

Nutrition Guideline

Pregnancy: Multiples

For Professional Reference Only

Applicable to: Nurses, Physicians and Other Health Professionals

The following recommendations address gestational weight gain, protein and energy requirements, and vitamin and mineral requirements for women pregnant with multiples. The current evidence is strongest for twins. The evidence specific to triplets and higher order multiples is limited but can be extrapolated from evidence for twins using professional judgment.

Recommendations:

- Women pregnant with multiples can be guided to follow general nutrition guidelines for women pregnant with singletons, including:
 - Eating a variety of foods and following *Eating Well with Canada's Food Guide* recommendations for women pregnant with singletons.
 - Choosing a daily multivitamin and mineral supplement that contains folic acid, iron, vitamin D, and vitamin B12.
 - Eating every 2 – 4 hours while awake.
 - Following safe food handling practices and avoiding foods that increase chances of getting a food-borne illness during pregnancy.
 - Limiting caffeine intake to 300 mg per day or less.
 - Drinking 10 cups (2.5 L) of fluid per day.

Detailed information for health professionals about these general nutrition guidelines for pregnancy can be found in the *Nutrition Guideline: Pregnancy*.

General nutrition information for pregnancy for the public can be found in Healthy Parents, Healthy Children: <http://www.healthyparentshealthychildren.ca>

- Refer women pregnant with multiples (twins, triplets, and higher order multiples) to a Registered Dietitian (RD) in the first trimester of pregnancy or as early as possible. Frequent follow ups with an RD are important to monitor gestational weight gain, energy (calorie), macronutrient (protein, carbohydrate, fat), and micronutrient (vitamin, mineral) intake. Referral processes will vary based on zone and site policy.
- Weight gain recommendations for women pregnant with multiples include:
 - Advise women to gain weight at the appropriate rate according to their pre-pregnancy body mass index (BMI). Provisional total weight gain recommendations are available for both twin and triplet pregnancies.
 - Advise women that early weight gain is important. Weight gain ideally starts in the first trimester of pregnancy, instead of the second trimester for women pregnant with singletons.
 - Advise women that increased caloric intake is recommended starting in the first trimester in order to achieve the desired weight gain. Adequate weight gain is the best guideline of sufficient energy intake. A range of approximately 3000 – 4000 calories per days is likely required.

- Track a woman's weight gain throughout the pregnancy to identify problematic patterns of weight gain as early as possible. A single measure is not enough to determine whether weight gain and caloric intake is on track.
 - Women with lower pre-pregnancy BMIs can be advised to consume calories at the upper end of the range.
 - Women with higher pre-pregnancy BMIs can be advised to consume calories at the lower end of the range.
- Nutrition guidelines specific to women pregnant with multiples include:
 - Emphasize high calorie and high protein food group choices within *Eating Well with Canada's Food Guide* to meet the greater energy requirements for women pregnant with multiples. The number of servings needed may exceed the recommended 2 to 3 extra Canada Food Guide servings for singleton pregnancies.
 - Recommend women choose foods that are rich in calcium and vitamin D. Additional servings of foods from the Milk and Alternatives food group will assist in achieving recommended calcium and vitamin D intakes.
 - Educate women that a pattern of eating three meals and three snacks a day will help in achieving an adequate intake of calories and nutrients.
 - Recommend a protein-rich food with every meal and snack and higher calorie food group choices (e.g. 2% milk versus skim milk).
 - Recommend that women take only one multivitamin supplement dose per day in addition to a healthy diet.
 - Assist women in choosing a multivitamin supplement that has:
 - 1 mg (1000 mcg) folic acid
 - at least 27 mg iron
 - 2.6 mcg vitamin B12
 - at least 400 international units (IU) vitamin D
 - A need for additional calcium, vitamin D, and/or omega-3 fatty acid (DHA/EPA) supplementation to be established through RD assessment.

Definitions

Preterm birth: birth of an infant at <37 weeks' 0 days' gestation.

Low birth weight: birth weight <2500 g, regardless of gestational age.

Very-low birth weight: birth weight <1500 g, regardless of gestational age.

