



PRENATAL CANNABIS USE AND ADVERSE BIRTH OUTCOMES

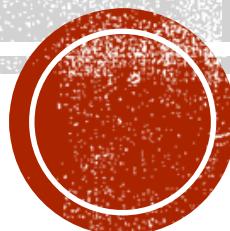
Dr. Jamie Seabrook

Associate Professor, Food & Nutritional Sciences, Brescia University College

Adjunct Professor, Paediatrics, and Epidemiology & Biostatistics, Western University

Scientist, Children's Health Research

Scientist, Lawson Health Research Institute



OBJECTIVES

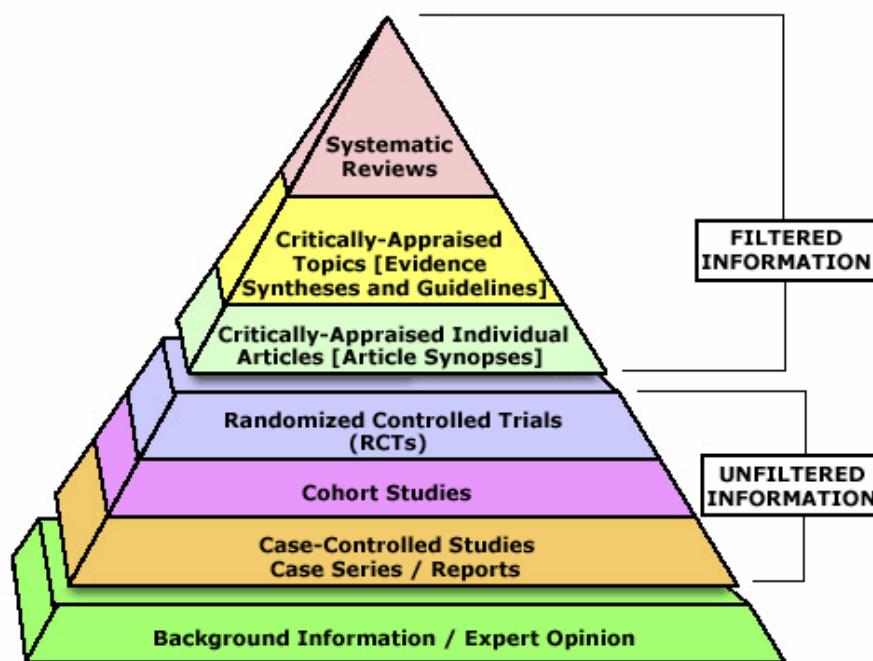
- Current state of evidence on prenatal cannabis use and adverse birth outcomes
- Sociodemographic characteristics of women who use cannabis during pregnancy
- Challenges in conducting this type of research
- Very recent research on this topic from my lab



INTRODUCTION

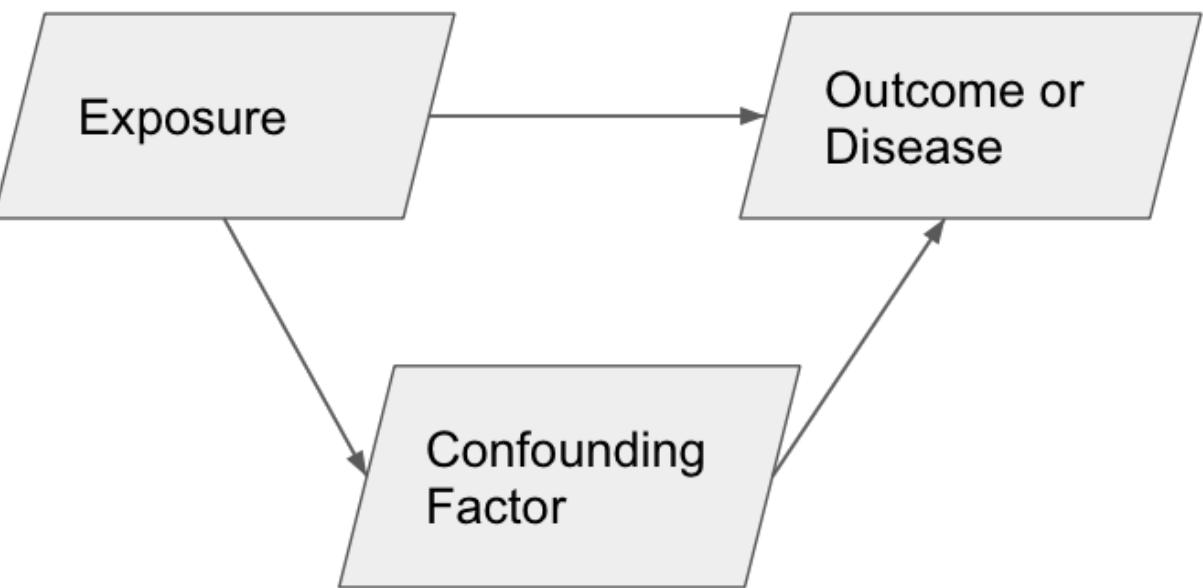
- Marijuana is the most commonly used recreational drug during pregnancy (Martin et al. 2015) and is often used to treat nausea and vomiting (Volkow et al. 2016)
- Between 2002 and 2014, past-month use among pregnant women increased from 2.4% to 3.9% (Brown et al. 2017)
- Canada has one of the highest rates of cannabis use in the world (UNICEF Office of Research 2013); Canadian youth ranked first for cannabis use among 43 countries (WHO, 2012)
- 48-60% of cannabis users report continued use throughout their pregnancy (Passey et al. 2014; Committee on Obstetric Practice 2017)
- Despite this increased use, little is known about the effects of marijuana on neonatal outcomes





