Gestational Weight Gain

Description

Percentage of women with gestational weight gain (GWG) within, greater than, or less than recommended.

Specific Indicators

- Percentage of pregnant women with gestational weight gain within the recommended range
- Percentage of women who gained more weight than recommended during pregnancy
- Percentage of women who gained less weight than recommended during pregnancy

Ontario Public Health Standards (OPHS)

The Ontario Public Health Standards (OPHS) establish requirements for the fundamental public health programs and services carried out by boards of health, which include assessment and surveillance, health promotion and policy development, disease and injury prevention, and health protection. The OPHS consist of one Foundational Standard and 13 Program Standards that articulate broad societal goals that result from the activities undertaken by boards of health and many others, including community partners, non-governmental organizations, and governmental bodies. These results have been expressed in terms of two levels of outcomes: societal outcomes and board of health outcomes. Societal outcomes entail changes in health status, organizations, systems, norms, policies, environments, and practices and result from the work of many sectors of society, including boards of health, for the improvement of the overall health of the population. Board of health outcomes are the results of endeavours by boards of health and often focus on changes in awareness, knowledge, attitudes, skills, practices, environments, and policies. Boards of health are accountable for these outcomes. The standards also outline the requirements that boards of health must implement to achieve the stated results.

Outcomes Related to this Indicator

- Board of Health Outcome (Reproductive Health): The board of health is aware of and uses epidemiology to influence the development of healthy public policy and its programs and services for the promotion of reproductive health.
- Board of Health Outcome (Foundational Standard): The public, community partners, and health care providers are aware of relevant and current population health information.

http://www.ontario.ca/publichealthstandards

Assessment and Surveillance Requirements Related to this Indicator (Reproductive Health)

- The board of health shall conduct epidemiological analysis of surveillance data, including monitoring of trends over time, emerging trends, and priority populations, in accordance with the *Population Health Assessment and Surveillance Protocol, 2008* (or as current) in the areas of: Healthy pregnancies.

Corresponding Health Indicators from Statistics Canada and CIHI

- None

Corresponding Indicator(s) from Other Sources

- Maternity Experiences Survey (MES), 2006-2007: Percentage of women who gained less than, within, and more than Health Canada's gestational weight gain guidelines by pre-pregnancy BMI. The MES was a self-reported telephone survey asking about height and weight pre-pregnancy, and total weight gain in pregnancy. Height and weight were used to calculate BMI. The MES used the 1990 Institute of Medicine (IOM) ranges for gestational weight gain.

Data Sources

Numerator & Denominator: **BORN Information System (BIS)**
Original Source: Better Outcomes Registry Network (BORN) Ontario
Distributed by: Better Outcomes Registry Network (BORN) Ontario
Suggested citation (see Data Citation Notes): BORN Information System [years], Date Extracted: [date].

Alternative Data Sources

- None

Data Elements in the BORN Information System (BIS)

Name	BORN ID	Description	Categories	Encounter
Pre-pregnancy maternal weight	M0018	The mother's self-reported weight closest to conception and no later than 12 weeks of gestation (metric or imperial units with conversion done by BORN Ontario).	Numeric (kg)	Labour, Birth (Mother), Antenatal General, Antenatal Specialty
Maternal height	M0017	Maternal height, measured in imperial or metric units. Reported in metric units.	Numeric (cm)	Labour, Birth (Mother), Antenatal General, Antenatal Specialty
Maternal BMI (calculated)	M0019	Maternal pre-pregnancy Body Mass Index (BMI) defined as weight in kilograms divided by the square of the height in metres (kg/m2).	Numeric (kg/m^2)	Labour, Birth (Mother), Antenatal General, Antenatal Specialty
Maternal weight at the end of pregnancy	M0202	Maternal self-reported weight closest to the end of pregnancy.	Numeric (kg)	Birth (Mother)
Number of fetuses	FAN0007	Number of fetuses	1-8, unknown	All encounters
Maternal weight gain in pregnancy (calculated)	M0203	Calculated field of weight gain in pregnancy.	Numeric (kg)	Labour, Birth (Mother)