Intrauterine growth restriction: a fetus with an estimated fetal weight <10th percentile on ultrasound, that, because of a pathological process, has not attained its biologically determined growth potential; also called small for gestational age.

Multivitamin supplement: terminology used to describe a supplement containing multiple vitamins and minerals. The terminology *prenatal multivitamin supplement* is not used due to the wide variation in supplements available for pregnant women.

Nutrient dense: relatively rich in nutrients for the number of calories the food contains.

Health Benefits

Pregnancy is a critical period in a woman's life that can influence the short and long-term health of both mother and infant. Maternal nutrition has a significant effect on infant health outcomes. Healthy pre-pregnancy weight and appropriate weight gain during pregnancy are linked with optimal maternal and infant outcomes. The amount of weight gained during pregnancy can affect the immediate and future health of a woman and her infant.¹ Women pregnant with multiples have the best maternal and infant outcomes if they start weight gain early (in the first trimester of pregnancy) and continue a pattern of optimal weight gain for the number of fetuses in the pregnancy (twins, triplets, higher order multiples).²⁻⁶ Specific health outcomes associated with optimal nutrition and weight gain for women pregnant with multiples include a lower proportion of low birth weight infants and reduction in preeclampsia.⁷ Although not well evaluated in women pregnant with multiples, excessive maternal weight gain may be associated with increased risk of gestational hypertension and cesarean delivery.²

Key Questions

What is the recommended total weight gain for women pregnant with multiples?

Women pregnant with multiples are at increased risk of preterm delivery, having low birth weight infants, and intrauterine growth restriction.^{2,8} Appropriate weight gain based on pre-pregnant BMI is associated with a reduction in spontaneous preterm delivery.⁹ The U.S. Institute of Medicine (IOM) has developed provisional guidelines for cumulative weight gain for women pregnant with twins based on pre-pregnancy BMI (Table 1).

Table 1. Provisional Guidelines for Cumulative Weight Gain for Women Pregnant with Twins

Pre-pregnancy BMI	Recommended Total Weight Gain	
	Kg	lb
BMI <18.5 Underweight	Insufficient information to determine	
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

Source: Adapted from: Institute of Medicine (IOM). Weight gain during pregnancy: reexamining the guidelines. Washington, DC: The National Academies Press; 2009. Available from: http://www.nap.edu/catalog.php?record_id=12584

What is the recommended pattern of weight gain for women pregnant with multiples?

The pattern of weight gain, including both rate and timing of weight gain, is important for optimal fetal growth in women pregnant with multiples.^{2,10} It is recommended to maximize weight gain early on in pregnancy and for gestational weight gain to proceed at a faster rate than for women pregnant with singletons.^{11,12} Specifically, weight gain from conception to 20 weeks and from 20 – 28 weeks (mid-gestation) have the strongest association with optimal twin birth weights and lowest risk of preterm birth.^{2-4,6,13}

Table 2 outlines the average rates of weight gain per week that support the best maternal and infant outcomes for women pregnant with twins.

Although there was insufficient data for the IOM to develop provisional recommendations for women pregnant with triplets, observational data suggests that a minimum weight gain of 16.3 kg/36 lbs by approximately 26 weeks' gestation and a cumulative total weight gain of at least 23 kg/50 lbs is recommended.¹⁴ The limited literature available also suggests the importance of early weight gain (minimum of 16.3 kg/36 lbs by 26 weeks) and at least 22 kg/48lbs by 33 weeks.^{6,13,15}

Few women pregnant with triplets (and higher order multiples) will reach term gestation. Average gestational age at time of delivery for triplets is 32 weeks.¹⁶ Higher early weight gains for women pregnant with multiples are thought to be beneficial for supporting placental structure and function and subsequent fetal growth as the placenta ages more quickly in women pregnant with multiples, shortening the gestational period for transferring nutrients to the developing fetuses.¹³ Attention to an appropriate weight gain pattern through frequent assessment is therefore recommended.

