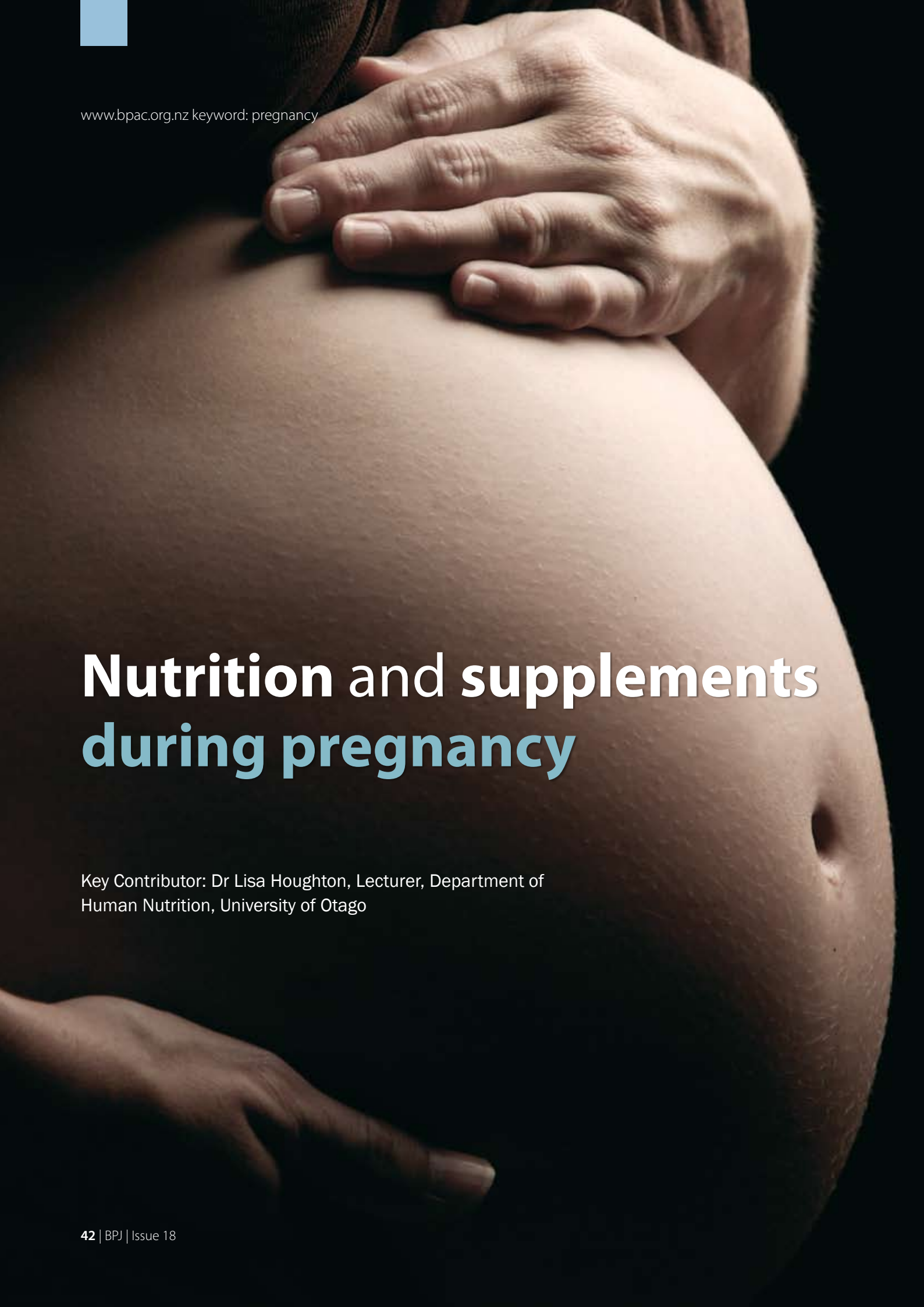

Nutrition and supplements during pregnancy

Key Contributor: Dr Lisa Houghton, Lecturer, Department of Human Nutrition, University of Otago

IN BPJ 15 (AUGUST 2008), we covered the topic of vitamin and mineral deficiencies. GPs tell us that they would like more information on what supplements or additional foods they should be prescribing or recommending for women who wish to become pregnant or those who are pregnant.