SYSTEMATIC REVIEW & META-ANALYSIS: CONNOR ET AL. (2016)

- Primary outcomes: LBW and PTB
- Data searched until Aug 2015 using 6 databases
- N=31 articles (17 high quality; 14 low quality)
- Women who used marijuana during pregnancy were not at increased risk for LBW (4 studies: aOR 1.16, 95% CI:0.98–1.37) or PTB (4 studies: aOR 1.08, 95% CI:0.82–1.43)
- The ability to adjust for tobacco and other confounding factors was a major strength



SYSTEMATIC REVIEW & META-ANALYSIS: GUNN ET AL. (2016)

- Examined many outcomes
- Data searched until Apr 2014 using 7 databases
- N=24 articles (most high quality)
- Infants exposed to cannabis in utero had a higher probability of LBW (7 studies: pooledOR=1.77, 95% CI: 1.04-3.01) than infants whose mothers did not use cannabis during pregnancy
- No association between in utero exposure to cannabis and PTB (9 studies: pOR=1.29, 95% CI: 0.80-2.08)
- Infants exposed to cannabis in utero were 2x more likely to need placement in the NICU compared with infants whose mothers did not use cannabis during pregnancy ($pOR=2.02$: 95% CI:1.27-3.21)
- Determining a cannabis-only effect (excluding tobacco & alcohol) was not possible





WHO ARE MOST AT RISK FOR CANNABIS USE DURING PREGNANCY?

- Young women (<25 years of age)
- Women from low-income households
- Cigarette smokers
- Those who experienced a significant emotional stressor before or during pregnancy (Vermont Department of Health, 2017)
- Depression during pregnancy (Brown et al, forthcoming)