Table 2. Rates of average maternal weight gain/week and average cumulative weight gain for women pregnant with twins*

Pre-Pregnancy BMI	Rates of weight gain/wk			Cumulative weight gain		
	2 – 13 wks	14 – 26 wks	27 wks – delivery	By 13 wks	By 26 wks	37 – 42 wks
BMI 18.5-24.9 Normal Weight	≤0.5 kg	0.6 – 0.9 kg	0.5 – 0.8 kg	1.4 – 5.4 kg	10.0 – 16.4 kg	16.8 – 24.5 kg
BMI 25-29.9 Overweight	≤0.4 kg	0.6 – 0.9 kg	0.4 – 0.8 kg	0.3 – 4.3 kg	7.7 – 14.1 kg	14.1 – 22.7 kg
BMI ≥ 30 Obese	<0.3 kg	0.2 – 0.6 kg	0.3 – 0.7 kg	0.9 – 3.8 kg	4.9 – 11.4 kg	11.4 – 19.1 kg

*Insufficient evidence related to rate of weight gain for pre pregnant BMI < 18.5 kg

Source: 1. TABLE C-3D Interquartile Ranges of Cumulative Gain by Trimesters, by Pregravid BMI Status for Mothers of Twins at Gestational Ages 37–42 Weeks, and with Average Twin Birth weight > 2500 g.¹⁷

2. TABLE C-3C Interquartile Ranges of Rates of Maternal Weight Gain by Trimesters, by Pregravid BMI Status for Mothers of Twins at Gestational Ages 37–42 Weeks, and with Average Twin Birth weight > 2500 g.¹⁷

What are common barriers to achieving adequate weight gain when pregnant with multiples?

Women pregnant with multiples may be more likely to experience nausea, vomiting, and/or heartburn compared to women pregnant with singletons.^{18,19} These symptoms can make it challenging to eat enough to support healthy rate and total weight gain. Early satiety may also reduce the amount that women are able to eat, which may negatively affect adequate gestational weight gain.²⁰ Women experiencing nausea, vomiting, and heartburn, and/or early satiety can be offered basic nutrition advice to manage these conditions (refer to www.healthyparentshealthychildren.ca) and be referred to an RD.

What is the best way to support women pregnant with multiples to optimize weight gain and nutrition?

Healthcare providers are recommended to determine pre-pregnancy BMI-specific maternal weight gain goals. It is recommended to regularly assess weight gain progress.^{2,6} An increased frequency of patient education and fetal growth monitoring, above that normally provided for women pregnant with singletons, may be recommended.^{2,4,5}

All women pregnant with multiples are recommended to see an RD for individualized care as early as possible in the pregnancy, ideally in the first trimester or beginning of the second trimester.²¹ Women pregnant with multiples who received nutrition counselling from an RD had improvements in maternal and fetal outcomes compared to those who did not receive this intervention. Specific outcomes impacted included a lower proportion of very low birth weight infants, higher maternal weight gains, and a reduction in preeclampsia.^{3,4,6,7,14}

A nutrition assessment by an RD will help determine if a woman pregnant with multiples has adequate calorie and nutrient intakes. In addition to calorie and macronutrient intake, specific micronutrients to be assessed include calcium, vitamin D, omega-3 fatty acids, folic acid, and iron.

Referrals for individual nutrition assessment and counselling by an RD are especially important for women who:

- consume plant-based beverages, such as almond milk, in place of fluid cow's milk or fortified soy beverage.
- have food allergies/intolerances.
- are vegetarian or vegan.
- are not achieving a recommended rate of weight gain for multiples.
- are having extreme nausea and vomiting of pregnancy.

Referral processes will vary based on zone and site policy.

How many servings from *Eating Well with Canada's Food Guide* are recommended for women pregnant with multiples?

Women pregnant with multiples may have difficulty eating large volumes of food. Evidence supports choosing small, frequent meals and snacks that include food group choices high in calories and protein rather than specifying how many servings from each food group in *Eating Well with Canada's Food Guide*.

Recommend:

- Choose nutrient dense, high fat, and high protein foods.
- Emphasize choices from the Milk and Alternatives and the Meat and Alternatives food groups. Examples include: 2% or homogenized milk, full fat Greek yogurt ($\geq 2\%$ M.F.) and cheese ($>28\%$ M.F.), nut butters, nuts and seeds, as well as fatty fish.