Data Elements in the Public Health Cube

Dimension	Categories
Maternal Weight Gain Recommended Group	Below, Within, Above, Missing data
Number of Fetuses	Singleton, Twins, Triplets, Quadruplets, Quintuplets, Sextuplets, Missing data
Maternal BMI Group 01 Lev 1	Underweight (<18.5), Normal (18.5 – 24.9), Overweight (25.0-25.9), Obese class I (30.0-34.9), Obese class II (35.0-39.9), Obese class III (<40.0), Missing data
Newborn DOB Calendar Year	2012 - Present

Analysis Check List

- BORN data are available to PHUs by custom request and through the BORN Ontario reporting environment as Public Health Standard Reports and the Public Health Cube. All users are required to sign a data sharing agreement and adhere to strict privacy and security measures.
- Refer to the **BORN Information System (BIS)** resource for more information about the data and the **BORN Data Dictionary** for a list and description of data elements captured in the BIS.
- For key information used by the Reproductive Health Sub-Group (RHSG) in their revision of the reproductive health core indicators and accompanying resources, refer to the **Reproductive Health Core Indicators Documentation Report**.
- Niday Perinatal Data (i.e., data prior to April 1, 2012) is available from BORN upon request; however, the gestational weight gain variable was not part of Niday and did not became part of the BIS until April 2012.
- The BORN licensing agreement with health units does not require suppression of small cells; however, BORN recommends the suppression of cells less than 6, although zero counts may be presented. This practice decreases the risk of re-identifying individuals. In general, caution should be used when reporting data at a level that could identify individuals (e.g., reporting at the dissemination area by maternal age).
- Aggregation (combining years, age groups, geographic levels, categories or picklist items) should be considered for small numbers.
- In general, analyze by mother's geography of residence, not place of birth. The standard reports and cube are tabulated by maternal residence. Ontario births include only Ontario residents and exclude births to mothers that reside out-of-province.
- Data available represents all data that has been entered, submitted and acknowledged into the BIS as of the time of extraction and as such, the numbers are subject to change. The BIS is a live database. For any analysis of the BIS, ensure that all or a majority of hospitals in your area have acknowledged their data.
- Caution should be taken when interpreting data if the proportion of "missing data" is greater than 5%. BORN Ontario recommends not reporting data if the missing is 30% or more. See more information in the Indicator Notes below.
- Although the BIS was launched in January 2012, data may not be complete for some elements and geographical areas in that first year. It is recommended that analysis begin for calendar year 2013. This is particularly true for GWG because the maternal height and weight elements did not became part of the BIS until April 2012.

- As part of the GWG calculation, the following groups should be excluded from both numerator and denominator (recommended filters are specified in the instructions below): all pregnancies with a maternal pre-pregnancy BMI >34.9, and pregnancies with three or more fetuses. As per 2009 guidelines from the Institute of Medicine (IOM) (1) and the Society of Obstetricians and Gynaecologists (SOGC) (2), there is insufficient information to develop guidelines for these groups. However, these exclusions have not been made in the "Maternal Weight Gain Recommended" dimension that has been calculated in the Public Health Cube and must be made through the analysis.
- Maternal Recommended Weight Gain is not calculated for multiple birth pregnancies among mothers with pre-pregnancy BMI <18.5. These have been coded in the Public Health Cube as missing. Ideally these would be excluded; however, it is not possible to do this type of double-barreled filter in the cube. The number of these pregnancies would be small.
- If using the Public Health Reports:
  - Currently the GWG indicator is not in Public Health Reports. A request has been made to BORN Ontario to add this indicator.
- If using the Public Health Cube:
  - Select Dimension: "Maternal Weight Gain Recommended Group" (found under Dimensions > Pregnancy > Maternal Characteristics)
  - Select Measure: "# of Pregnancies – Women Who Gave Birth" (found under Measures > Pregnancy)
  - Specify Filters by right clicking on each of the following dimensions and selecting the following categories:
    - "Num of Fetuses" (found under Pregnancy > Pregnancy History) = "Singleton" AND "Twins" AND "Missing data".
    - "Maternal BMI Group 01 Lev 1" (found under Pregnancy > Maternal Characteristics) = Underweight (<18.5) AND Normal (18.5 – 24.9) AND Overweight (25.0-25.9) AND Obese class I (30.0-34.9) AND Missing data.
    - Newborn DOB Calendar Year (found under Newborn DOB > Newborn DOB Calendar) = Deselect 2012 (and others as appropriate to your analysis).
  - Calculate percentages within the Cube or export to Excel.

