

NICE RAPID REVIEW

The effectiveness of public health interventions to improve the nutrition of pregnant women

November 2007

Lalitha D'Souza
Sarah King
Alison McFadden
Jenny Moreton
*Kath Wright
Felicia McCormick
Mary Renfrew
Lisa Dyson

Elizabeth Dowler, PDG member, re-drafted the introduction to the main report on behalf of NICE

Mother and Infant Research Unit
Department of Health Sciences
University of York
York, UK
YO10 5DD

*Centre for Reviews and Dissemination
University of York
York, UK
YO10 5DD

Table of Contents

1.	Executive Summary	3
1.1	Key Questions	3
1.2	Method	3
1.3	Results	3
1.4	Conclusion	5
1.5	References to included papers, and check-list rating	6
1.6	Evidence statements	7
1.7	References	9
2.	Background	10
2.1	Nutritional requirements and food safety issues during pregnancy	10
2.2	Nutrition and health outcomes	11
2.3	Dietary intakes	12
2.4	Maternal obesity	14
2.5	Aims of review	16
2.6	References	17
3.	Methodology	19
3.1	Literature Search	19
3.2	Selection of studies for inclusion	19
3.3	Screening	21
3.4	Quality appraisal	21
3.5	Assessing Applicability	22
3.6	Synthesis	22
4.	Summary of Findings	23
4.1	Literature review	23
4.2	Key question 1	23
4.3	Key question 2	31
4.4	Key question 3	34
4.5	Key question 4	36
4.6	Key question 5	36
4.7	Key question 6	37
5.	Overview and Discussion	38
6.	Additional References	43
	APPENDIX A: included studies	44
	APPENDIX B: excluded studies	46
	APPENDIX C: search strategy	51
	APPENDIX D: data tables	76

1. Executive Summary

Pregnancy is a time of increased nutritional requirements. The total energy cost of pregnancy is estimated to be 335 MJ (Jackson and Robinson, 2001). Increased energy intake during pregnancy brings with it an increase in many of the vitamins and minerals required (Anderson, 2001). The Department of Health issues recommendations for the additional requirements of energy, protein and vitamins during pregnancy (Department of Health, 1991). For minerals no additional increment is recommended. During pregnancy women are also advised, to pay particular attention to food hygiene, avoid certain foods, alcohol and high doses of some dietary supplements (Williamson, 2006).

This rapid review examines the evidence about the effectiveness of public health nutrition interventions delivered during pregnancy in primary care and community settings that aim to improve maternal health and birth weight.

1.1 Key questions

Six key questions are addressed:

1. What is the effectiveness of food support programmes in improving nutrient intakes among pregnant women?
2. What is the effectiveness of interventions designed to promote the uptake of folic acid supplements in the first trimester of pregnancy?
3. What is the effectiveness of interventions to reduce alcohol consumption during pregnancy?
4. What is the effectiveness of interventions designed to promote the intake of oily fish or omega-3 supplements in pregnant women at risk?
5. What interventions increase the uptake of food safety advice?
6. What interventions increase the uptake of allergy prophylaxis advice?

1.2 Method

Appropriate databases were searched for intervention studies using a piloted search strategy. The first search was conducted in October 2005 using a stepped approach and looked at key questions one, two and three. Initially, a worldwide search was conducted to identify potentially relevant systematic reviews (from 1995 onwards) followed by randomised controlled trials (1990 onwards) and then studies of other types undertaken in the UK and published from 1990 onwards. In June 2006 an extended search was conducted to identify studies for questions four, five and six after which this rapid review was re-focussed. A Final update search of the literature to identify newly published studies that might be relevant was undertaken in Spring 2007. In addition to formal searches of the literature additional material suggested by stakeholders and members of the guidance programme development group was screened for relevance.

1.3 Results

This rapid review appraised four systematic reviews unpicking the relevant content from the studies included in those reviews, five randomized control trials and four UK intervention studies of other designs. In addition evidence from a systematic review and a randomised trial about folic acid that was included in the preconception review is also presented.

For some key questions evidence was missing or very sparse. There were no studies found that had evaluated advice about food safety or allergy prophylaxis. Only one case control study was found about the intake of oily fish or omega-3 supplements (Odent 1996 +). This study could not demonstrate any differences in birth outcomes between controls and women given tailored advice to eat more fish.

This review looked at ways to reduce drinking in pregnant women that did not have a known alcohol problem and excluded studies with problem drinkers. A number of studies have evaluated ways to reduce alcohol consumption among pregnant women but a systematic review by Schorling (Schorling 1993+) found that many early studies contain important methodological flaws. Two recent randomised control trials (Chang 2005+) and (O'Connor 2007+) have conflicting results. The Chang paper reports no difference between the intervention and control groups but in both groups drinking fell substantially. The O'Connor study again reports that alcohol consumption fell in both the control and intervention groups but a regression model found that the brief intervention group were five times more likely to be abstinent. All the studies evaluated used self reporting to measure alcohol intake which might lead to bias. What was striking was that in all studies drinking as measured by self reporting falls in both the intervention and the control groups. This suggests either that alcohol consumption in women that drink at the start of pregnancy tends to fall as a pregnancy develops or that enrolling women into a study that focuses on alcohol is sufficient to prompt a decrease in alcohol consumption.

In relation to folate and folic acid the crucial period for preventing neural tube defects is the early stages of pregnancy. Therefore research and awareness campaigns focus on the need to take folic acid around the peri-conceptual period. The evidence about awareness and increasing intake of folic acid is covered in the preconception review. This review found no additional studies to those covered by the preconception review.

Studies about food support programmes for improving nutrient intakes among pregnant women that are included in this review evaluated the effectiveness of providing advice or counselling about nutrition, home support for pregnant women and the provision of food supplements or food vouchers.

Evaluation of the role of dietary counselling in improving the diets of pregnant women is held back by the lack of high quality studies. A review by van Teijlingen reported that there was some evidence to suggest that educational interventions have a modest effect but much of this evidence was flawed. The van Teijlingen review concluded that there was a dearth of research in this area and that high quality research was needed. Only one study was found that evaluated advice or information on its own (Anderson 1995+). This study undertaken in Scotland found that dietary advice and information alone helped improve knowledge about diet but did not improve dietary behaviour. This suggests that dietary advice alone is not sufficient for behaviour change.

Evidence on the effectiveness of food supplementation to pregnant women came from US studies that evaluated individual parts of the WIC programme and a study undertaken in Finland. Many of the studies evaluating WIC were found to be flawed. A trial by Metcoff included in the D'Souza systematic review was given a + rating and looked at the provision of vouchers exchangeable for milk, eggs and cheese. After adjusting for baseline differences in maternal weight no significant difference in mean birth weight was found between the intervention and control groups. However in a subset of smokers the intervention had a positive impact on birth weight. It is possible that food supplement interventions are more effective in those at highest risk.

