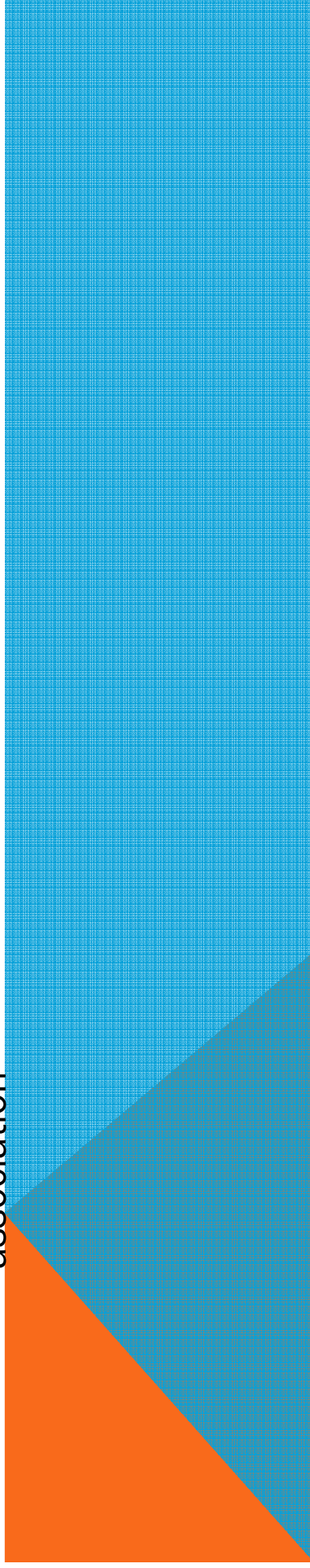
SUMMARY

There is some evidence to suggest a causal relationship

Major question regarding directionality

Bias, confounding, chance not consistently found across studies to explain association

- Small sample size, non-response, loss to follow-up (Hatton, 2005; Yonkers 2001; Dennis 2007).
- Misclassification: to lack of reevaluation of mothers or exclusion of mothers based mixed breastfeeding status (Tashakori 2012)
- Depressive symptoms scores (Chaudron 2001, Dennis 2007).
- Some confounders not considered: transition from breastfeeding to solid foods and return to employment
- Most studies subsets of larger studies not geared towards this association



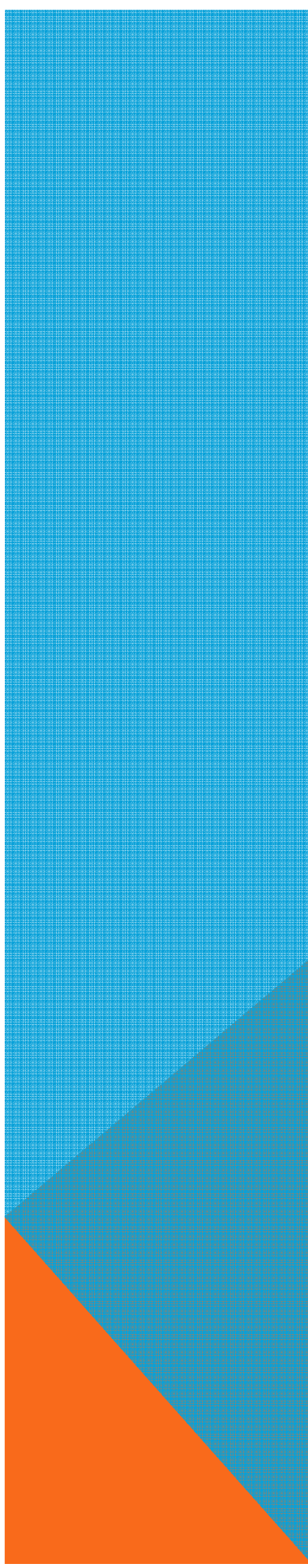
FUTURE STUDIES

Directionality

Onset of depressive symptoms

Levels of breastfeeding

Intervention effect



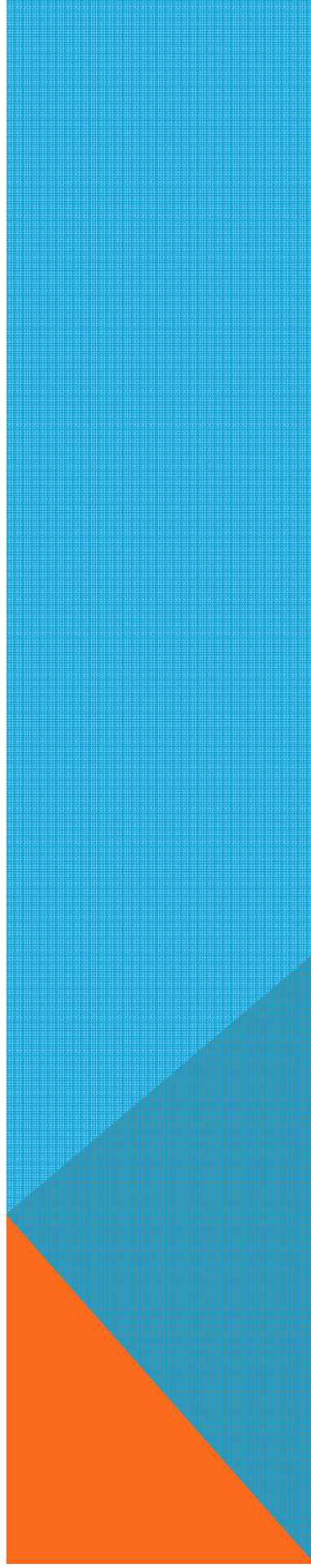
PUBLIC HEALTH IMPLICATIONS

Support of breastfeeding practices to improve mental health outcomes, improve mother-infant bonding

If breastfeeding decreases SRPPDS encouragement of breastfeeding initiation and duration could be used to decrease severity of depressive symptoms in mothers hesitant to use antidepressants.

If SRPPDS early on decreases breastfeeding intensity and duration then early screening and recognition of depressive symptoms and treatment could improve breastfeeding outcomes

If the association is bidirectional then early recognition of depressive symptoms as well as support of breastfeeding practice may confer improved mental health as well as other health outcomes in mother and infants.



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