The importance of ensuring good maternal health during pregnancy is widely recognised while an increasing body of evidence suggests that nutritional status prior to pregnancy strongly influences foetal and infant outcomes. In view of this, the goal is to ensure that women attain good nutritional status before, during and between pregnancies to optimise their own health and reduce the risk of pregnancy complications, birth defects and the onset of chronic diseases in their children.

Attention to pre-conception nutrition improves pregnancy outcomes

Improving nutritional status before pregnancy is challenging because about half of pregnancies in New Zealand are not planned.[1,2] Even among women planning pregnancy, few seek medical or nutritional advice prior to conception, and most women do not have their first prenatal care visit until well into the first trimester.

Key concepts:

Health professionals can improve pregnancy outcomes by advising women to:

- Achieve a healthy body weight prior to conception and maintain appropriate weight gain during pregnancy according to pre-pregnancy BMI
- Take a daily supplement of 800 mcg of folic acid beginning before becoming pregnant and continuing throughout the duration of pregnancy (400 mcg folic acid is adequate but funded tablets are available in 800 mcg or 5 mg strengths)
- Take a low dose iron supplement in their second and third trimester
- Use iodised salt when cooking and at the table, and to choose foods that are sources of iodine e.g. low-fat milk, eggs
- If consuming a multivitamin and mineral supplement during pregnancy, choose a supplement containing folic acid, iron, and potassium iodide and be careful not to take excess vitamin A.

Folate reduces risk of neural tube defects

It is well established that folate decreases the risk for neural tube defects. Women planning a pregnancy, or who are in the early stages of pregnancy, are advised to take a daily folic acid supplement of 800 mcg for at least four weeks before, and up to 12 weeks after conception (although women are recommended to continue with this supplement throughout pregnancy). Higher doses (5 mg daily) are recommended for those who have had a previous neural tube defect affected pregnancy, a family history of neural tube defects, or are taking anticonvulsant drugs. Supplementing with 400 mcg of folic acid is sufficient to reduce the risk for women who have no history of neural tube defects, however only 800 mcg or 5 mg tablets are currently available as registered medicines in New Zealand. Mandatory folic acid fortification of bread next year will ensure that all women who become pregnant – planned or unplanned – will receive some preconceptional folic acid.

Sub-optimal iron stores are difficult to replenish once pregnant

A substantial amount of iron is required during pregnancy to meet foetal and maternal needs. About 40% of women aged 15–44 years in New Zealand have an inadequate intake of iron. Adequate pre-pregnancy iron stores may play a role in reducing risk for iron deficiency and anaemia during pregnancy. Sub-optimal iron stores are difficult to replenish once pregnant.

Healthy pre-conception bodyweight improves outcomes

Being underweight or overweight prior to conception can affect birth outcome. Evidence from observational studies suggests that low pre-pregnancy body mass index (BMI, <20 kg/m^2) is associated with reduced infant birth weight, and increased incidence of preterm delivery.[3] Obese women have an elevated risk for pre-eclampsia, gestational diabetes, neural tube defects and stillbirth, as well as giving birth to a large for gestational age infant.[3,4] More than one quarter of all New Zealand women are obese.[4]

Weight gain during pregnancy influences infant birth weight and health

The U.S. Institute of Medicine recommendations for appropriate weight gain during pregnancy (Table 1) are based on pre-pregnancy BMI and uphold a slightly different range of weight gain for each BMI category. Weight gains within these guidelines are associated with optimal birth weight (between 3000 g and 4000 g) and best labour and delivery outcomes. Women who gain more weight in pregnancy than recommended have a significantly increased risk of having an infant weighing greater than 4000 g.[5] High birthweight infants tend to be taller and heavier children with increased risk of obesity and metabolic problems in later life.[6] Excessive prenatal weight gain also places the mother at risk for long-term obesity post-delivery.[7]

There are currently no data available to indicate how much weight New Zealand women are gaining during pregnancy. Survey work conducted in the United States and Europe indicates that only a small proportion of women gain within the recommended ranges with excessive weight gain being more prevalent than inadequate weight gain.[5] Reports indicate that pregnancy weight gain is influenced by recommendations of health care providers so it is important this advice is accurate. Many women receive no prenatal weight gain advice.[8,9]

Table 1: Current recommendations for weight gain during pregnancy[6]