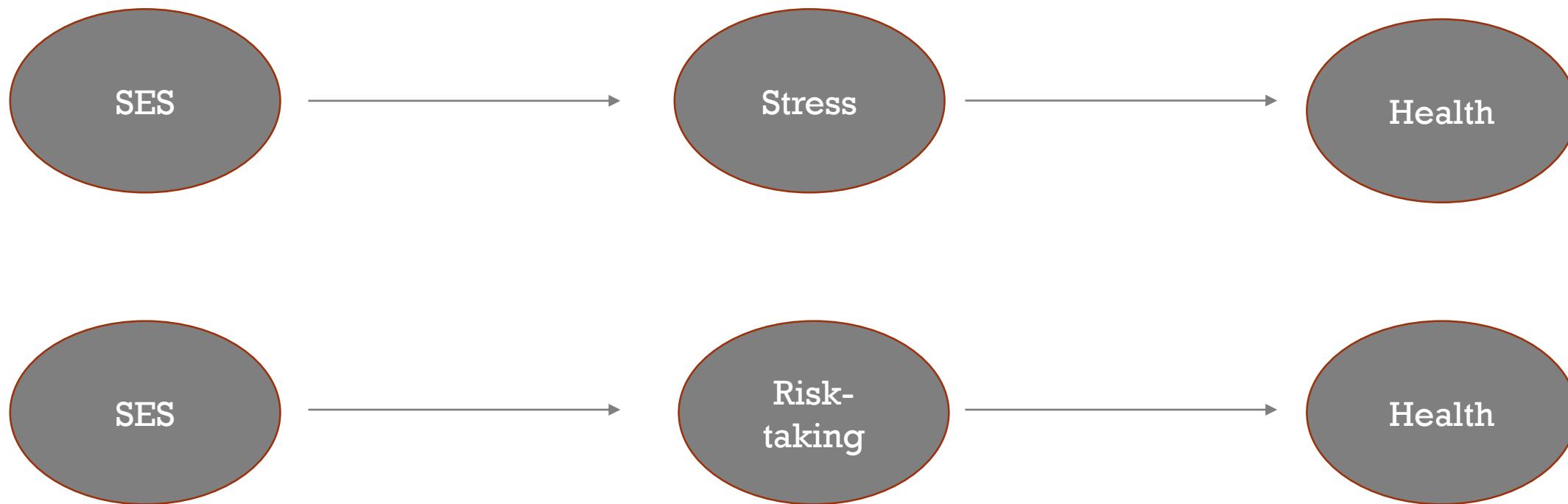




SOCIOECONOMIC STATUS & HEALTH DISPARITIES

- 2 common explanations:
- (1) low SES groups experience more kinds & greater exposure to stress
 - E.g., poor living conditions, low job security, financial difficulties
- (2) low SES groups engage in more risky health behaviours
 - E.g., tobacco use, low physical activity

STRESS & HEALTH BEHAVIOURS AS MEDIATORS: ARE WE BLAMING THE VICTIM?



CHALLENGES TO STUDIES ON PRENATAL CANNABIS USE AND ADVERSE BIRTH OUTCOMES

- Many women who report using cannabis during pregnancy also use alcohol and tobacco (Ko et al. 2013)
- Most studies have relied on self-report → this included most articles in both systematic reviews
- Reliance on self-report is problematic → only 36% of pregnant patients who tested positive for THC actually disclosed their cannabis use (Chang et al. 2017)





Predictors of drug use during pregnancy: The relative effects of socioeconomic, demographic, and mental health risk factors

R.A. Brown^a, H. Dakkak^a, J. Gilliland^{b–h} and J.A. Seabrook^{a–e,h,*}

^aSchool of Food and Nutritional Sciences, Brescia University College, London, ON, Canada

^bDepartment of Paediatrics, Western University, London, ON, Canada

^cChildren's Health Research Institute, London, ON, Canada

^dLawson Health Research Institute, London, ON, Canada

^eHuman Environments Analysis Laboratory, Western University, London, ON, Canada

^fDepartment of Geography, Western University, London, ON, Canada

^gSchool of Health Studies, Western University, London, ON, Canada

^hDepartment of Epidemiology & Biostatistics, Western University, London, ON, Canada

Received 23 February 2015

Revised 6 July 2018

Accepted 29 October 2018

Abstract.

BACKGROUND: With limited Canadian research on predictors of drug use during pregnancy, the primary objective was to assess the relative effects of socioeconomic, demographic, and mental health risk factors associated with drug use during pregnancy. Predictors of an Apgar score <7 and fetal macrosomia were examined as secondary outcomes.

METHODS: This retrospective cohort study consisted of 25,734 pregnant women from Southwestern Ontario. Data were prospectively obtained from perinatal and neonatal databases at a tertiary hospital in London, Ontario. Using a Geographic Information System, neighborhood-level socioeconomic variables were obtained by mapping maternal postal codes. Separate logistic regressions were computed for all outcome variables.

RESULTS: The rates of alcohol, tobacco, and cannabis use during pregnancy were 1.9%, 16.2%, and 2.3%, respectively. The mean maternal age was 29.4 ± 5.4 years. Maternal age was inversely associated with alcohol, tobacco and cannabis use, whereas lone-parent household, depression, and anxiety increased the odds of substance use. Depression was the top risk factor of all three substances. Compared to women who were not depressed during pregnancy, women who were depressed were 2.15 times more likely to use alcohol (95% CI: 1.60, 2.90), 1.70 times more likely to smoke tobacco (95% CI: 1.48, 1.95), and 2.56 times more likely to use cannabis (95% CI: 1.95, 3.35). Adverse birth outcomes were also associated with overweight and obesity, gestational diabetes and insulin-dependent diabetes.

CONCLUSIONS: Maternal depression is the primary risk factor of drug use during pregnancy. Policy interventions that target at-risk women are important considerations to improve maternal mental health.