Method of Calculation

- The number of pregnant females who gained weight within gestational weight gain recommendations as a percentage of the total number of pregnant females in a given place and time
- The number of pregnant females who gained more weight than recommended during gestation as a percentage of the total number of pregnant females in a given place and time
- The number of pregnant females who gained less weight than recommended during gestation as a percentage of the total number of pregnant females in a given place and time

Proportion of pregnant females who gained weight within GWG recommendations

$$\frac{\text{Number of pregnant females who gained weight within GWG recommendations}}{\text{Total number of pregnant females}} \times 100$$

For singleton pregnancies, women with pre-pregnancy
BMI < 18.5 (underweight) gained 12.5-18.0 kg or 28-40 lbs;
BMI 18.5-24.9 (normal weight) gained 11.5-16.0 kg or 25-35 lbs;
BMI 25.0-29.9 (overweight) gained 7.0-11.5 kg or 15-25 lbs; and
BMI 30-34.9 (obese) gained 5.0-9.0 kg or 11-20 lbs.

For twin pregnancies, women with pre-pregnancy
BMI 18.5-24.9 (normal weight) gained 17-25 kg or 37-54 lbs;
BMI 25.0-29.9 (overweight) gained 14-23 kg or 31-50 lbs; and
BMI 30-34.9 (obese) gained 11-19 kg or 25-42 lbs.
(exclude pregnancies with a maternal pre-pregnancy BMI >34.9 and pregnancies with three or more fetuses; multiple birth pregnancies among mothers with pre-pregnancy BMI <18.5 are excluded as part of non-response)

Proportion of pregnant females who gained more weight than GWG recommendations

$$\frac{\text{Number of pregnant females who gained more than GWG recommendations}}{\text{Total number of pregnant females}} \times 100$$

For singleton pregnancies, women with pre-pregnancy
BMI < 18.5 (underweight) gained more than 18 kg or 40 lbs;
BMI 18.5-24.9 (normal weight) gained more than 16 kg or 35 lbs;
BMI 25.0-29.9 (overweight) gained more than 11.5 kg or 25 lbs; and
BMI 30-34.9 (obese) gained more than 9.0 kg or 20 lbs.

For twin pregnancies, women with pre-pregnancy
BMI 18.5-24.9 (normal weight) gained more than 25 kg or 54 lbs;
BMI 25.0-29.9 (overweight) gained more than 23 kg or 50 lbs; and
BMI 30-34.9 (obese) gained more than 19 kg or 42 lbs.

(exclude pregnancies with a maternal pre-pregnancy BMI >34.9 and pregnancies with three or more fetuses; multiple birth pregnancies among mothers with pre-pregnancy BMI <18.5 are excluded as part of non-response)

Proportion of pregnant females who gained less weight than GWG recommendations

$$\frac{\text{Number of pregnant females who gained less than GWG recommendations}}{\text{Total number of pregnant females}} \times 100$$

For singleton pregnancies, women with pre-pregnancy
BMI < 18.5 (underweight) gained less than 12.5 kg or 28 lbs;
BMI 18.5-24.9 (normal weight) gained less than 11.5 kg or 25 lbs;
BMI 25.0-29.9 (overweight) gained less than 7.0 kg or 15 lbs; and
BMI 30-34.9 (obese) gained less than 5.0 kg or 11 lbs.

For twin pregnancies, women with pre-pregnancy
BMI 18.5-24.9 (normal weight) gained less than 17 kg or 37 lbs;
BMI 25.0-29.9 (overweight) gained less than 14 kg or 31 lbs; and
BMI 30-34.9 (obese) gained less than 11 kg or 25 lbs.

(exclude pregnancies with a maternal pre-pregnancy BMI >34.9 and pregnancies with three or more fetuses; multiple birth pregnancies among mothers with pre-pregnancy BMI <18.5 are excluded as part of non-response)