Pre-pregnancy BMI category	Recommended total gain (kg)
Low (<20)	12.5 – 18.0
Normal (20 – 25)	11.5 – 16.0
High (>25 – 29)	7.0 – 11.5
Obese (>29)	≥7.0

A healthy diet meets most nutrient requirements during pregnancy

Many questions remain unanswered regarding how the mother's nutritional status influences pregnancy outcome. Consequences of deficient or excessive nutrient intakes are difficult to determine, and assessment of vitamin and mineral status during pregnancy is not easy due to a lack of pregnancy-specific laboratory values. Based on available evidence, a healthy and varied diet can provide adequate energy and meet the mother's requirements for most nutrients. Selected vitamin and minerals that are likely to be limited in the diets of pregnant women are briefly highlighted.

Folate requirements are high during pregnancy

In addition to reducing neural tube defects, lack of folate during pregnancy is associated with increased risk of preterm delivery, low birth weight and poor foetal growth. The recommended intake of dietary folate is 600 mcg per day. Survey data of pregnant women in New Zealand indicate that dietary intakes of folate are well below recommended levels.[4]

400 mcg folic acid or 600 mcg dietary folate?

The 400 mcg recommendation to reduce neural tube defects is based on folic acid (synthetic form of folate) only. The 600 mcg recommended during pregnancy is in the units of Dietary Folate Equivalents (DFE) (food folate = 1 mcg DFE and folic acid = 1.7 mcg DFE). So essentially the 400 mcg folic acid tablet recommended preconceptional is worth 680 mcg DFEs and pregnant women then meet both recommendations by taking a supplement. Post-closure of the neural tube (after the first trimester) it is recommended that women intake 600 mcg DFEs. It is possible to obtain this all from the diet but this would involve large amounts of foods such as broccoli and spinach. Therefore women are recommended to continue with a folic acid supplement in addition to a folate rich diet for the entire pregnancy. This recommendation stands regardless of fortification of the food supply.

Iron requirements increase throughout pregnancy

Additional iron requirements during pregnancy increase substantially from the first trimester to the third trimester. A recommended dietary intake of 27 mg per day for the entire duration of pregnancy builds iron stores in early pregnancy for the third trimester.

Although women should be encouraged to consume plenty of iron rich foods during pregnancy, obtaining the recommended intake from diet alone is difficult. Survey data of pregnant women in New Zealand indicate mean

iron intakes between 11–14 mg per day.[4] The highest prevalence of low iron stores, iron deficiency and iron-deficiency anaemia is among New Zealand Māori women, particularly aged 15–24 years.[4] Maternal anaemia is associated with infant mortality and premature delivery.

Post-delivery, a woman who has been iron deficient during pregnancy should have further follow-up as postpartum anaemia is associated with emotional instability, depression and stress.[10]

For those who consume no or small amounts of animal source food, or when low iron stores are suspected, a low-dose iron supplement (30 mg ferrous iron per day) taken at bedtime or between meals is advised. When iron deficiency with or without anaemia is diagnosed, larger doses of iron supplements (~100 mg ferrous iron per day) may be advised to improve iron status as early in pregnancy as possible.[6] Although there is currently insufficient evidence to recommend for (or against) routine iron supplementation of all pregnant women, the U.S. Institute of Medicine, recognises that many women have suboptimal iron stores and advise daily low-dose iron supplementation (30 mg) to all women in the second and third trimesters.

Iodine requirements increase in pregnancy

Requirements for iodine increase in pregnancy due to a marked change in thyroid function. Despite the upcoming mandatory fortification of bread with iodine in 2009, pregnant women will likely have intakes below the recommended level of 220 mcg per day. Median iodine intakes of New Zealand pregnant women are estimated between 60 to 70 mcg per day.[11] Iodine deficiency during pregnancy can negatively affect both maternal and infant thyroid function and cognitive development of the infant.

Despite lack of clinical data on the effect of iodine supplementation on birth outcomes in mild to moderately deficient pregnant women,[12] several health authorities recommend that pregnant women consume 150 mcg per day of potassium iodide to prevent deficiency.[13, 14] Currently there are no single oral iodine preparations available as registered medicines in New Zealand. Seaweed and kelp tablets should not be used as the iodine content in these products is extremely variable and can be toxic.

