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Effect of Pre-Pregnancy Maternal Weight and Gestational Weight Gain on Birth Weight

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Disclosures

- None

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Background

Background

- Excess and inadequate body mass index (BMI) and gestational weight gain (GWG) have been associated with increased risk of adverse neonatal outcomes
- High BMI and GWG have been associated with:
  - Large for gestational age infants
  - Preterm birth
  - Stillbirth
- Low BMI and GWG have been associated with:
  - Small for gestational age infants
  - Preterm birth

Background

- In Canada:
  - ~ 50 % pregnant women are overweight/obese and ~ 6% are underweight
  - > 50% pregnant women gain excessive weight and ~ 20% gain inadequate weight
- Dzakpasu et al. 2015 (Canadian Maternal Experiences Survey 2005-2006)
  - Excess GWG contributed more than high BMI to large for GA and preterm birth
  - Inadequate GWG contributed more than smoking to small for GA and preterm birth

Background

- National project with provincial perinatal datasets (BC, ON, NS, NL)
    - Understand the extent of excess and inadequate maternal GWG and BMI in Canada and by region
    - Understand the regional variation in the impact of excess/inadequate GWG and BMI in perinatal indicators

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Objectives

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- Describe the extent of excess and inadequate pre-pregnancy BMI and GWG in BC
- Determine the impact of excess and inadequate pre-pregnancy BMI and GWG on birth weight in BC

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Methodology

Cohort Definition

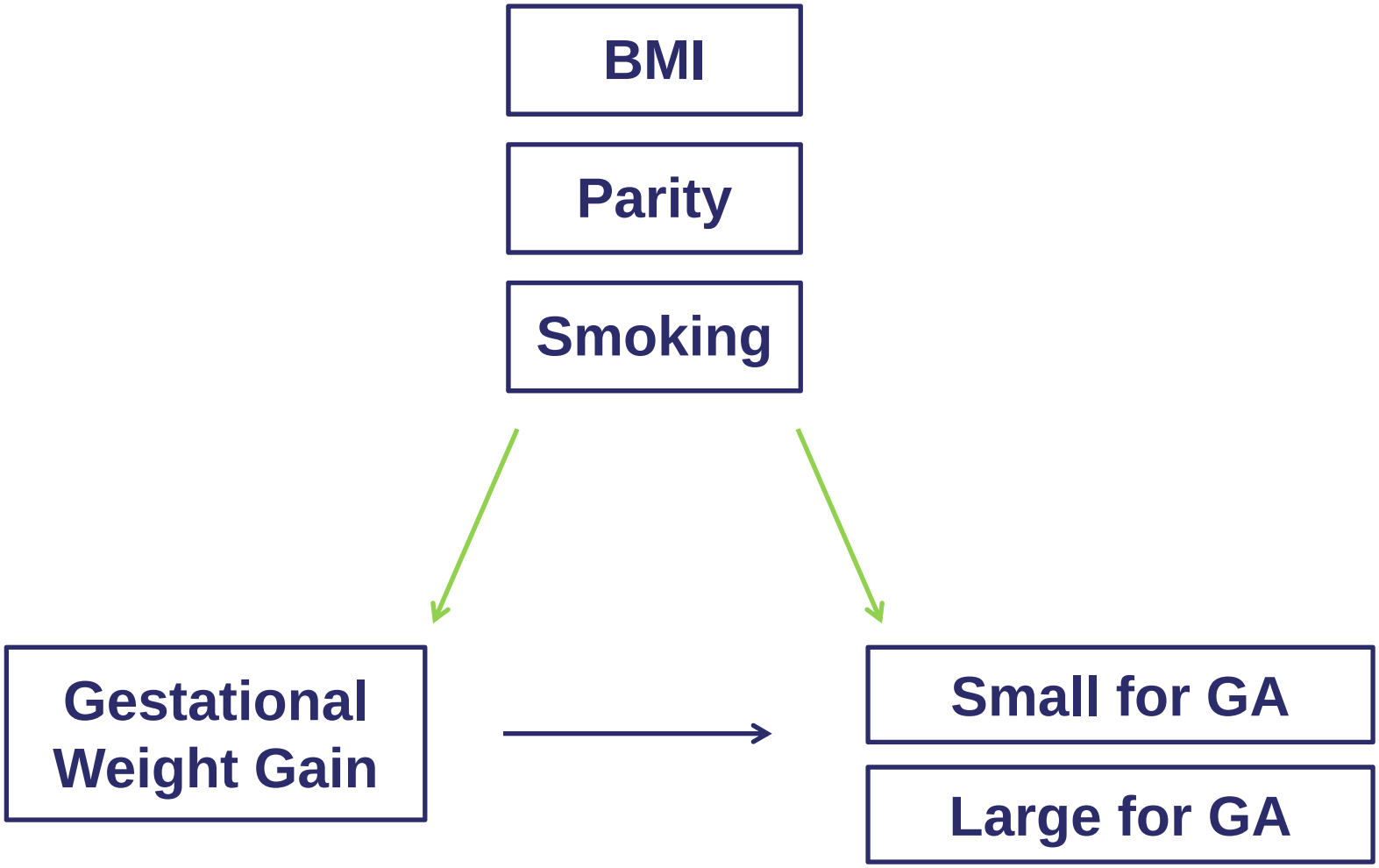
- Inclusions criteria:
  - Deliveries in BC hospitals
  - Between April 1, 2013 and March 31, 2014
  - Live births
  - Singletons
  - Final GA between 22+0 and 42+6 weeks
  - Maternal age >= 19
  - With plausible BMI (15-70 kg/m^2) and GWG (-30 to +50 kg) information
- Exclusion criteria:
  - Late terminations
  - Fetus with major anomalies