Keywords: Alcohol, cannabis, tobacco, pregnancy, risk factors



where
you
live
matters



J. Biosoc. Sci., (2018) **50**, 102–113, © Cambridge University Press, 2017
doi:10.1017/S0021932017000062 First published online 8 Mar 2017

SOCIOECONOMIC STATUS AND ADVERSE BIRTH OUTCOMES: A POPULATION-BASED CANADIAN SAMPLE

EMILY E. CAMPBELL*, JASON GILLILAND†,
PAULA D. N. DWORATZEK*, BARBRA DE VRIJER‡, DEBBIE PENAVA‡
AND JAMIE A. SEABROOK*¹

*School of Food and Nutritional Sciences, Brescia University College, London, Ontario, Canada, †Department of Geography, Western University, London, Ontario, Canada and ‡Department of Obstetrics and Gynaecology, Western University, London, Ontario, Canada

Summary. This study assessed the strength of the association between socioeconomic status (SES) and low birth weight (LBW) and preterm birth (PTB) in Southwestern Ontario. Utilizing perinatal and neonatal databases at the London Health Science Centre, maternal postal codes were entered into a Geographic Information System to determine home neighbourhoods. Neighbourhoods were defined by dissemination areas (DAs). Median household income for each DA was extracted from the latest Canadian Census and linked to each mother. All singleton infants born between February 2009 and February 2014 were included. Of 26,654 live singleton births, 6.4% were LBW and 9.7% were PTB. Top risk factors for LBW were: maternal amphetamine use, chronic hypertension and maternal marijuana use (OR respectively: 17.51, 3.18, 2.72); previously diagnosed diabetes, maternal narcotic use and insulin-controlled gestational diabetes predicted PTB (OR respectively: 17.95, 2.69, 2.42). Overall, SES had little impact on adverse birth outcomes, although low maternal education increased the likelihood of a LBW neonate (OR: 1.01).



Journal of Neonatal-Perinatal Medicine 11 (2018) 71–77
DOI:10.3233/NPM-181741
IOS Press

71

Original Research

The association between alcohol outlet accessibility and adverse birth outcomes: A retrospective cohort study

J.A. Seabrook^{a,b,c,d,e,f,*}, N. Woods^a, A. Clark^{f,g}, B. de Vrijer^{d,i}, D. Penava^{d,i} and J. Gilliland^{b,c,d,e,f,g}

^aSchool of Food and Nutritional Sciences, Brescia University College, London, ON, Canada

^bDepartment of Paediatrics, Western University, London, ON, Canada

^cDepartment of Epidemiology and Biostatistics, Western University, London, ON, Canada

^dChildren's Health Research Institute, London, ON, Canada

^eLawson Health Research Institute, London, ON, Canada

^fHuman Environments Analysis Laboratory, London, ON, Canada

^gDepartment of Geography, Western University, London, ON, Canada

ⁱSchool of Health Studies, Western University, London, ON, Canada

*School of Obstetrics and Gynaecology, Western University, London, ON, Canada

^{*}Correspondence to: Dr. Jamie A. Seabrook, Brescia University College at Western University, 1285 Western Road,

London, ON N6G 1H2, Canada. Tel.: +1 519 432 8353/Ext. 28284;

Fax: +1 519 858 5137; E-mail: jseabro2@uwo.ca.

Received 12 March 2017

Revised 17 July 2017

Accepted 18 September 2017

Abstract.

BACKGROUND: Alcohol outlet accessibility is positively associated with alcohol consumption, although this relationship has not been thoroughly examined in pregnant women. The present study examines the relationship between proximity and density of alcohol outlets and risk for low birth weight (LBW: <2,500 grams) and preterm birth (PTB: <37 weeks gestational age), and is the first Canadian study to investigate this association.

METHODS: Maternal accessibility to alcohol outlets was specified using a gravity-type measure of accessibility, which provides the amount of accessibility that a given household has to liquor stores within 30-minutes of their home. All singleton newborns without congenital anomalies that were born between February 2009 and February 2014 at London Health Sciences Centre in London, Ontario, were included in this cohort.

RESULTS: The sample consisted of 25,734 live births, of which 5.8% were LBW and 7.6% were PTB. Only 2.0% of women reported alcohol use during pregnancy. Alcohol outlet gravity was positively correlated with the percentage of mothers living in poverty ($r_s = 0.33$, $p < 0.001$) and in single-parent families ($r_s = 0.39$, $p < 0.001$), and who self-identify as being minorities ($r_s = 0.45$, $p < 0.001$). Alcohol outlet gravity increased the odds that mothers drank alcohol during pregnancy (OR 1.05; 95% CI: 1.02, 1.07), although the association was weak. Furthermore, alcohol outlet gravity did not increase the likelihood of a LBW or PTB infant.