Do women pregnant with multiples have higher calorie and macronutrient requirements than women pregnant with singletons?

Women pregnant with multiples require additional calories above that of women pregnant with singletons in order to promote adequate weight gain and prevent pregnancy complications.^{2-4,6,11-13,22} Recommendations for specific additional energy requirements will vary with pre-pregnancy BMI, number of fetuses, trimester of pregnancy, and other unique individual factors. Table 3 provides recommended total caloric intakes for women pregnant with multiples and ranges from approximately 3000 – 4000 calories per day or 30 – 50 calories/kg.^{2,3} The best guideline for assessing adequacy of energy intake is by monitoring rate of maternal weight gain relative to pre-pregnancy BMI-specific weight gain goals and cumulative weight gain.

Table 3. Recommended daily Calories based on pre-pregnancy BMI

Pre-pregnancy BMI	Estimated Caloric Requirements	
	Calories/kg/day	Total calories/day
BMI <18.5 Underweight	~42 – 50	~4000
BMI 18.5 – 24.9 Normal weight	~40 – 45	~3500
BMI 25.0 – 29.9 Overweight	~30 – 35	~3250
BMI ≥ 30 Obese	Insufficient information	~3000

Source: PEN Pregnancy Multi-fetal key practice point #1 2016-04-26. Estimated caloric requirements have been derived from an extrapolation of the singleton pregnancy recommended dietary allowances (RDA) and BMI specific weight gain tables.³

Those with lower pre-pregnancy BMIs are advised to consume the upper range of calories, and those with higher pre-pregnancy BMIs are advised to consume the lower range.^{2,3,23} As women pregnant with multiples often deliver early at 30 – 35 weeks, there is a shortened gestational period for transferring nutrients to the developing fetuses.¹⁶ An appropriate strategy is to increase caloric intake starting in the first trimester and continue throughout the entire pregnancy.¹⁶

Women pregnant with triplets or higher order multiples may require a caloric intake greater than 4000 calories per day, starting in the first trimester, to achieve the desired weight gain.

A high quality balanced diet of 20% calories from protein, 40% calories from carbohydrate, and 40% calories from fat, with three meals and three snacks is recommended.²⁻⁴ As a practical approach to meet the recommended macronutrient distribution, women are advised to include a protein rich food with every meal and snack and to consume higher calorie food group choices (e.g. 2% milk versus skim milk). A dietitian may develop individualized meal plans and provide patient-centred nutrition counselling to meet these recommendations.

Examples of high protein, high calorie snacks include:

- full fat cheese ($\geq 28\%$ M.F.) and crackers
- full fat Greek yogurt ($> 2\%$ M.F.) with fruit
- hard-boiled egg
- hummus with carrot sticks
- peanut butter and apple slices

Are oral commercial nutritional supplements safe to consume during pregnancy with multiples?

For some women pregnant with multiples, a commercial oral supplement can be recommended when intake from food sources does not meet energy needs. An individualized nutrition assessment is needed to avoid excessive vitamin A intake. The amount of vitamin A in common nutrition supplement drinks should not be a concern if women are only drinking one serving a day. Women should not drink more unless recommended by their physician or dietitian. It is important to read labels and compare products to ensure that total daily vitamin A intake does not exceed the upper limit (UL) from the following sources combined:

- multivitamin
- nutrition supplement drink
- foods high in vitamin A (e.g. liver)

Do women pregnant with multiples need to take more than one multivitamin supplement per day?

Taking more than one multivitamin supplement dose per day is not recommended for any pregnant woman.²⁴ To meet additional micronutrient requirements of women pregnant with multiples, it is recommended to choose a daily multivitamin supplement dose that contains 1 mg (1000 mcg) of folic acid, at least 27 mg of iron, at least 400 international units (IU) of vitamin D, and 2.6 mcg of vitamin B12. Common multivitamin supplements marketed for pregnancy, often referred to as prenatal multivitamin supplements, contain these higher doses of folic acid and iron.