Low vitamin D levels can affect foetal bone

During pregnancy, the lack of vitamin D may adversely affect foetal bone and accumulation of newborn vitamin D stores.[15] Vitamin D increases intestinal absorption of calcium. Rickets is a clinical marker of poor pre- and postnatal bone health caused by vitamin D deficiency. There have been reports that rickets is re-emerging though its prevalence in New Zealand is unknown.

Dietary sources of vitamin D are limited and the main source is skin synthesis on exposure to sunlight. The most recent national survey indicated a high prevalence of vitamin D insufficiency in New Zealanders.[16] Plasma concentration of 25-hydroxyvitamin D is a marker of vitamin D status. A level below 25 nmol/L indicates risk of vitamin D deficiency. A survey of pregnant women from a general practice population in Wellington reported that 87% of women had 25-hydroxyvitamin D below 50 nmol/L.[17]

Many experts agree that the recommended adequate intake for vitamin D of 200 IU per day during pregnancy is grossly underestimated.[18] Studies are currently underway to address the effect of vitamin D supplementation during pregnancy on the nutritional vitamin D status in both mother and foetus.

There is little evidence to support other supplements

For all other vitamin and minerals in pregnancy, there is little evidence to support routine supplementation unless inadequate nutrient intakes are suspected.

Women who are taking multivitamin/multimineral supplements should be cautioned to avoid exceeding intake of 10,000 IU (3,330 RE) of vitamin A (retinol) per day.

See Table 2 (over page) for a comparison of ingredients of some commonly used pregnancy multivitamins.

Fully funded supplements in pregnancy:

Iron

Ferrous fumarate

Tab 200 mg – Ferro-tab
Approximate elemental iron = 65 mg

Ferrous fumarate with folic acid

Tab 310 mg with folic acid 350 mcg – Ferro-F-Tabs
Approximate elemental iron = 100 mg

Ferrous gluconate with ascorbic acid

Tab 170 mg with ascorbic acid 40 mg – Healtheries Iron with Vitamin C
Approximate elemental iron = 20 mg

N.B: Ferrous sulphate preparations are available but subject to a part charge

Folic acid

Tab 5 mg – Apo-Folic Acid

Tab 0.8 mg – Apo-Folic Acid

Vitamin D

Alfacalcidol

Cap 0.25 mcg; Cap 1 mcg; Oral drops 2 mcg per mL

Table 2: Commonly used pregnancy multivitamins – comparison of ingredients (per recommended daily dose)

	Elevit	Blackmores Pregnancy and Breastfeeding Gold	Clinicians PregaVit	Solgar Prenatal Vitamins
Dose	One tablet daily	One tablet daily	Three capsules twice daily (6 caps/day)	Two tablets daily
Calcium	125 mg	59 mg	265 mg	650 mg
Folic Acid	800 mcg	250 mcg	300 mcg	400 mcg
Iodine	nil	125 mcg	50 mcg	75 mcg
Iron	60 mg	5 mg	nil	14 mg
Vitamin A*	nil	2880 mcg (carotenoids) = 2400 IU	225 mcg (retinol) = 750 IU	1800 mcg (beta carotene) + 4.8 mcg (carotenoids) = 3004 IU
Vitamin B12	4.0 mcg	1.5 mcg	25 mcg	2 mcg
Vitamin C	100 mg	30 mg	42 mg	25 mg
Vitamin D (cholecalciferol)	12.5 mcg = 500 IU	6.25 mcg = 250 IU	2.5 mcg = 100 IU	2.5 mcg = 100 IU