A more recent study from Finland (Pirainen et al, 2006+) is interesting as it suggests that a combination of the free provision of healthy foods and appropriate dietary advice can improve diet but this improvement might not be sufficient to influence commonly measured birth outcomes such as birth weight and head size at birth. It seems likely that in many populations, particularly in developed countries, that it would be difficult to for a dietary intervention in pregnant women to achieve statistically significant changes in birth outcomes.

Two randomised control trials were identified that evaluated home support. One was graded plus (Graham 1992+) and one was graded minus (Olds 1986 -). In the Graham study African American women attending a clinic were initially screened for family stress and their need for support. Those included in the study were randomised to a group that received peer support from trained members of their peer group at four home visits during the second and third trimesters. The study evaluated birth outcomes in the control and intervention groups and found no significant difference in the proportion of babies of low birth-weight. The Olds study also found no impact on birth outcomes.

Although both of these studies could not demonstrate a significant effect of home support it is a broad area and many components for example health visits focussing on nutrition have not been evaluated in the literature. It is probably correct to conclude that there is a lack of evidence about the effectiveness of home support programmes.

It was also notable that none of the studies evaluating different aspects of food support programmes during pregnancy had long term follow up. Therefore the long term impact of such programmes on child development is unknown.

1.4 Conclusions

The evidence that was found and included in this rapid review was rarely of a high quality. For a number of areas evidence is completely lacking. Studies on improvement in access to healthy foods, food shopping, storage and preparation are lacking. There was no evidence to answer questions about the best way to provide advice about food hygiene or the best way to provide advice about how to avoid allergies. There was insufficient evidence to evaluate home support. Some tentative conclusions can be reached about alcohol, diet advice and food supplements. With regards to alcohol the evidence suggests that the vast majority of women reduce their drinking during pregnancy and for most a brief intervention reminding pregnant women about the dangers of excessive alcohol is likely to be sufficient. In terms of intervening to improve diets. There is no evidence to indicate that diet advice alone is sufficient to change dietary behaviour but many strategies have not been evaluated. There is a lack of high quality studies that have evaluated the provision of food supplements in different populations. The available evidence suggests that providing healthy foods to eat and supporting this with appropriate advice can improve diet.

1.5 References to included papers, and methodology check-list rating

Systematic reviews included

<i>Reference</i>	<i>Methodology checklist rating</i>
D'Souza L, Renfrew M, McCormick F, Dyson L, Wright K, Henderson J, Thomas J (In Press) Food support programmes for low-income and socially disadvantaged childbearing women in developed countries. National Institute for Health and Clinical Excellence, London.	2+
Schorling JB (1993) The prevention of prenatal alcohol use: a critical analysis of intervention studies. <i>Journal of Studies on Alcohol</i> 54: 261-267.	2+
Nielsen JN, Gittleson J, Anliker J, O'Brien K (2006) Interventions to improve diet and weight gain among pregnant adolescents and recommendations for further research. <i>Journal of the American Dietetic Association</i> Vol 106 No 11 pp 1825-1840.	2+
van Teijlingen E, Wilson B, Barry N et al. (1998) Effectiveness of interventions to promote healthy eating in pregnant women and women of childbearing age: a review. London: Health Education Authority.	2+

Randomised control trials

<i>Reference</i>	<i>Methodology checklist rating</i>
Chang G, Wilkins-Haug L, Berman S, Goetz MA. Brief intervention for alcohol use in pregnancy: a randomized trial. <i>Addiction</i> 1999;94:1499–1508	1-
Chang G, Mcnamara TK, Orav EJ, Koby D, Lavigne A, Ludman B, Vincitorio NA, Wilkins-Huag L. (2005) Brief intervention for prenatal alcohol use: a randomised trial. <i>Obstetrics and Gynecology</i> 105 (5): 991-8.	1+
O'Connor MJ, Whaley SE. Brief intervention for alcohol use by pregnant women. <i>Am J Public Health</i> . 2007 Feb;97(2):252-8	1+
Piirainen T, Isolauri E, Lagström H, Laitinen K. Impact of dietary counselling on nutrient intake during pregnancy: a prospective cohort study. <i>British Journal of Nutrition</i> , Volume 96, Number 6, December 2006 , pp. 1095-1104(10)	1+
Reynolds KD, Coombs DW, Lowe JB, Peterson PL, Gayoso E. Evaluation of a self-help program to reduce alcohol consumption among pregnant women. <i>Int J Addict</i> . 1995 Mar;30(4):427-43.	1-

UK studies of other design

<i>Reference</i>	<i>Methodology checklist rating</i>
Anderson, A.S., Campbell, D.M., Shepherd, R. (1995), "The influence of dietary advice on nutrient intake during pregnancy", British Journal of Nutrition, Vol. 73 No.2, pp.163-77	2+
Changing preconceptions. The Health Education Authority Folic Acid Campaign 1995-1998. HEA1998	2+
Doyle W, Wynn AHA, Crawford MA, Wynn SW. Nutritional counselling and supplementation in the second and third trimester of pregnancy, a study in a London population. J Nutr Med 1992; 3: 249-256	2+
Odent MR, McMillan L, Kimmel T. Prenatal care and sea fish. Eur J Obstetr Gynecol Reproduct Biol. 1996;68:49-51	2+

1.6 Evidence Statements

1. A non-randomised control trial in Scotland demonstrated that written educational materials aimed at improving knowledge practical skills and diet of pregnant women provided to pregnant women at an initial meeting during the first trimester and again with an accompanying personalised letter at six months gestation produced a small but significant increase in women's nutrition knowledge but failed to improve women's attitudes about diet or their reported nutrition.
2. A non-randomised trial in London (Doyle 1992 +) comparing intervention groups that received multiple episodes of nutrition counselling alone or with two different types of food supplement during the second and third trimester to a control group found no significant differences among the groups when measuring maternal weight gain, length of gestation, babies head size or babies length. The study found a small but statistically significant increase in the mean birth-weight of babies born to women in all intervention groups combined compared to women in the control population.
3. A systematic review of studies which included a nutrition education component and adolescents in the target audience included 29 studies of which 19 had a control population and found that the majority of studies measured distal outcomes such as low birth weight and gestational weight gain and detected improvements in these outcomes in the intervention groups but it was not possible from the data collected to measure the independent contribution of the nutrition component of the intervention. This review found only one study that had evaluated a nutrition intervention that was based on a theoretical model of behaviour change.
4. One randomised control trial found no significant increase in the mean birth weight of babies or a significant reduction in low birth weight babies born to

women recruited into the USA's WIC programme at mid-pregnancy compared to women in a control population who received no free dietary supplements.