Are there any specific micronutrient recommendations for women pregnant with multiples?

Most vitamin and mineral requirements can be met through a balanced diet and daily intake of one multivitamin supplement dose, with the exception of calcium and vitamin D. Additional supplementation may be required to achieve a combined daily food and supplement intake of 1200 IU vitamin D and 2000 – 2500 mg of calcium. Supplementation with 300 – 500 mg DHA/EPA (docosahexaenoic acid [DHA] and eicosapentaenoic acid [EPA]) is recommended for consideration.²³

Nutrition Guideline

Pregnancy: Multiples

For Professional Reference Only

Applicable to: Nurses, Physicians and Other Health Professionals

Table 4 describes the total amount of calcium, vitamin D, iron, folic acid, omega-3 fatty acids, and vitamin A recommended for women pregnant with both singletons and twins. There is little evidence concerning specific recommendations for women pregnant with triplets and higher order multiples.

Healthcare providers may need to assist with label reading (of food and supplements) to ensure the patient takes the recommended dosage of vitamins/minerals, especially considering additional needs for vitamin D and calcium.

Table 4. Recommended Amounts of Vitamins and Minerals in Women Pregnant with Singletons and Twins from All Sources (i.e. Food, multivitamin supplement, single source supplements)

Vitamins/Minerals	Singleton Pregnancy	Twin Pregnancy	Upper Limit (UL)
Calcium	1000 mg ^a (<19 yrs 1300 mg)	2000 – 2500 mg ^b	Total daily intake not to exceed 2500 mg ^c
Vitamin D	600 IU ^a	1200 IU ^b	Total daily intake not to exceed 4000 IU ^a
Iron	27 mg ^a	30 mg ^b	Total daily intake not to exceed 45 mg ^c unless advised by a physician. Monitor iron status closely.
Folate/Folic Acid	0.6 mg (600 mcg) ^a	1 mg (1000 mcg) ^b	Supplementation not to exceed 1 mg (1000 mcg) unless advised by a physician (<19 years: 0.8 mg (800 mcg) ^c
Omega- 3 Fatty Acids (DHA and EPA)	Include fish rich in omega-3 fatty acids (low in mercury) at least two food guide servings per week (75 grams or 2 ½ ounces each) ^d	Include fish rich in omega-3 fatty acids (low in mercury) at least two food guide servings per week (75 grams or 2 ½ ounces each) ^d Consider supplementation with 300 – 500 mg ^b DHA/ EPA	Safe upper limit not defined ^c
Vitamin A	A diet rich in vitamin A (including fortified foods and beverages) that meets the RDA (770 mcg) ^c	A diet rich in vitamin A (including fortified foods and beverages) that meets the RDA (770 mcg) ^c	Pregnancy 3000 mcg/day (<19yrs: 2800 mcg/day) ^c UL is for preformed vitamin A only.

Source:

^aHealth Canada, 2010. Dietary Reference Intakes Tables (Pregnancy)²⁵

^bDietitians of Canada²³

^cIOM, 2006²⁶

^dHealth Canada, 2017. Mercury in Fish²⁷

Calcium

Women pregnant with multiples have greater calcium requirements than women pregnant with singletons.^{2,14} Recommended daily intakes of calcium from food and supplement combined are 2000 – 2500 mg/day.²³ It is recommended that women pregnant with multiples consume a minimum of two to three servings of Milk and Alternatives per day. One serving of Milk and Alternatives provides approximately 300 mg of calcium, and most multivitamin supplements contain 250 mg of calcium. An additional calcium supplement may be required in order to meet the above recommendations.⁶ A woman consuming two to three Milk and Alternatives food guide servings may need an additional 500 – 1000 mg of calcium per day to meet these additional requirements. In order to maximize absorption and minimize any potential gastrointestinal discomforts, such as bloating and constipation, the maximum amount of supplemental calcium to be consumed at one time is 500 mg.²⁶ Single source calcium supplements are to be taken separately from multivitamin supplements containing iron (at least 2 hours between) due to the potential of calcium binding to iron.²⁶ The upper limit of calcium is 2500 mg.²⁶