* 1 mg retinol = 0.5 mg beta carotene = 0.08 mg carotenoids

References

1. Schader I, Corwin P. How many pregnant women in Christchurch are using folic acid supplements in early pregnancy? NZ Med J 1999;112:463-5.
2. Dobson I, Devenish C, Skeaff CM, Green TJ. Periconceptional folic acid use among women giving birth at Queen Mary Maternity Hospital in Dunedin. Aust NZ J Obstetrics and Gynaecology 2006;46:534-7.
3. Hauger MS, Gibbons L, Vik T, Belizán JM. Prepregnancy weight status and the risk of adverse pregnancy outcome. Acta Obstet Gynecol Scand. 2008;87(9):953-9.
4. Ministry of Health. 2008. A Portrait of Health: Key results of the 2006/07 New Zealand Health Survey. Wellington: Ministry of Health.
5. Olsen CM. Achieving a healthy weight gain during pregnancy. Ann Rev Nutr. 2008;28:411-23.
6. Institute of Medicine, Food and Nutrition Board, Committee on Nutritional Status During Pregnancy and Lactation, Subcommittee on Dietary Intake and Nutrient Supplements During Pregnancy, Subcommittee on Nutritional Status and Weight Gain During Pregnancy. Nutrition during pregnancy. Part I - Weight gain. Part II - Nutrient supplements. Washington, DC: National Academy Press; 1990.
7. Linne Y, Dye L, Barkeling B, Rossner S. Long-term weight development in women: A 15-year follow-up of the effects of pregnancy. Obes Res. 2004:12:1166-78.
8. Stotland NE, Haas JS, Brawarsky P, Jackson RA, Fuentes-Afflick E, Escobar GJ. Body mass index, provider advice, and target gestational weight gain. Obstet Gynecol. 2005;105(3):633-8.
9. Cogswell ME, Scanlon KS, Fein SB, Schieve LA. Medically advised, mother's personal target, and actual weight gain during pregnancy. Obstet Gynecol. 1999;94:616-22.

Thompsons Pregnacare	Radiance Pregnancy Multivitamin	Bronson Prenatal	Recommended daily intake (RDI) in pregnancy[19] (obtained through diet and supplementation if required)
One tablet twice daily	One capsule daily	One chewable tablet daily	
400 mg	300 mg	125 mg	RDI = 1000 mg/day. Do not exceed 2500 mg/day.
300 mcg	200 mcg	400 mcg	RDI = 400 mcg for prevention against neural tube defects. Do not exceed 1000 mcg/day.
nil	37.5 mcg	75 mcg	RDI = 220 mcg/day. Do not exceed 1100 mcg/day. A supplementary intake of 150 mcg/day is recommended.
10 mg	9 mg	25 mg	RDI = 27 mg/day. Do not exceed 45 mg/day. A supplementary intake of 30 mg/day is suitable for all women in the second and third trimesters.
3000 mcg (beta carotene) = 5000 IU	1500 mcg (beta carotene) = 2500 IU	600 mcg (retinol) = 2000 IU	RDI (retinol) = 800 mcg/day (2667 IU). Do not exceed 10,000 IU/day.
12 mcg	5 mcg	7.5 mcg	RDI = 2.6 mcg/day. There is no upper level of intake.
160 mg	30 mg	60 mg	RDI = 60 mg/day Do not exceed 1000 mg/day.
5 mcg = 200 IU	2.5 mcg = 100 IU	5.0 mcg = 200 IU	RDI = 200 IU/day. Do not exceed 3200 IU/day.

10. Beard JL, Hendricks MK, Perez EM et al. Maternal iron deficiency anemia affects postpartum emotions and cognition. J Nutr 2005;135:267-72.
11. Thomson CD, Packer MA, Butler JA, et al. Urinary selenium and iodine during pregnancy and lactation. J Trace Elem Med Biol 2001;14:210-7.
12. Zimmerman MB. The adverse effects of mild-to-moderate iodine deficiency during pregnancy and childhood:a review. Thyroid. 2007;17:829-35.
13. Andersson M, de Benoist B, Delange F, Zupan J. Prevention and control of iodine deficiency in pregnant and lactating women and in children less than 2 years old: conclusion and recommendations of the technical consultation. Public Health Nutr 2007;10(12A):1606-11
14. Sullivan K. Iodine supplementation for pregnancy and lactation: United States and Canada: recommendations of the American Thyroid Association. Thyroid 2007;483-4.
15. Morley R, Carlin JB, Pasco JA, Wark JD. Maternal 25-hydroxyvitamin D and parathyroid hormone concentrations and offspring birth size. J Clin Endocrinol Metab. 2006;91(3):906-12.
16. Rockell JE, Skeaff CM, Williams SM, Green TJ. Serum 25-hydroxyvitamin D concentrations of New Zealanders aged 15 years and older. Osteoporos Int. 2006;17:1382-9.
17. Judkins A, Eagleton C. Vitamin D deficiency in pregnant New Zealand women. NZ Med J. 2006;119
18. Hollis BW. Vitamin D requirement during pregnancy and lactation. J Bone Miner Res. 2007;22 Suppl 2:V39-44
19. Australian Government. Department of Health and Ageing. National Health and Medical Research Council. Ministry of Health New Zealand. Nutrient reference values for Australia and New Zealand including recommended dietary intakes. 2006