5. One randomised control trial found a statistically significant maternal weight gain among pregnant women recruited into the USA's WIC programme at mid-pregnancy compared to women in a control population who received no free dietary supplements.
6. One randomised trial in pregnant women attending a welfare clinic in Finland found that an intervention involving the provision of healthy foods and advice delivered three times during pregnancy improved some nutritional outcome measures, but did not lead to a significant difference in pregnancy outcomes between the intervention and control groups
7. One randomised control trial in the USA with pregnant inner city black women found that four home visits during the second and third trimester from a woman of a similar peer group who was trained to deliver a complex intervention including psychosocial/social support, nutrition education and referral to other services found no statistically significant impact on the rates of low birth weight compared to a control population receiving usual care.
8. Studies undertaken in the USA and Europe have consistently found that women enrolled into studies that measure self reported alcohol consumption during pregnancy reduce their reported alcohol consumption as pregnancy progresses. This is found in both control and intervention groups.
9. A randomised control trial evaluating a brief intervention from a trained counsellor to reduce alcohol consumption among pregnant women who were drinkers involving goal setting and including a woman's partner did not lead to a significant reduction in reported alcohol consumption when compared to a control group that did not receive the intervention. However, in both the control and intervention groups reported drinking fell.
10. A cluster randomised trial used a questionnaire to screen 4980 disadvantaged US pregnant women attending six Special Supplemental Nutrition Program for Women, Infants and Children (WIC) clinics and found 345 (6.9%) were drinking post conception. From these women 183 were randomised to receive a brief intervention about alcohol from a nutritionist and 162 were an assessment only control population. Although drinking fell substantially in both the intervention and the assessment only group a statistical model found that the odds ratio for abstinence by the third trimester in women in the brief intervention group was 5.39 (95% confidence interval 1.59 to 18.25) compared to women at similar WIC clinics offering alcohol assessment only.
11. An observational case control study did not find a significant difference in birth outcomes among women given counselling about the benefits of eating sea fish at 20 weeks gestation and women not given this advice.

1.7 References

Anderson, A. S. (2001) Pregnancy as a time for dietary change? Proceedings of the Nutrition Society, 60; 497-504.

Department of Health (1991) Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. Report on Health and Social Subjects no 41. London: H. M. Stationery Office.

Jackson, A. A. and Robinson, S. M. (2001) Dietary guidelines for pregnancy: a review of current evidence. Public Health Nutrition, 4 (2B), 625-630.

Williamson, C. S. (2006) Nutrition in pregnancy. Nutrition Bulletin, 31, 28-59.

2. Background

The 1996 World Food Summit affirmed the 'right of everyone to have access to safe and nutritious food' and asserted that poverty was a major cause of food insecurity throughout the world. National statistics have formally recognized food poverty in Britain for many years, showing that many sections of the population experienced particular health problems, some of which were nutrition related. Of particular concern is that, "pregnant women who live on low incomes have very poor diets indeed: they are more likely to bear low birth weight babies and are less likely to breastfeed their infants" (Dowler et al., 2001a).

2.1 Nutritional requirements and food safety issues during pregnancy

Pregnancy is a time of increased nutritional requirements, for example the total energy cost of pregnancy is estimated to amount to 335 MJ (Jackson and Robinson, 2001). The current recommendation for dietary references values (Department of Health (DH), 1991) outlines the following additional requirements for pregnant women:

- Energy + 0.80 MJ (200 kcals) per day in the last trimester only
- Protein + 6 g per day (though all stages of pregnancy)
- Thiamine + 0.1 mg/ day (last trimester only)
- Riboflavin + 0.3 mg/ day
- Folate + 100 µg/ day
- Folic acid + 400 mg daily supplement during the first trimester (DH, 1992)
- Vitamin C + 10 mg/ day
- Vitamin A + 100 µg/ day
- Vitamin D + 10 µg/ day

For minerals no additional increment is recommended. Iron requirements increase during pregnancy but the absence of menstruation and increase in absorption will for most well-nourished women be enough to meet needs. Pregnancy is also a period of high calcium requirement but evidence suggests that pregnancy and lactation are characterised by physiological adaptive processes that are independent of maternal calcium intake and provide the calcium necessary for fetal growth. In addition it has been recognised that the increase in energy intake will bring with it an increase in many of the vitamins and minerals required (Anderson, 2001).

In order to reduce their risk of exposure to substances, such as food pathogens pregnant women are advised to pay particular attention to food hygiene during pregnancy. They are also advised to avoid certain foods, alcohol and high doses of some dietary supplements (Williamson, 2006):

- Excessive intakes of vitamin A, in the form of retinol, are toxic to the developing foetus and may cause birth defects, therefore pregnant women are advised to limit their intake of vitamin A by avoiding liver and liver products and supplements containing retinol.
- Alcohol consumption in high amounts can be potentially damaging to the developing embryo and may cause foetal alcohol syndrome. The Department of Health advises pregnant women to limit their alcohol consumption to no more than 1-2 units, once or twice a week.

- High intakes of caffeine during pregnancy may increase the risk of low birth weight or miscarriage and therefore pregnant women are advised to limit their intake of caffeine to 300 mg per day.
- Pregnant women are advised to pay particular attention to food hygiene and to avoid certain foods during pregnancy in order to minimise the risk of food poisoning from potentially harmful pathogens, such as listeria and salmonella.
- Pregnant women are advised to consume no more than two portions of oil-rich fish per week, to avoid exposure to dioxins and polychlorinated biphenyls (PCBs). They should also avoid shark, marlin and swordfish, and limit their intake of tuna to prevent exposure to methylmercury, which can be harmful to the developing foetus.
- Pregnant women with a strong family history of atopic disease (i.e. hay fever, asthma, eczema or other allergy) are advised to avoid peanuts during pregnancy

2.2 Nutrition and health outcomes

Epidemiological reviews and analyses of routine data for England and Wales show that there is a link between birth weight and socio-economic status, with a higher incidence of low birth weight (<2500g) among babies born into less privileged households (Macfarlane and Mugford, 2000). The proportion of low birth weight babies is higher among babies born to single mothers, those born in inner city populations and in those who have fathers working in manual occupations. Smoking in pregnancy, a behaviour more common in low-income groups, increases the risk of low birth weight.