Vitamin D

Women pregnant with multiples have greater vitamin D requirements than women pregnant with singletons.^{12,14} Recommended daily intakes of vitamin D from food and supplement sources combined are 1200 IU/day.²³ It is recommended that women pregnant with multiples consume a minimum of 500 mL (2 cups) of fluid cow's milk or fortified soy beverage daily. One serving (250 mL [1 cup]) of fluid cow's milk or fortified soy beverage provides approximately 100 IU vitamin D, and most multivitamin supplements contain 400 IU vitamin D. An additional vitamin D supplement may be required in order to meet the above recommendations.²³ The Upper Limit for vitamin D is 4000 IU per day.^{25,28}

Iron

Women pregnant with multiples have four times the risk of developing iron deficiency anemia, compared to women pregnant with singletons.^{2,6,14,29} Recommended daily intake of iron for women pregnant with twins is 30 mg iron.²³ Recommended iron intake can be achieved through a multivitamin supplement containing 27 mg iron and a diet high in iron. Most multivitamin supplements marketed for pregnancy contain 27 mg iron. These are often referred to as prenatal multivitamin supplements.

Early screening of maternal iron status is recommended to identify if additional iron supplements are required.²⁹ If additional single source iron supplements are needed they should be prescribed by a physician.

The upper limit for iron is 45 mg per day.²⁶ Pregnant women who are being treated for iron deficiency anemia may be treated with higher doses of iron above the upper limit.²⁴

Folate/Folic Acid

Women pregnant with multiples have eight times the risk of developing anemia due to folate (folic acid) deficiency, compared to women pregnant with singletons.^{2,6} Recommended daily intakes of folate from food and folic acid from supplement sources combined are 1 mg (1000 mcg) per day.²³ Recommended folate/folic acid intake can be achieved through a multivitamin supplement containing folic acid and a diet high in folate. Fortified foods such as enriched, ready to eat cereal, pasta and bread products made with enriched flour, will contribute to total daily folic acid recommendations.³⁰ Most multivitamin supplements marketed for pregnancy contain 1 mg (1000 mcg) folate (folic acid). These are often referred to as prenatal multivitamin supplements.

Women pregnant with multiples are not at a higher risk for neural tube defects or other folic acid-sensitive congenital anomalies compared to women pregnant with singletons.³¹ Women who have an increased risk of neural tube defects are advised to contact their doctor regarding folic acid supplementation, as requirements may be higher.³¹ The upper limit for folate (folic acid) from supplements and/or fortified food is 1000 mcg/day for pregnant women ≥ 19 years; 800 mcg for < 19 years; there is no upper limit established from food alone.²⁶ Supplementation with greater than 1 mg (1000 mcg) of supplemental folate (folic acid) per day should be done in consultation with a physician.

Omega-3 Fatty Acids

Women pregnant with multiples have an increased utilization of fatty acids.³ Recommended daily intake of omega-3 fatty acids in pregnancy are not well established. All pregnant women are recommended to include at least two food guide servings (75 grams or 2½ ounces each) of low-mercury, fatty fish each week.²⁷ Daily supplementation of 300 – 500 mg DHA/ EPA is recommended for consideration.²³ The safe upper limit for DHA/EPA supplementation is not currently known.²⁶

Vitamin A

Women pregnant with multiples do not have an increased vitamin A requirement. A diet rich in vitamin A (including fortified foods and beverages) that meets the RDA of 770 mcg per day is recommended. The upper limit for preformed vitamin A during pregnancy is 3000 mcg retinal activity equivalent (RAE)/day for women ≥ 19 years and 2800 mcg RAE/day for women < 19 years.^{24,26} Preformed vitamin A is found primarily in meat, poultry, fish, milk products and supplements. An excess intake of preformed vitamin A during pregnancy has been associated with birth defects.²⁶ Consuming more than one multivitamin supplement dose per day may put women at risk of exceeding the UL for preformed vitamin A.