Basic Categories

- Geographic areas of maternal residence: Ontario, public health unit

Indicator Comments

- The Public Health Cube documentation indicates that the BIS uses the 2011 SOGC guidelines (2) for singleton pregnancies to calculate recommended weight gain for non-obese pre-pregnancy BMIs and 2009 IOM guidelines (1) for all other pregnancies (obese and multiple gestation). However, since the SOGC and IOM guidelines are the same for singleton non-obese pregnancies, the BIS essentially uses the IOM guidelines for all categories of gestational weight gain. BORN generally prefers to indicate the Canadian standards to which they are aligned first and foremost, which would be the SOGC guidelines.
- The IOM updated their GWG guidelines in 2009 to consider the health of both infants and mothers, the trends towards increasing twin and triplet pregnancies, and the higher rates of obesity in the population. The increasing percentage of women who are entering pregnancy overweight or obese and who are gaining too much weight during pregnancy increases the risk of chronic disease and puts the mother and baby's health at risk. As a result, pre-pregnancy Body Mass Index and twin pregnancies were incorporated into the updated guidelines. There are no recommendations for triplet and other higher order pregnancies (1).
- Health Canada (3), the Public Health Agency of Canada (4), and Eat Right Ontario (5) have adopted the 2009 IOM recommendations. See Table 1 and Table 2 for specific GWG recommendations.

Table 1: Health Canada/IOM gestational weight gain (GWG) recommendations for singleton pregnancies (1,3)

Pre-pregnancy BMI category	Mean rate of weight gain in the 2nd and 3rd trimester		Recommended range of total weight gain*	
	kg/week	lb/week	kg	lbs
BMI < 18.5: Underweight	0.5	1.0	12.5 - 18.0	28 - 40
BMI 18.5 - 24.9: Normal weight	0.4	1.0	11.5 - 16.0	25 - 35
BMI 25.0 - 29.9: Overweight	0.3	0.6	7.0 - 11.5	15 - 25
BMI ≥ 30: Obese**	0.2	0.5	5.0 - 9.0	11 - 20

* Calculations assume a total of 0.5-2.0 kg (1.2-4.4 lbs) weight gain in the first trimester
** Health Canada advises that the obesity category is for those with a BMI 30.0-34.9. There is no evidence to suggest an appropriate weight gain range if maternal BMI is 35.0 or greater, in which case specific weight gain advice from a health care provider is required.

Table 2: Health Canada/IOM gestational weight gain (GWG) recommendations for twin pregnancies (1,3)

Pre-pregnancy BMI category	Recommended range of total weight gain	
	kg	lbs
BMI < 18.5: Underweight	*	*
BMI 18.5 - 24.9: Normal weight	17-25	37-54
BMI 25.0 - 29.9: Overweight	14-23	31-50
BMI ≥ 30: Obese**	11-19	25-42

* Based on an IOM review of evidence, there is insufficient information available to develop guidelines for underweight women carrying twins.
** Health Canada advises that the obesity category is for those with a BMI 30.0-34.9. There is no evidence to suggest an appropriate weight gain range if maternal BMI is 35.0 or greater, in which case specific weight gain advice from a health care provider is required.

- GWG recommendations from the SOGC (2) are slightly different from the 2009 IOM (1) and Health Canada (3) guidelines. The SOGC guidelines differ when maternal BMI is more than 30 (at least 7 kg versus a range of 5.0-9.0 kg) and for twin pregnancies where the SOGC recommendation is a weight gain of 16.0-20.5 kg with no breakdown by pre-pregnancy BMI.

  SOGC GWG Guidelines:
  BMI before pregnancy Recommended weight gain
  Less than 18.5……12.5 to 18.0 kg (28 to 40 lb)
  Between 18.5 and 24.9…….11.5 to 16.0 kg (25 to 35 lb)
  Between 25 and 29.9…….7.0 to 11.5 kg (15 to 25 lb)
  More than 30……At least 7 kg (15 lb)
  Twin pregnancies……..16.0 to 20.5 kg (35 to 45 lb)