CONCLUSIONS: Women with high accessibility to alcohol outlets are more likely to consume alcohol during pregnancy, but greater alcohol outlet accessibility does not translate into poor birth outcomes.

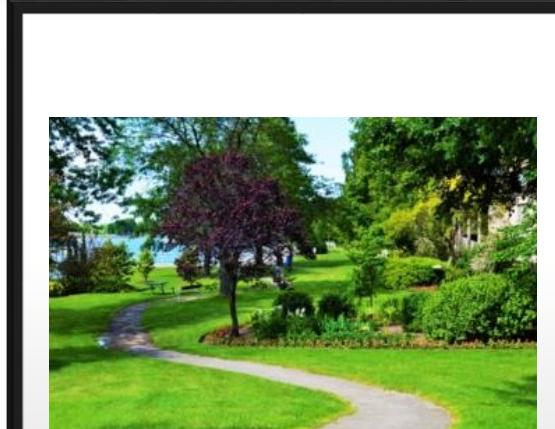
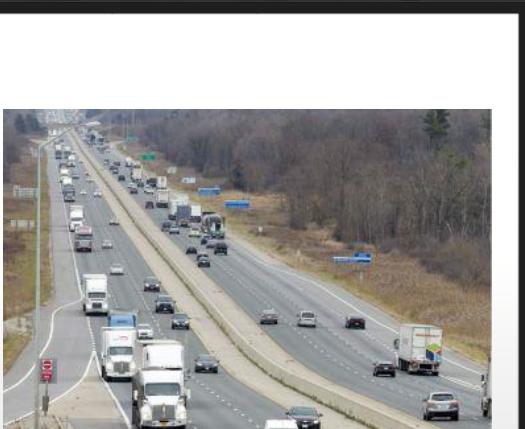
Keywords: Alcohol outlets, alcohol use, pregnancy, low birth weight, preterm birth



*Address for correspondence: Dr. Jamie A. Seabrook, Brescia University College at Western University, 1285 Western Road,

London, ON N6G 1H2, Canada. Tel.: +1 519 432 8353/Ext. 28284;
Fax: +1 519 858 5137; E-mail: jseabro2@uwo.ca.





Environmental Research 172 (2019) 18–26

Contents lists available at ScienceDirect



Environmental Research

journal homepage: www.elsevier.com/locate/envres



Geospatial analyses of adverse birth outcomes in Southwestern Ontario: Examining the impact of environmental factors

Jamie A. Seabrook^{a,b,c,d,e,f}, Alexandra Smith^a, Andrew F. Clark^{d,f,g}, Jason A. Gilliland^{b,c,d,e,f,g,h,*}

^aSchool of Food and Nutritional Sciences, Brescia University College, 1285 Western Road, London, Ontario, Canada, N6G 1H2

^bDepartment of Paediatrics, Western University, 800 Commissioners Road East, London, Ontario, Canada, N6A 5W9

^cDepartment of Epidemiology and Biostatistics, Western University, 1151 Richmond Street, London, Ontario, Canada, N6A 5C1

^dChildren's Health Research Institute, 800 Commissioners Road East, London, Ontario, Canada, N6C 2R5

^eLawson Health Research Institute, 750 Baseline Road East, London, Ontario, Canada, N6C 2R5

^fHuman Environments Analysis Laboratory, Western University, 1151 Richmond Street, London, Ontario, Canada, N6A 3K7

^gDepartment of Geography, Western University, 1151 Richmond Street, London, Ontario, Canada, N6A 5C2

^hSchool of Health Studies, Western University, 1151 Richmond Street, London, Ontario, Canada, N6A 3K7

ARTICLE INFO

Keywords:

Premature birth
Infant
Low birth weight
Sulfur dioxide
Air pollution

ABSTRACT

Background: A growing body of research has examined the association between exposure to environmental factors during pregnancy and adverse birth outcomes; however, many studies do not control for potential covariates and findings vary considerably.

Objective: To test the relative influence of environmental factors including exposure to air pollution, major roads, highways, industry, parks, greenspaces, and food retailers on low birth weight (LBW) and preterm birth (PTB) in Southwestern Ontario (SWO), Canada, while accounting for medical (e.g., previous preterm birth, gestational diabetes), behavioral (e.g., alcohol, smoking), demographic (e.g., maternal age, body mass index), and neighborhood-level socioeconomic (e.g., household income, education) factors.