Relationships between maternal nutritional status and measurable outcomes such as birth weight are less easily understood. More recent evidence has focused on the impact of under nutrition of the foetus while still in the womb and long-term health outcomes. The 'foetal origins' hypothesis suggests that malnutrition at certain, critical phases of development before, and soon after, birth causes permanent change to structures and metabolic processes. This 'biological programming' is said to lead to impaired function or health in later life (Barker, 1997, Wadsworth, 1999). Babies who are thinner or shorter at birth (but not defined as low birth weight [<2500g]), have been shown to be at greater risk of developing adult non-insulin dependent diabetes or coronary heart disease, especially if they grow poorly in the first year of life and subsequently become obese as adults. They are also at increased risk of raised blood pressure and stroke.

Both the foetal environment and adult risk factors are strongly socially determined. A mother's health during pregnancy depends on her health and experience throughout her life and the full foetal development depends on good placental function, low infection, plenty of exercise, not smoking or drinking alcohol and an adequate diet during pregnancy. All these depend on her family and social circumstances (Dowler et al., 2001b). There is increasing evidence that a mother's nutritional status, which in turn probably depends on patterns of eating and exercise when she herself was a child or teenager, has a long term impact on her baby's health in the womb, soon after birth, and throughout that child's life (Dowler et al., 2001b).

The DH report in 1995, *Variations in Health*, concluded, "we need a life-course perspective on inequalities, that enables us to understand the cumulative effect of differential exposure to health-damaging or health-promoting physical and social environments" (Acheson, 1998). For example, adult height is a good predictor of

coronary heart disease, respiratory diseases and some cancers (Davey Smith and Brunner, 1997, Davey Smith, 2000).

2.3 Dietary intakes

One-off surveys, including data for households identified as 'poor' through social or occupational indicators, have been used to identify food patterns and nutrient intakes for target population groups. The main surveys include the National Food Survey (MAFF), National Diet and Nutrition Surveys (now conducted by the FSA), the Scottish Heart Health Survey, the National Child Development Study and the Health Survey for England.

All surveys have produced consistent findings. Families on lower incomes are more likely than richer families to consume:

- less fruit juice or fruit, fewer fresh vegetables;
- less semi-skimmed milk, lean meat, oily fish, wholemeal products;
- fewer salads;
- more white bread, potatoes;
- cheaper fatty meats and meat products;
- more beans, eggs and chips.

The surveys also suggest that those who are poor in the UK eat monotonous diets with little variation.

In July 2007 a national survey of food and nutrition in low income households was published by the Food Standards Agency. This provided, for the first time, "robust, nationally representative, baseline data on food consumption, nutrient intake and nutritional status and factors affecting these in low-income / materially deprived consumers" (www.food.gov.uk.science). A total of 3,728 people from 2,477 households were included in the survey. It included a face-to-face interview and self-completed questionnaire, four 24-hour recalls of diet on random days (including at least one weekend day) within a 10-day period and physical measurements, indicating height and weight. In addition a blood sample was requested for those aged eight years old and over, to measure indicators of nutritional status.

The results for food consumption were as follows:

- For many foods, the types and quantities eaten by people on low income appeared similar to those of the general population. Where differences did exist, they were often consistent across different age groups.
- Generally, those on low income were less likely to eat wholemeal bread and vegetables. They tended to drink more soft drinks (not diet drinks) and eat more processed meats, whole milk and sugar.
- For men and women, consumption of pasta, pizza, burgers and kebabs, chips, fried and roast potatoes, crisps and savoury snacks and carbonated soft drinks (not diet) decreased with increasing age. Consumption of wholegrain and high fibre breakfast cereals, tended to increase with increasing age.
- The majority of fat spreads used by the low income population were not polyunsaturated.

- Children were more likely than adults to eat sausages, coated chicken and turkey and burgers and kebabs.
- The average number of fruit and vegetable portions eaten daily was: men 2.4, women 2.5, boys 1.6, girls 2.0. Like the general population, this is well below the Government's recommendation to eat at least five portions a day.

The full results of the survey can be found at:
www.food.gov.uk/science/dietarysurveys/lidnsbranch/

In studies carried out in the 1980s, diets of pregnant women from low socio-economic groups were found to be far below the reference values for most nutrients, and especially for iron, vitamins A and C, and folic acid (Harrison and Lang, 1997). Poorer pregnant women were consuming a less varied, less nutrient dense diet than those with adequate incomes. A 1995 survey of food intakes of pregnant women who were living on less than £100 a week found that consumption of breakfast cereals, fruit or vegetables, milk and fruit juice was lower among women spending less on food in general. Low iron intakes considered harmful to good health were identified among over two thirds of the women studied and nearly two in five had very low intakes of folic acid (Dallison and Lobstein, 1995).

The Avon Longitudinal Study of Parents and Children (ALSPAC) estimated the dietary intakes of 11,923 pregnant women in the South West of England (Rogers et al., 1998a). Mean intakes of energy, iron, folate, magnesium and potassium were lower in the study participants compared to the reference nutrient intakes (RNI) for pregnant women. Supplementary vitamin and mineral use during pregnancy were low; iron supplements were taken by less than a quarter (22.5%) of pregnant women before 18 weeks of pregnancy; this percentage nearly doubled by 32 weeks. The corresponding figures for folate supplements were 9% and 18%. Consistent with other studies, there was a strong relationship between difficulty in affording food and the quality of the diet. Those who had least money were more likely than any others to eat chips, sausages, pies and pasties, and less likely to eat green vegetables, salad and fruit or fruit juice.

The Avon study found no evidence that mothers who said they could not afford to buy food subsequently had babies of lower birth weights, unless they smoked. This is consistent with other studies suggesting that smoking may be independently associated with nutrient intakes during pregnancy. Mathews (1999) found a 104g decrease in birth weight among babies of smokers (Mathews et al., 1999); and Godfrey (1996) observed a decrease of 148g (Godfrey et al., 1996). Furthermore, Mathew (1999) found that smokers were also less likely to eat healthily, with even light smokers having poorer intakes of most vitamins and minerals than non-smokers. Only iron and folate acid intakes were improved by supplement use. This study found that the mother's age, as well as smoking status, was an important predictor of the quality of her diet. Younger women were more likely to smoke and had worse diets than older women of similar social class and education levels. For example, intakes of vitamin C and beta-carotene in smokers under 24 years were almost half the levels of non-smokers aged 28 and over.

Using the life-course approach to understanding smoking [and associated dietary] behaviour, Spencer (1996) argues that "birth weight is the end result of a complex process influenced by the women's own diet and experience in childhood, and her present and past social support and level of stress" (Spencer, 1996). "Smoking

cannot be disentangled from the complex of cumulative influences in which the main determinant is social structure..." (Dowler et al., 2001a).