Cohort Definition

43,442
deliveries in BC in 2013/14

22,210
deliveries in cohort

Conceptual Model



Definitions

- Small for gestational age (SGA): <10% for GA and sex
- Large for gestational age (LGA): >90% for GA and sex

Definitions

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BMI Category (kg/m^2)	Recommended GWG (kg)
Underweight (< 18.5)	12.5 – 18.0
Normal weight (18.5 - 24.9)	11.5 – 16.0
Overweight (5.0 - 29.9)	7.0 – 11.5
Obese (≥ 30)	5.9 – 9.0

Interactions and Covariates

- Two-way interactions between main confounders and GWG
- Other covariates:
  - Maternal age
  - Gestational diabetes
  - Hypertension during pregnancy
  - Preexisting diabetes
  - Preexisting hypertension
  - Other preexisting major health conditions
  - History of depression
  - History of other mental health conditions
  - Socio-Economic Status (QUAIPPE): 1 (low) to 5 (high)

Analysis

- Correlation among explanatory variables
- For each outcome variable (SGA and LGA)
  - Univariable analysis
  - Multivariable analysis

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Results

Cohort Description

Variable	Category	%
Birth weight	Small for GA	6.6
	Normal for GA	80.0
	Large for GA	13.4

Cohort Description

Variable	Category	%
GWG	Low	20.9
	Recommended	33.7
	High	45.4
BMI	Underweight	6.0
	Normal	58.8
	Overweight	21.1
	Obese	14.1
Parity	Multiparous	50.0
	Nulliparous	50.0
Smoking	No	92.8
	Yes	7.2

Cohort Description

Variable	Category	%
Maternal age	<25	11.8
	25-29	28.1
	30-34	36.8
	35+	23.2
SES	1 (Lowest)	20.6
	2	22.2
	3	21.3
	4	20.5
	5 (Highest)	15.4

Cohort Description

Variable	%
Pre-existing hypertension	0.6
Pre-existing diabetes	0.7
Other pre-existing health issues	1.2
Gestational diabetes	12.4
Gestational hypertension	1.9
History of depression	11.4
History of other mental health issues	7.8

LGA – Adjusted Odds Ratios

Variable	Comparison	OR (95% CI)
GWG	Low vs. Recommended	0.7 (0.7, 0.9)
	High vs. Recommended	1.8 (1.7, 2.0)
BMI	Underweight vs. Normal	0.5 (0.4, 0.6)
	Overweight vs. Normal	1.5 (1.3, 1.6)
	Obese vs. Normal	2.1 (1.9, 2.3)
Parity	Nulliparous vs. Multiparous	0.5 (0.5, 0.6)
Smoking	Yes vs. No	0.8 (0.7, 0.9)
SES	1 vs. 5	0.9 (0.8, 1.0)
	2 vs. 5	0.9 (0.8, 1.0)
	3 vs. 5	1.0 (0.9, 1.2)
	4 vs. 5	1.1 (0.9, 1.2)
Pre-existing DM	Yes vs. No	2.6 (1.8, 3.7)
Gestational DM	Yes vs. No	1.2 (1.1, 1.4)
H. of Depression	Yes vs. No	1.2 (1.1, 1.3)