- Ideally, women should be within a healthy BMI range before they conceive, which indicates that a preconception health focus is ultimately required to improve maternal and child health outcomes (6).
- While it generally is not recommended to use adult BMI cut-offs for those under 18, the IOM (2009) recommends use of adult BMI for those under 18 years of age for GWG recommendations. A higher percentage of younger adolescents will likely be categorized in the underweight BMI category and will therefore be advised to gain more weight during pregnancy (1).
- The recommended weight gain ranges for short women and for racial or ethnic groups are the same as those for the whole population (1).
- Exceeding GWG recommendations is associated with increased risk of caesarean section (7), increased risk of maternal postpartum weight retention up to three years post index pregnancy (7,8,9), increased risk of large-for-gestational age babies (7), and increased risk of children being overweight or obese later in life (10,11,12).
- Gaining insufficient weight during pregnancy and not meeting the GWG recommendation is associated with preterm birth and increased risk of small-for-gestational age babies (7).
- Various factors may affect GWG including pre-pregnancy weight, age, parity, education, and income (13).
- The 2008 Canadian Perinatal Health Report listed shoulder dystocia, brachial plexus injury, and Erb's palsy as possible adverse outcomes for infants being born large-for-gestational age (LGA) along with increased risk of postpartum hemorrhage as a maternal complication (14). Those babies born with a high birth weight may be at increased risk of type 2 diabetes mellitus later in life (14). Other reported outcomes include increased risk of caesarean delivery, maternal death and fistulae (1). More recent publications list the following as adverse health outcomes associated with LGA: perinatal tear, post-partum hemorrhage, shoulder dystocia, hypoglycemia (15), hypertension (16), and overweight/obesity (17,18).
- Reported adverse birth outcomes associated with small-for-gestational age (SGA) babies include higher risks of infant mortality, cerebral palsy, hypoglycemia, hypocalcemia, polycythemia and birth asphyxia. Longer term outcomes include increased risk of central adiposity, insulin resistance, metabolic syndrome, type 2 diabetes, hypertension, and coronary heart disease. Being born small plus a rapid weight gain in the first year of life increases the risk of these outcomes (1).
- Various limitations exist in determining height, weight, and gestational weight gain. A Canadian study found that females tend to over-report their height by 0.5 cm on average and under-report their weight by an average of 2.5 kg. When based on measured rather than on self-reported values, the prevalence of obesity was 6 points higher among females compared to males (19).

- Misreporting of weight and height leads to measurement error in the BMI calculation, which then leads to misclassification into BMI categories and gestational weight gain categories. One study found that associations between self-reported pre-pregnancy BMI and adverse birth outcomes may be slightly overestimated due to misclassification; however, the conclusion that complications increased with higher BMI remained (20). Misreporting of weight varies by BMI category and ethnicity (21). Pregnant women are more likely to under-report their weight compared to non-pregnant women (22).
- It has been reported that despite the limitations of self-reported weight and height, there likely will be no difference in whether women are categorized as being below, within, or above their gestational weight gain range (23,24), suggesting that self-reported height and weight measures are sufficiently valid for this use.
- Using measures of gestational weight gain and not controlling for gestational age at delivery may obscure the true contribution of gestational weight gain to maternal and perinatal health outcomes (25). A recent re-analysis of the Maternity Experiences Survey examining the association between pre-pregnancy BMI, GWG and caesarian sections excluded preterm births (<37 weeks gestation) (26).
- However, analysis by the Reproductive Health Sub-Group found there was no difference in GWG for preterm versus full-term pregnancies. As a result, it is not necessary to report GWG rates separately for these populations unless it is of specific interest in your analyses.
- It is currently unknown whether the current Health Canada GWG guidelines apply to pregnant women with pre-existing diabetes or for women with gestational diabetes. Best available evidence suggests that women with diabetes who exceed their GWG guideline experience similar adverse pregnancy and birth outcomes as their non-diabetic counterparts (27-31). Therefore, there is not enough evidence to justify the exclusion of this group from analysis at this time.
- Analysis by the Reproductive Health Sub-Group found there was no difference in GWG rates for women with diabetes versus women without diabetes. As a result, it is not necessary to report GWG rates separately for these populations unless it is of specific interest in your analyses.
- Height and weight in the BIS are collected from the Ontario Antenatal Record (OAR) form that is sent by a woman's health care provider to the hospital where they intend to give birth. In situations where the form is not present at the hospital when and where the woman gives birth, height and weight will be unknown.
- There is a relatively high degree of missing data for the GWG indicator, but it does vary by hospital and therefore by PHU. The total missing for Ontario in the first 3 years of available BIS data shows a decrease in the proportion of records with missing values (40% in 2012; 35% in 2013 and 26% in 2014). Overall, the total missing varied across health units, ranging for 6% to 48% (32). It's important to understand the missing data in this indicator for your health unit prior to reporting on it.

Cross-References to Other Indicators

- Birth Weights
- Maternal Obesity (new)
- Adult Body Mass Index

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Changes Made

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