A study of 46 pregnant teenagers aged less than 18 years from seven locations around England (Burchett and Seeley, 2003) found that most of the teenagers consumed too many high salt/ sugar/ fat foods in the 24-hour period analysed. Commonly consumed foods included milk, breakfast cereals (usually sweetened), squashes/ fizzy drinks, white bread and crisps/ bagged snacks. Almost all of the teenagers did not eat enough fruit and vegetables. A nutritional analysis of a sample of participants showed that the majority ate diets that did not meet energy requirements (despite frequent consumption of high sugar/ fat foods). Most ate too much fat (particularly saturated fat), too much sugar and not enough fibre. Insufficient intakes of vitamin A, magnesium, zinc and vitamin C were common. The authors concluded that the nutrition of pregnant teenagers needs more attention.

The Southampton Women's Survey (Southampton Women's Survey, 2005), including almost the whole range of Townsend deprivation scores and a wide range of social groups, aims to characterize the diets of 3000 pregnant women for whom information is also available from pre-conception (Southampton Women's Survey, 2005). Results from this survey are expected to be available in the near future.

2.4 Maternal obesity

The increasing prevalence of obesity in the UK population is of major public health concern. The Health Survey for England showed that the prevalence of obesity in women of childbearing age is increasing, in 2004 around two-thirds of women were either overweight or obese in 2004 (DH Health, 2005). It is now established that maternal obesity is associated with increased complications throughout pregnancy and increased health risks to the mother and her infant (Morin, 1998; Andreasen et al. 2004). These include:

- Chronic hypertension and increased risk of pregnancy-induced hypertension (estimated twofold increased risk)
- Severe pre-eclampsia
- Diabetes and a higher incidence of gestational diabetes
- Obese pregnant women experience more operative interventions, both primary caesarean births and repeat caesarean births
- Increased incidence of labour induction
- Epidural anaesthesia difficulties (i.e. positioning regional anaesthetics or finding arterial or venous access)
- Operative considerations including increased blood loss, total operative time and use of uterotonics
- Increased postpartum wound and endometrial infections
- Postpartum urinary incontinence
- Obese women are more likely to give birth to larger babies (weighing more than 4 kg), however conversely the risk of delivering a small-for-gestational-age infant is also greater
- Increased incidence of congenital malformations and neural tube defects. This increased risk can also be explained by difficulties in visualization when making the ultrasound scan and missing adjustment for weight when measuring biochemical markers.

A scoping study of maternal obesity was recently conducted in the North East of England (North East Public Health Observatory (NEPHO), 2006) as this area reports the highest prevalence of obesity in the country (DH, 2005). This scoping study of maternity units showed:

- Consistent concerns from staff relating to maternal obesity, which covers the whole spectrum of care in pregnancy (for example, equipment issues - adequate beds, wheelchairs, birthing pools, operating tables and weighing scales and the need for additional high dependency care requirements)
- Maternal obesity has a major impact on practice however there is a lack of evidence to base clinical policy
- Difficulties in communicating appropriate health advice to obese pregnant women.

The study recommended a need for further research and the need for a clear policy for dealing with pregnant obese women (NEPHO, 2006).

Existing public health policies

The recent government focus on reducing inequalities in income, health and social experience has generated a number of reports and policy responses. In health, the Acheson Inquiry into *Inequalities in Health* (1998) and the subsequent White Paper, *Saving Lives: Our Healthier Nation* (Department of Health, 1999), highlighted the need for policies and programmes targeting childbearing women and their children, with the specific aim of reducing inequalities in the health of the UK population. These reports recognized the role of an inadequate diet, and called for 'policies to increase the availability and accessibility of food stuffs to supply an adequate and affordable diet' (p65) and the 'further development of policies which will ensure adequate retail provision of food to those who are disadvantaged' (p66) (Department of Health, 1999).

The NHS Plan defined targets to reduce inequalities, including a reduction by 10% in the rate of infant mortality between the highest and lowest income groups in the country (Department of Health, 2000). The *NHS Plan* states that "the role of Government is to ensure people have information and proper access to healthy food wherever they live" (p110). A key initiative directly affecting pregnant women within the NHS Plan is the need to increase fruit and vegetable consumption, through improving their availability and affordability at local levels.

The subsequent Programme of Action (Department of Health, 2003) further planned to tackle inequalities in infant mortality and life expectancy at birth. Key strategies include improving nutrition in pregnancy and the early years; reducing smoking during pregnancy; improving the quality and accessibility of antenatal care and early years support, and supporting teenage parents. The recent public health White Paper, 'Choosing Health' which continues the policy commitment to addressing inequalities in health, gives a high priority to tackling smoking, and also to supporting maternal and child nutrition in low-income groups, primarily through reform of The Welfare Food Scheme into its successor, the Healthy Start Programme (Department of Health, 2004).

The Welfare Food Scheme was introduced in the UK in 1940 as part of the war effort to safeguard the nutritional status of pregnant women and young children (Committee on Medical Aspects of Food and Nutrition Policy and (COMA), 2002). Entitlements for pregnant women include free vitamins in the form of drops or

tablets(Committee on Medical Aspects of Food and Nutrition Policy and (COMA), 2002). Families or expectant mothers in receipt of Income Support or Income Based Jobseekers Allowance receive the entitlements free of charge.

The revised Scheme, under the new name of Healthy Start includes: registration for the scheme at the time of the first antenatal visit through the health care professional; a widening of the nutritional basis of the scheme for new mothers and their babies by the addition of fresh fruit and vegetables to the current entitlement of milk and formula; a fixed-value food voucher to replace the milk token; and a public education and information campaign on the importance of good nutrition.

Information and guidance on breastfeeding and nutrition are available in the Sure Start local programme and Children's Centre areas to all families with young children. Numerous other initiatives targeting improved nutrition for nursery and school children under the Food in Schools Programme may also indirectly benefit those pregnant women with a child at nursery or school by increasing the household resource of nutritious foods. Examples include the National School Fruit Scheme and healthier breakfast clubs and tuck shops in schools.

2.5 Aim of this review

This rapid review examined the evidence about the effectiveness of public health nutrition interventions delivered during pregnancy in primary care and community settings that aim to improve maternal health and birth weight. The review addressed the following questions:

1. What is the effectiveness of food support programmes in improving nutrient intakes among pregnant women?
2. What is the effectiveness of interventions designed to promote the uptake of folic acid supplements in the first trimester of pregnancy?
3. What is the effectiveness of interventions to reduce alcohol consumption during pregnancy?
4. What is the effectiveness of interventions designed to promote the intake of oily fish or omega-3 supplements in pregnant women at risk?
5. What interventions increase the uptake of food safety advice?
6. What interventions increase the uptake of allergy prophylaxis advice?