LGA – Adjusted Probabilities

Variable	Category	Probabilities (95% CI)
GWG	Low	11.3 (9.2, 13.8)
	Recommended	14.6 (12.0, 17.5)
	High	23.8 (20.2, 27.9)
BMI	Underweight	7.7 (5.7, 10.4)
	Normal	14.6 (12.2, 17.4)
	Overweight	20.2 (17.0, 23.8)
	Obese	26.4 (22.5, 30.6)
Parity	Multiparous	20.5 (17.3, 24.2)
	Nulliparous	12.2 (10.1, 14.7)
Smoking	No	17.7 (14.9, 20.8)
	Yes	14.3 (11.6, 17.7)

SGA – Adjusted Odds Ratios

BMI	GWG	OR (95% CI)
	Low vs. Recommended	1.3 (1.1, 1.6)
	High vs. Recommended	0.5 (0.4, 0.6)
Underweight vs. Normal		1.5 (1.2, 1.8)
Overweight vs. Normal		0.9 (0.8, 1.1)
Obese vs. Normal		0.6 (0.5, 0.7)
Underweight	Low vs. Recommended	1.7 (1.2, 2.5)
Underweight	High vs. Recommended	0.4 (0.3, 0.7)
Normal	Low vs. Recommended	1.4 (1.2, 1.7)
Normal	High vs. Recommended	0.5 (0.4, 0.6)
Overweight	Low vs. Recommended	1.5 (1.1, 2.3)
Overweight	High vs. Recommended	0.5 (0.4, 0.7)
Obese	Low vs. Recommended	0.7 (0.4, 1.3)
Obese	High vs. Recommended	0.7 (0.5, 1.0)

SGA – Adjusted Probabilities

BMI	GWG	Probabilities (95% CI)
Underweight	Low	27.6 (21.8, 34.3)
	Recommended	18.1 (14.0, 23.2)
	High	8.9 (5.7, 13.7)
Normal	Low	17.6 (14.8, 20.8)
	Recommended	12.9 (10.8, 15.3)
	High	7.2 (5.9, 8.8)
Overweight	Low	17.1 (12.8, 22.4)
	Recommended	11.8 (9.1, 15.1)
	High	6.2 (4.9, 7.8)
Obese	Low	7.0 (4.5, 10.7)
	Recommended	9.2 (6.5, 12.8)
	High	6.5 (5.1, 8.4)

SGA – Adjusted Odds Ratios

Variable	Comparison	OR (95% CI)
Parity	Nulliparous vs. Multiparous	2.1 (1.9, 2.4)
Smoking	Yes vs. No	1.7 (1.4, 2.1)
SES	1 vs. 5	1.3 (1.1, 1.6)
	2 vs. 5	1.1 (0.9, 1.3)
	3 vs. 5	1.1 (0.9, 1.3)
	4 vs. 5	1.0 (0.8, 1.2)
Gestational hypertension	Yes vs. No	3.0 (2.3, 4.0)
History of depression	Yes vs. No	0.8 (0.6, 0.9)

SGA – Adjusted Probabilities

Variable	Comparison	Probabilities (95% CI)
Parity	Multiparous	8.1 (6.8, 9.7)
	Nulliparous	15.7 (13.4, 18.3)
Smoking	No	8.9 (7.6, 10.3)
	Yes	14.5 (11.9, 17.6)

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Conclusions and Next Steps

Conclusions

- After controlling for other factors such as parity and smoking, GWG and BMI affect birth weight
- The occurrence of LGA and SGA could be reduced if women began their pregnancies with normal BMI and GWG was within the recommended range

Next Steps

- Calculate Population Attributable Fractions to quantify the contribution of each risk factor to SGA and LGA
- Knowing the impact of each risk factor in the BC/Canadian population will help in the development of appropriate preventive interventions

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Questions?