Methods: This retrospective cohort study consisted of a large sample of pregnant women from SWO who gave birth to singleton newborns between February 2009 and February 2014 at London Health Sciences Centre. Data on maternal postal codes were entered into a Geographic Information System to map the distribution of maternal residences and determine selected characteristics of their neighborhood environments (i.e., socioeconomic, built, natural). These variables were developed based on postal codes where the mothers lived prior to giving birth. Logistic regression was used to assess the relative effects of the physical environment, socioeconomic status, clinical history, and behavioral risk factors on mothers having a LBW or PTB infant.

Results: Out of 25,263 live births, 5.7% were LBW and 7.5% were PTB. Exposure to sulfur dioxide was a top predictor of both LBW and PTB. For every one-unit increase in sulfur dioxide, the odds of a LBW and PTB were 3.4 (95% CI: 2.2, 5.2) and 2.0 (95% CI: 1.4, 3.0) times higher, after controlling for other variables in the model, respectively ($p < 0.001$). Previous PTB was also highly associated with both birth outcomes.

Conclusions: Health care providers should be informed about the hazards of air pollution to developing fetuses so that recommendations can be made to their pregnant patients about limiting exposure when air quality is poor.

Table 4

Logistic Regression Assessing the Relative Effects of the Physical Environment, Socioeconomic Status, Clinical History of Medical Problems, and Behavioral Risk Factors on Mothers Having a Low Birth Weight Infant.

	Model 1		Model 2		Model 3		Model 4	
	B	OR	b	OR	b	OR	b	OR
Sulfur dioxide	1.426***	4.162	1.429***	4.174	1.183***	3.266	1.209***	3.351
Ground-level ozone	0.093**	1.097	0.041	1.042	0.028	1.029	0.024	1.024
# of grocery stores within 1600 m	0.017	1.017	0.006	1.006	0.023	1.023	0.029	1.029
# of variety stores within 500 m	0.073*	1.076	0.004	1.045	0.024	1.025	0.036	1.036
% of dwellings in need of major repair	0.008*	1.008	0.000	1.000	0.002	1.002	0.002	1.002
NDVI within 1600 m	-2.057***	0.128	-1.667*	0.189	-1.444	0.236	-1.332	0.264
Underweight pre-pregnancy BMI			0.715***	2.044	0.746***	2.109	0.681***	1.976
Maternal age			-0.004	0.996	-0.019*	0.982	-0.007	0.993
% ≤ high school diploma			0.008	1.008	0.005	1.005	0.003	1.003
Population density			-0.029	0.972	-0.032	0.969	-0.026	0.974
% immigrants			-0.044**	0.957	-0.040*	0.960	-0.040*	0.961
% visible minorities			0.001	1.001	0.003	1.003	0.005	1.005
% aboriginal			0.000	1.000	0.000	1.000	-0.002	0.998
% low income			0.006	1.006	0.005	1.005	0.004	1.004
% lone-parent families			0.001	1.001	-0.001	0.999	-0.002	0.998
Previous preterm birth					1.280***	3.597	1.236***	3.441
Anxiety this pregnancy					0.011	1.011	0.122	1.130
Pre-pregnancy asthma					0.430**	1.537	0.418**	1.519
Pre-existing heart disease					0.216	1.241	0.314	1.369
Pre-existing hepatitis B					1.321**	3.747	1.338*	3.812
Pre-existing lupus					-0.256	0.774	-0.170	0.843
Pre-existing thyroid disease					0.414*	1.513	0.394*	1.482
Depression this pregnancy					0.262	1.299	0.142	1.152
Pre-existing insulin-dependent diabetes					0.042	1.043	-0.151	0.860
Chronic hypertension					0.972***	2.642	1.049***	2.855
Infant gender					-0.142	0.868	-0.172	0.842
Gestational diabetes					0.345	1.412	0.419*	1.521
No antenatal care provider							-0.127	0.881
Marijuana use during pregnancy							0.860***	2.363
Smoked during pregnancy							0.399**	1.490
Alcohol use during pregnancy							-0.561	0.571
Opioid use during pregnancy							0.296	1.344
Narcotic use during pregnancy							0.754	2.126
Herbal medicine use							-0.327	0.721
Intention to breastfeed							-0.141	0.868
Constant	-4.865		-3.597		-3.027		-3.282	
Adjusted R ²	0.016		0.030		0.066		0.078	

* p < 0.05.