2.6 References

- Acheson, D. (1998) Department of Health, London.
- Anderson, A. S. (2001) Pregnancy as a time for dietary change? *Proceedings of the Nutrition Society*, 60; 497-504.
- Andreasen, K. R., Andersen, M. L & Schantz, A L. (2004) Obesity and pregnancy. *Acta Obstet Gynecol Scan*, 83, 1022-1029.
- Barker, D. J. P. (1997) In *Diet, Nutrition and Chronic Disease: Lessons from Contrasting Worlds* (Eds, Shetty, P. S. and McPherson, K.) John Wiley & Sons, Chichester, UK .
- Burchett, H. and Seeley, A. (2003) Good enough to eat? The diet of pregnant teenagers. The Maternity Alliance/ The Food Commission.
- Committee on Medical Aspects of Food and Nutrition Policy and (COMA) (2002) Department of Health London (GB).Norwich (GB). : Stationery Office., pp. 169.
- Dallison J and Lobstein T (1995) NCH Action for Children and The Maternity Alliance, London.
- Davey Smith, G. and Brunner, E. (1997) *Proceedings of the nutrition society*, **56**, 75-90.
- Davey Smith, G. S. G., Hart C, Upton M, Hole D, Gillis C, Watt G, Hawthorne V. (2000) *J Epidemiol Community Health* **54** 97-103.
- Department of Health (1991) *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. Report on Health and Social Subjects no 41*. London: H. M. Stationery Office.
- Department of Health Scottish Office Home and Health Department, Welsh Office, Department of Health and Social Services, Northern Ireland. (1992). *Folic acid and the prevention of neural tube defects. Report from an expert advisory group*. London: Department of Health; p. 1-33.
- Department of Health (1999). *Saving Lives: Our healthier nation White paper and reducing health inequalities: a action report*. The Stationery Office, London.
- Department of Health (2000). *The NHS Plan*. The Stationery Office, London.
- Department of Health (2003). *A Programme of Action*. The Stationery Office, London.
- Department of Health (2004). *Choosing Health, making healthy choices easier*. The Stationery Office, London.
- Department of Health (2005) *Health survey for England – trends*. London: Department of Health.
- Dowler, E., Blair, A., Rex, D., Donkin, A. and Grundy, C. (2001a) Health Action Zone.
- Dowler, E., Turner, S. and Dobson, B. (2001b) Child Poverty Action Group London.
- Godfrey K, Robinson S, Barker DJP, Osmond C and Cox V (1996) *BMJ*, **312**, 410-414.
- Harrison, M. and Lang, T. (1997), Vol. 12 Demos Collection, pp. 25-27.
- Jackson, A. A. and Robinson, S. M. (2001) Dietary guidelines for pregnancy: a review of current evidence. *Public Health Nutrition*, 4 (2B), 625-630.
- Macfarlane, A. and Mugford, M. (2000) *Birth Counts: statistics of pregnancy and childbirth*, National Perinatal Epidemiology Unit.
- Mathews, F., Yudkin, P. and Neil, A. (1999) *BMJ*, **319**, 339-343.
- Morin, K. H. (1998) Perinatal outcomes of obese women: a review of the literature. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 27, 431-440.
- North East Public Health Observatory (NEPHO), University of Teesside and Regional Maternity Survey office. (2006) Maternal Obesity and Pregnancy Outcome: a scoping study. Occasional Paper No. 22
- Rogers I, Emmet P and the ALSPAC study team (1998a) *European Journal of Clinical Nutrition*, **52**, 246-250.
- Southampton Women's Survey (2005), Vol. 2005.
- Spencer, N. (1996) *Poverty and Child Health*.

Wadsworth, M. (1999) In *Social determinants of health*(Eds, Marmot, M. and Wilkinson, R. G.) Oxford University Press.

Williamson, C. S. (2006) Nutrition in pregnancy. *Nutrition Bulletin*, 31, 28-59.

World Food Summit (1996) In *World Food Summit* Food and Agriculture Organisation, Rome
www.food.gov.uk/science.

3. Methodology

3.1 Literature Search

Kath Wright (Centre for Reviews and Dissemination, University of York) conducted the searches for this rapid review. The searches began in October 2005, with input from the MCN-CC review team (LDS). Initially, a scoping search was undertaken in order to direct and refine the final search strategy.

The search was conducted using a stepped approach. First, a worldwide search was conducted to identify potentially relevant systematic reviews (from 1995 onwards) followed by randomised controlled trials (1990 onwards) and then other study types (conducted in the UK and published from 1990 onwards). This search aimed to address the following questions:

1. What is the effectiveness of food support programmes in improving nutrient intakes among pregnant women?
2. What is the effectiveness of interventions designed to promote the uptake of folic acid supplements in the first trimester of pregnancy?
3. What is the effectiveness of interventions to reduce alcohol consumption during pregnancy?

In June 2006, an additional search was conducted to identify studies for three new key questions.

4. What is the effectiveness of interventions designed to promote the intake of oily fish or omega-3 supplements in pregnant women at risk?
5. What interventions increase the uptake of food safety advice?
6. What interventions increase the uptake of allergy prophylaxis advice?

As part of the NICE process a final update search is undertaken to identify any relevant publications that might have been recently published. The final update search was undertaken in spring 2007. A report of the databases and search terms used in this rapid review is presented in Appendix C.

In addition to references identified via the formal search of databases members of the Programme Development Group, that being the committee responsible for producing the guidance, and registered stakeholders also suggested references for inclusion. This was done because data bases of references are sometimes incomplete and can lead to important information being missed.

3.2 Selection of Studies for Inclusion

To be included in this rapid review studies must have been undertaken in developed countries and be published in English.

3.2.1 Populations

Included

To be included in the review, a study had to examine interventions targeting healthy pregnant women.

Where data were available, the review considered the following population subgroups:

- Mothers from lower socio-economic groups
- Black and minority ethnic groups
- Mothers aged under 18
- Mothers in lower socio-economic groups
- Mothers living in areas of deprivation including inner city areas
- Mothers from groups that are likely to be at nutritional risk including single mothers, and those who are unsupported, homeless, travellers, refugees or asylum seekers, disabled women, prisoners
- Women who are obese or significantly overweight during pregnancy
- Mothers who smoke during pregnancy

Excluded

Studies of populations with clinical conditions that require specialist advice (for example diabetes mellitus), secondary dietary management or clinical therapeutic advice, where normal care would be inappropriate, were excluded from the review.