Other

Women pregnant with multiples may have additional needs for vitamin C, vitamin E, zinc, copper, and vitamin B6. However evidence remains scarce relative to these nutrient needs for women pregnant with multiples. No specific recommendations beyond those pregnant with singletons are available.¹⁴

What additional resources are available?

For Professionals:

General nutrition guidelines for health professionals on pregnancy can be found in the Nutrition Guideline (NG): Pregnancy. <http://www.albertahealthservices.ca/info/Page8248.aspx>

An accredited continuing medical education learning program on healthy pregnancy weight gain. Registration is free. All health care providers are welcome to register.

<http://ecme.ucalgary.ca/programs/hpwg/>

For the Public:

General pregnancy nutrition information for the public can be found in Healthy Parents, Healthy Children. <http://www.healthyparentshealthychildren.ca>.

References

- (1) Institute of Medicine. Weight gain during pregnancy: Reexamining the guidelines. Washington (DC): National Academies Press (US); 2009.
- (2) Goodnight W, Newman R. Optimal nutrition for improved twin pregnancy outcome. *Obstet Gynecol.* 2009 Nov. 114:(5):1121-34.
- (3) Luke B. Nutrition and multiple gestation. *Semin Perinatol.* 2005 Oct. 29:(5):349-54.
- (4) Luke B. Nutrition for multiples. *Clin Obstet Gynecol.* 2015 Sep. 58:(3):585-610.
- (5) Pettit KE, Lacoursiere DY, Schrimmer DB, Ablewi H, Moore TR, Ramos GA. Maternal and neonatal outcomes in women with twin pregnancies with excessive gestational weight gain. *J Matern Fetal Neonatal Med.* 2016 29:(13):2182-5.
- (6) Roem K. Nutritional management of multiple pregnancies. *Twin Res.* 2003 Dec. 6:(6):514-9.
- (7) Thangaratinam S, Rogozinska E, Jolly K, Glinkowski S, Roseboom T, Tomlinson JW, et al. Effects of interventions in pregnancy on maternal weight and obstetric outcomes: Meta-analysis of randomised evidence. *BMJ.* 2012 Oct 1. 67:(10):e2088.
- (8) Chu SY, D'Angelo DV. Gestational weight gain among US women who deliver twins, 2001-2006. *Am J Obstet Gynecol.* 2009 Apr. 200:(4):6.
- (9) Algeri P, Pelizzoni F, Bernasconi DP, Russo F, Incerti M, Cozzolino S, et al. Influence of weight gain, according to institute of medicine 2009 recommendation, on spontaneous preterm delivery in twin pregnancies. *BMC Pregnancy Childbirth.* 2018 01 03,. 18:(1):6.
- (10) Lal AK, Kominiarek MA. Weight gain in twin gestations: Are the institute of medicine guidelines optimal for neonatal outcomes? *Journal of Perinatology.* 2015 Jun 1, 35:(6):405-10.
- (11) Marcason W. What are the calorie requirements for women having twins? *JADA.* 2006 106:(8):1292.
- (12) Roselló-Soberón ME, Fuentes-Chaparro L, Casanueva E. Twin pregnancies: Eating for three? maternal nutrition update. *Nutr Rev.* 2005 Sep. 63:(9):295-302.
- (13) Dietitians of Canada. What is the recommended weight gain for women carrying multiple fetuses? In: Practice-based evidence in nutrition [PEN]. 2016; [Cited: October 11 2018]. Available from: <http://www.pennutrition.com/KnowledgePathway.aspx?kpid=13491&pqcatid=146&pqid=13519> Access only by subscription.
- (14) Klein L. Nutritional recommendations for multiple pregnancy. *J Am Diet Assoc.* 2005 Jul. 105:(7):1050-2.
- (15) Fidel-Rimon O, Rhea DJ, Keith LG, Shinwell ES, Blickstein I. Early adequate maternal weight gain is associated with fewer small for gestational age triplets. *Journal of perinatal medicine.* 2005 Oct 1. 33:(5):379-82.
- (16) American Society for Reproductive Medicine. Multiple pregnancy and birth: Twins, triplets, and high-order multiples. 2012; [Cited: October 11 2018]. Available from: https://www.asrm.org/globalassets/rf/news-and-publications/bookletsfact-sheets/english-fact-sheets-and-info-booklets/booklet_multiple_pregnancy_and_birth_twins_triplets_and_high-order_multiples.pdf .
- (17) Rasmussen KM, Yaktine AL. Weight gain during pregnancy: Reexamining the guidelines. Washington (DC): National Academies Press (US); 2009.
- (18) The American College of Obstetricians and Gynecologists. What are some symptoms of multiple pregnancy? 2015; [Cited: October 15 2018]. Available from: <https://www.acog.org/Patients/FAQs/Multiple-Pregnancy#some> .
- (19) Louik C, Hernandez-Diaz S, Werler MM, Mitchell AA. Nausea and vomiting in pregnancy: Maternal characteristics and risk factors. *Paediatr Perinat Epidemiol.* 2006 Jul. 20:(4):270-8.