** p < 0.01.

*** p < 0.001.

Table 5

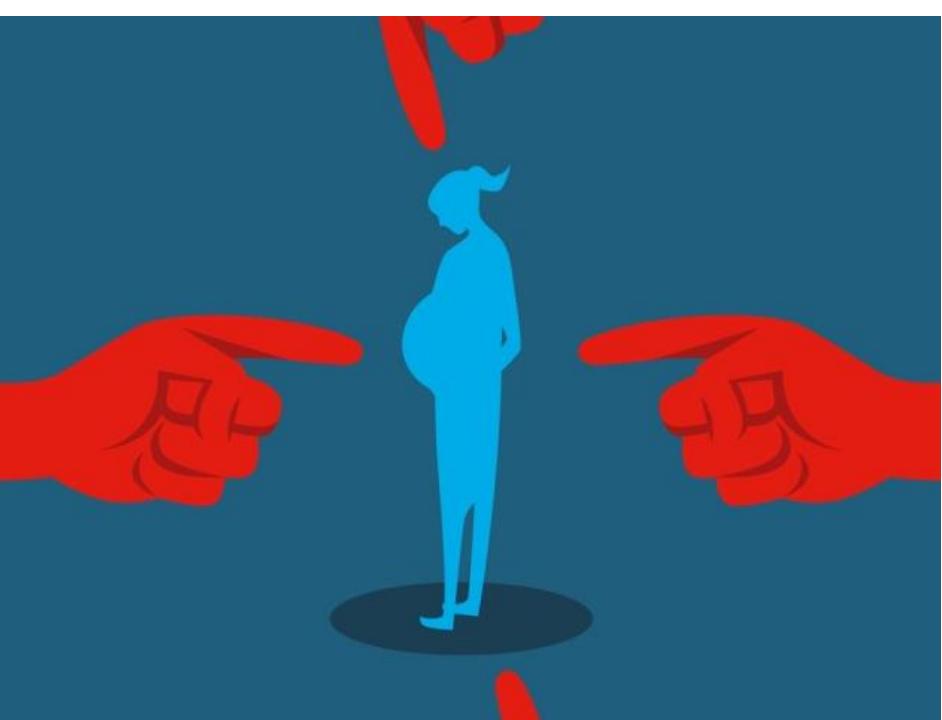
Logistic Regression Assessing the Relative Effects of the Physical Environment, Socioeconomic Status, Clinical History of Medical Problems, and Behavioral Risk Factors on Mothers Having a Preterm Infant.

	Model 1		Model 2		Model 3		Model 4	
	B	OR	b	OR	b	OR	b	OR
Sulfur dioxide	0.791 ***	2.205	0.957 ***	2.604	0.743 ***	2.101	0.712 ***	2.039
Ground-level ozone	0.013	1.013	- 0.066	0.936	- 0.062	0.940	- 0.070	0.932
Major road/highway within 200 m	0.097	1.102	0.092	1.096	0.085	1.089	0.088	1.092
Distance between home and parks	0.002	1.002	0.003	1.003	- 0.008	0.992	- 0.007	0.993
Distance between home and variety	0.013	1.013	0.017	1.017	0.001	1.011	0.011	1.011
Maternal age			0.008	1.008	- 0.006	0.994	- 0.008	0.992
% immigrants (2011)			- 0.043 **	0.958	- 0.034 *	0.966	- 0.036 *	0.965
% visible minorities			- 0.009	0.991	- 0.009 *	0.991	- 0.009 *	0.991
% aboriginal			- 0.002	0.998	0.000	1.000	- 0.001	0.999
% ≤ high school diploma			0.004	1.004	0.000	1.000	0.001	1.001
% low income			0.005	1.005	0.003	1.003	0.003	1.003
% lone-parent families			0.001	1.001	- 0.001	0.999	0.000	1.000
Population density			0.017	1.017	0.006	1.006	0.004	1.004
Underweight pre-pregnancy BMI			0.381 *	1.464	0.435 **	1.545	0.416 **	1.516
Previous preterm birth					1.518 ***	4.565	1.522 ***	4.583
Anxiety this pregnancy					0.322 *	1.380	0.348 *	1.417
Pre-pregnancy asthma					0.292 *	1.339	0.311 *	1.365
Pre-existing thyroid disease					0.516 **	1.676	0.482 **	1.620
Depression this pregnancy					0.198	1.211	0.215	1.240
Gestational diabetes					0.634 ***	1.868	0.561 ***	1.753
Pre-existing insulin dependent diabetes					0.507	1.660	0.508	1.663
Infant gender					0.121	1.128	0.113	1.119
Marijuana use during pregnancy							0.423	1.527
Smoked during pregnancy							- 0.309 *	0.734
Alcohol use during pregnancy							- 0.220	0.803
Opioid use during pregnancy							0.345	1.412
Amphetamine use during pregnancy							0.514	1.672
Constant	- 3.123		- 1.285		- 1.148		- 0.796	
Adjusted R ²	0.008		0.018		0.070		0.073	

* p < 0.05.