3.2.2 Interventions

Included

This rapid review included public health interventions that aimed to improve the diets of pregnant women, their nutrition-related health, and infant outcomes. Studies of interventions that aimed to improve dietary intake among at-risk women such as food supplements, nutrition advice and counselling were included. Studies comparing different strategies of delivering these interventions (nutrition advice) were also included. Interventions promoting the uptake of advice about folic acid, food safety, oily fish / omega-3 consumption and allergy prophylaxis in pregnancy were included. Finally, interventions that aimed to reduce alcohol intake during pregnancy were included.

Participants delivering the interventions could be primary care practitioners such as midwives, Health Visitors, pharmacists, General Practitioners or Nurse Practitioners.

Excluded

Intervention studies that assessed the risk or evaluated the effectiveness of vitamins and mineral supplements were excluded from this review.

3.2.3 Outcomes

The review did not exclude studies based solely upon the outcome measured and the outcomes included depended on the intervention examined. These included:

Primary maternal outcomes

- Dietary intake
- Nutrient and micronutrient intake
- Nutrient status, for example iron status
- Appropriate weight change
- Knowledge, attitudes and beliefs, practices related to healthy eating

- Change in food choice
- Mortality
- Morbidity

Primary birth outcomes

- Mean Birth weight
- Rates of low birth weight

Secondary outcomes

- Pregnancy induced hypertension
- Development of gestational diabetes
- Mode of delivery
- Outcomes in subsequent pregnancies
- Miscarriage/ spontaneous abortion rate
- Views and experiences of childbearing women if reported in intervention studies
- Late outcomes such as development of cancers, hypertension, heart disease, other long term outcomes

In addition when economic data was reported this was included.

3.2.4 Study design

This rapid review included any relevant systematic reviews and randomised controlled trials from any developed country. The review also included intervention studies of other designs, for example non-randomised trials and before and after studies, if they were undertaken in the UK.

3.3 Screening

All studies that were identified by the literature search were screened for inclusion in the review. Any study that was not published in English was excluded from the review.

The initial phase of screening involved an inspection of all citations found by the literature searches. These citations were screened for relevance to each of the review questions. Those that were obviously not relevant were excluded. For those that were considered to be potentially relevant a copy of the study papers were obtained and assessed.

In addition, to the formal search strategy the NICE process allows stakeholders and members of the Programme Development Group committee to suggest additional material that might be relevant. Any suggested material was screened for relevance using the same process as that for material identified via the formal search strategy. The studies that passed the initial screen excluded with reasons for exclusion is presented in Appendix B.

3.4 Quality Appraisal

All of the studies that met the inclusion criteria were critically appraised by two reviewers in accordance with criteria described in NICE (2006). A study was graded using a code '++', '+' or '-', based on the extent to which the potential sources of bias

had been minimised. If there was any discrepancy in a grade given to a study by the two reviewers, the opinion of a third reviewer was sought. The NICE criteria and the methodology checklist used in this review are presented in Appendix D. It is noted that these grades reflect the quality of the author's reporting of their study.

3.5 Assessing applicability

Each included study was assessed to determine its applicability to UK settings. Notes on applicability are presented in the data extraction tables. In addition, a search was conducted for non-randomised UK studies from 1990 onwards to identify additional relevant studies.

3.6 Synthesis

Due to heterogeneity of design among the studies, a narrative synthesis was conducted.

4. Summary of Findings

4.1 Review of Literature

A total of 21,147 citations were identified via the search strategy and screened. Overall after removal of 90 duplicates, the searches for Systematic Reviews, Randomised Control Trials and UK studies identified 86 systematic reviews, 3512 RCTs and 17,459 UK studies. Inspection of these resulted in the retrieval of full paper copies of 34 systematic reviews, 4 randomised controlled trials and 16 studies of other designs. These were assessed and three systematic reviews, two randomised control trials and four UK studies of other designs were included in this review. Update searches identified a further systematic review and two randomised trials that were also included. In addition, a randomized control trial was identified by a member of the Programme Development Group and was included. Therefore this rapid review appraised four systematic reviews unpicking the relevant content from the studies included in those reviews, five randomised control trials and four UK studies of other design. Full references of the included studies are listed in Appendix A. Citations and reasons for exclusion are listed in Appendix B.

4.2 Key question 1

What is the effectiveness of food support interventions on maternal dietary intake?

Food support interventions can include studies of food supplements, nutrient supplements, nutrition education, counselling or advice, and complex health and social care interventions incorporating a nutrition element. To clarify the question being answered, key question 1 was divided into three questions that will be addressed using the evidence. The first is about educational interventions, the second is about the provision of food vouchers or incentives to purchase food and the third is about other types of interventions.

1a) What educational interventions that are aimed at all pregnant women or are targeted at a defined group of pregnant women, for example, low income or ethnic minorities are by themselves effective in improving dietary intake and nutritional status?

The evidence comes from two systematic reviews that looked at all pregnant women (van Teijlingen 1998 +) and (D'Souza 2005, +) and a recent systematic review which looked at interventions in pregnant adolescents (Nielsen et al 2006+). Each of the reviews had different inclusion criteria and considered different review questions. The van Teijlingen review's main question was: do women of childbearing and women who are pregnant change their dietary knowledge, attitudes and /or behaviour in response to specific interventions? The main question for the D'Souza review was about food support for pregnant women on low incomes and for the Nielsen review the main questions were: To what extent have nutrition education interventions targeting pregnant adolescents been tested? What are the effects of such programs? What further research is needed?

The van Teijlingen review included four intervention studies on pregnant women of which three included educational information to improve nutrition during pregnancy.

These three studies were randomised control trials undertaken in Greece (Kafatos 1989 -) and the USA (Sweeney 1985 -) and a non randomised control trial undertaken in Scotland (Anderson 1995+). The D' Souza review includes eight studies of nutrition advice the Kafatos and Sweeney studies and one non randomised control trial undertaken in the UK (Doyle 1992+) and five studies undertaken in the USA a randomised control trial (Hunt 1976 -), three non randomised control trials (Briley 2002 -), (Long 2002 -) (Widga 1999 -) and one before and after study (Gray-Donald 2000).

The van Teijlingen and D'Souza reviews criticised many of the studies that met their inclusion criteria pointing out important methodological flaws in their design. Some of the studies that investigated educational interventions were small and also flawed, for example the Briley study is based on an inadequate sample size of 27 and the Sweeney study on one of 43. These studies provide no worthwhile evidence.