Nutrition Guideline

Pregnancy: Multiples

For Professional Reference Only

Applicable to: Nurses, Physicians and Other Health Professionals

- (20) Brigham and Women's Hospital. Twin pregnancy obstetric care guidelines. 2018; [Cited: October 11 2018]. Available from: <https://www.brighamandwomens.org/obgyn/maternal-fetal-medicine/for-medical-professionals/twin-pregnancy-obstetric-care-guidelines> .
- (21) Gandhi M, Salmanian B, Hosseinzadeh P, Moaddab A, Golabbakhsh H, Shamshirsaz A. Weight gain adequacy in twin gestations with a dietician consult based on BMI. American Journal of Obstetrics and Gynecology. 2015 January 31, 212:(1):S256.
- (22) Shinagawa S, Suzuki S, Chihara H, Otsubo Y, Takeshita T, Araki T. Maternal basal metabolic rate in twin pregnancy. Gynecol Obstet Invest. 2005 60:(3):145-8.
- (23) Dietitians of Canada. What are the nutritional requirements for women carrying multiple fetuses and do they differ from the recommendations for singleton pregnancies? In: Practice-based evidence in nutrition [PEN]. 2016; [Cited: October 11 2018]. Available from: <http://www.pennutrition.com/KnowledgePathway.aspx?kpid=13491&pgcatid=146&pgid=13522> Access only by subscription.
- (24) O'Connor DL, Blake J, Bell R, Bowen A, Callum J, Fenton S, et al. Canadian consensus on female nutrition: Adolescence, reproduction, menopause, and beyond. J Obstet Gynaecol Can. 2016 06. 38:(6):554.e18.
- (25) Health Canada. Dietary reference intakes tables. 2010; [Cited: Jul 24, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/dietary-reference-intakes/tables.html> .
- (26) U.S. Institute of Medicine (IOM). Dietary reference intakes: The essential guide to nutrient requirements. Washington (DC): The National Academies Press; 2006.
- (27) Health Canada. Mercury in fish. 2007; [Cited: Oct 9, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants/mercury/mercury-fish.html> .
- (28) U.S. Department of Health and Human Services, National Institutes of Health, Office of Dietary Supplements. Office of dietary supplements - vitamin D. [Cited: Oct 9, 2018]. Available from: <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/> .
- (29) Ru Y, Pressman EK, Cooper EM, Gullet R, Katzman PJ, Kent TR, et al. Iron deficiency and anemia are prevalent in women with multiple gestations. Am J Clin Nutr. 2016 10. 104:(4):1052-60.
- (30) Health Canada. Prenatal nutrition guidelines for health professionals - folate contributes to a healthy pregnancy. 2009; [Cited: Oct 9, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/reports-publications/nutrition-healthy-eating/prenatal-nutrition-guidelines-health-professionals-folate-contributes-healthy-pregnancy-2009.html> .
- (31) Wilson RD, Wilson RD, Audibert F, Brock J, Carroll J, Cartier L, et al. Pre-conception folic acid and multivitamin supplementation for the primary and secondary prevention of neural tube defects and other folic acid-sensitive congenital anomalies. J Obstet Gynaecol Can. 2015 Jun. 37:(6):534-52.