** p < 0.01.

*** p < 0.001.



MOTHER-BLAME IN ORIGINS OF CHRONIC DISEASE

- Mothers are causal agents in the reproduction of adult disease
- Casual factors are maternal “choices”
- Mothers are harmers or helpers
- “A frame about behavior that rests solely on the individual and avoids broader context...is generally easier to communicate than one that draws connections to external forces” (Winett et al. 2016, pg. 1372)

QUESTIONS / COMMENTS?



Dr. Jamie Seabrook
jseabro2@uwo.ca



REFERENCES (1)

- Brown QL, Sarvet AL, Shmulewitz D, Martins SS, Wall MM, Hasin DS, et al. Trends in Marijuana Use Among Pregnant and Nonpregnant Reproductive-Aged Women, 2002–2014. *JAMA*. 2017; 317(2):207–9.
- Brown RA, Dakkak H, Gilliland J, Seabrook JA. Predictors of drug use during pregnancy: The relative effects of socioeconomic, demographic, and mental health risk factors. *J Neonatal Perinatal Med*. In press.
- Campbell EE, Gilliland J, Dworatzek PD, De Vrijer B, Penava D, Seabrook JA. Socioeconomic status and adverse birth outcomes: a population-based Canadian sample. *J Biosoc Sci* 2018; 50(1):102-13.
- Chang JC, Holland CL, Tarr JA, Rubio D, Rodriguez KL, Kraemer KL, Day N, Arnold RM. Perinatal illicit drug and marijuana use: an observational study examining prevalence, screening, and disclosure. *Am J Health Promot* 2017; 31(1):35-42.
- Committee on Obstetric Practice. Committee opinion no. 722: marijuana use during pregnancy and lactation. *Obstet Gynecol* 2017;130(4):e205–e209
- Conner SN, Bedell V, Lipsey K, et al. Maternal marijuana use and adverse neonatal outcomes: a systematic review and meta-analysis. *Obstet Gynecol* 2016;128:713–23.
- Gunn JK, Rosales CB, Center KE, Nuñez A, Gibson SJ, Christ C, Ehiri JE. Prenatal exposure to cannabis and maternal and child health outcomes: a systematic review and meta-analysis. *BMJ Open* 2016;6(4):e009986.
- Ko JY, Farr SL, Tong VT, Creanga AA, Callaghan WM. Prevalence and patterns of marijuana use among pregnant and nonpregnant women of reproductive age. *Am J Obstet Gynecol*. 2015; 213(2): 201:e1-201.
- Martin CE, Longinaker N, Mark K, Chisolm MS, Terplan M. Recent trends in treatment admission for marijuana use during pregnancy. *J Addict Med* 2015;9:99–104.

REFERENCES (2)

- Passey ME, Sanson-Fisher RW, D'Este CA, Stirling JM. Tobacco, alcohol and cannabis use during pregnancy: clustering of risks. *Drug Alcohol Depend.* 2014;134:44–50
- Seabrook JA, Smith A, Clark AF, Gilliland JA. Geospatial analyses of adverse birth outcomes in Southwestern Ontario: Examining the impact of environmental factors. *Environmental research.* 2019; 172:18-26.
- Seabrook JA, Woods N, Clark A, De Vrijer B, Penava D, Gilliland J. The association between alcohol outlet accessibility and adverse birth outcomes: A retrospective cohort study. *J Neonatal Perinatal Med* 2018; 11(1):71-7.
- UNICEF Office of Research. Child well-being in rich countries: a comparative overview. *Innocenti report card 11.* Florence, Italy: UNICEF Office of Research; 2013.
- Vermont Department of Health. Marijuana use before, during, and after pregnancy. Available at: http://www.healthvermont.gov/sites/default/files/documents/2017/02/PRAMS_Marijuana_2009_2013_corrected.pdf.
- Volkow ND, Compton WM, Wargo EM. The Risks of Marijuana Use During Pregnancy. *JAMA.* 2016; 317(2):129–30.
- WHO. Social Determinants of Health and Well-being Among Young People. *Health Behaviour in School-Aged Children (HBSC) Study: International Report From the 2009/2010 Survey.* Copenhagen: WHO Regional Office for Europe, 2012.
- Winett LB, Wulf AB, Wallack L. Framing strategies to avoid mother-blame in communicating the origins of chronic disease. *Am J Public Health* 2016;106(8):1369-73.