The van Teijlingen review reported that there was some evidence to suggest that educational interventions have a modest effect but much of this evidence was flawed. The review concluded that there was a dearth of research in this area and that high quality research was needed. The D'Souza review found moderate evidence that studies of nutrition advice/counselling that aimed at improving the intakes of women with poor diets during pregnancy showed increases in the maternal intake of protein, vitamins and calcium, and reduction in the proportion of women with low levels of dietary calcium, ascorbic acid and riboflavin. The review also found that nutrition counselling did not result in reduction in rates of low birth weight, or increase gestational age at birth, head circumference or length at birth.

The applicability to UK women of the D'Souza review finding that counselling or advice can improve intakes of protein, vitamins and calcium, and a reduction in the proportion of women with low levels of dietary calcium, ascorbic acid and riboflavin is not certain. The main study underpinning this finding was that undertaken by Hunt. This was a reasonable quality randomised control trial and was given a + rating, but was undertaken on Mexican immigrants in the USA in 1976. Consequently the transferability of the findings of that study to a modern UK setting is questionable.

Across these two reviews the interventions varied considerably as did the populations studied. For example the reviews included studies in populations as diverse as Cree Indians on a reservation in Canada and rural Greek women. The applicability of the findings from these non-UK studies to UK women must be doubtful and consequently no evidence statements were generated. Two UK studies were included in these reviews and these offer evidence that is transferable to the UK setting these were a non randomised trial in Scotland which was rated 2+ (Anderson 1995) and a non randomised trial in the East end of London which was rated 2+ (Doyle 1992).

In the Anderson study 328 women were recruited. The control population received usual care which included nutrition advice and women in the intervention group received usual care and also a nutrition education pack from the midwife at study entry. The intervention group then received a second pack posted to them at 26 weeks gestation. At 30 weeks both groups were invited to fill in specific questionnaires about food knowledge and attitudes and record their food intake. The intervention group had higher scores for knowledge but did not score higher for attitudes about good nutrition or for their reported nutrition.

In Doyle's study the control population received no intervention and usual care and women in the intervention group had 3 weekly dietary counselling during the second and third trimester either alone or along with two different types of food supplement. There were no differences in outcomes between the intervention groups that received and did not receive food supplements. However there was a small but statistically significant impact on the birth-weight of babies born to the intervention group as a whole when compared to the control group.

Evidence statement 1

A non-randomised control trial in Scotland (Anderson 1995+) demonstrated that written educational materials aimed at improving knowledge practical skills and diet of pregnant women provided to pregnant women at an initial meeting during the first trimester and again with an accompanying personalised letter at six months gestation produced a small but significant increase in women's nutrition knowledge but failed to improve women's attitudes about diet or their reported nutrition.

Evidence statement 2

A non-randomised trial in London (Doyle 1992 +) comparing intervention groups that received multiple episodes of nutrition counselling alone or with two different types of food supplement during the second and third trimester to a control group found no significant differences among the groups when measuring maternal weight gain, length of gestation, babies head size or babies length. The study found a small but statistically significant increase in the mean birth-weight of babies born to women in all intervention groups combined compared to women in the control population.

The Nielsen review (2006) looked at studies that included pregnant adolescents. The review by Nielsen (2006) comprehensively searched the literature and had a low threshold for inclusion of studies and is likely to have identified all relevant studies. The review did not formally critically appraise the methodology of each included study but instead passed comment on the selected studies. It was therefore graded as a + review and not a ++. The lack of full critical appraisal is unlikely to have biased the overall conclusions or the main general findings of this review. In the timeframe available it was not possible to independently assess all the included studies and give them a NICE quality rating.

The Nielsen review (2006) included 27 articles which were reviewed in two groups, those that were controlled trials and those that did not have an adequate control group. Nineteen studies were identified that had a control population of which 13 targeted teenagers and six included them. All these studies were undertaken in North America; 18 in the USA and one in Canada.

There was heterogeneity among the studies in populations included, types of interventions, year in which study took place and study design. Four intervention models were identified among these 19 studies. These were enhanced pre-natal care which aimed to address the special psychological and nutrition needs of adolescents (seven studies), pre-natal care supplemented with health education classes (seven studies), home visits (three studies) and nutritional prescriptions (two studies).

Outcomes measured in the 19 studies varied. Twelve studies examined mean birth weight; six found significant improvements in the intervention group compared to the

control group. Sixteen studies investigated low birth weight; nine found significant improvement in favour of the intervention group. Nine examined gestational weight gain but only two found significant increases in the intervention group. No studies examined the risk of excessive weight gain. Four studies examined and detected dietary changes in the intervention group.

Enhanced pre-natal care

Of the seven studies considered three found a significant positive effect in their intervention groups compared to their control groups and four did not. One study (Hardy, 1987) was identified as having a successful intervention. This was intensive and individualised and orientated specifically towards adolescents. The mean gestational weight gain was significant 13.1 kg compared to 10.7 kg and the intervention group had fewer babies of low birth weight.

Pre-natal care with health education

Six of the seven studies reported at least one significant benefit for women in the intervention group compared to the control group. The review notes that most interventions provided nutrition education along with other topics which made it difficult to assess the relative importance of nutrition education. Only one of the studies was based explicitly on a theoretical model of behaviour change. This study found a benefit for the intervention when compared with historical controls but not when compared with geographical controls.

Pre-natal care with home visits

The three studies reported some benefits but all three had methodological problems which made it difficult to draw any conclusions

Nutrition prescriptions

Two studies used nutrition prescriptions which involved assessing the participants nutrition risk and then prescribing increased intakes of nutrients. Both studies found positive outcomes. The first study concluded that outcome of teenage pregnancy when managed in a specialized antenatal program resembles the patterns associated with young adults rather than the outcomes of teenagers in a general clinic. Three factors were believed to be important: early prenatal care, nursing management in primary care, and special and consistent emphasis on adequate nutrition. Outcomes were significantly enhanced regarding infant weight and gestational age scoring, 1 and 5-minute Apgar scores, fewer intensive care admissions, and shorter hospital stays when compared to the general clinic experience. These conclusions were based on a retrospective analysis of records of 579 pregnant teenagers over a 4-year period (1976-1979) who attended the Young Women's Clinic or the University obstetrics clinic, and a group, age 20-25, also receiving care at the University obstetric clinic (2655 women). The second study provided milk, eggs and prenatal vitamins in addition to the counselling. Compared with the control population the intervention population had significantly lower rates of low birth weight and very low birth weight babies.

The review concludes that the evidence from controlled trials for the positive influence of prenatal nutrition interventions with adolescents is modest but encouraging. The reviewers suggest greater effects could be achieved by applying behaviour change strategies that have been implemented successfully with other,

similar populations, and propose further research to test such approaches with pregnant, high-risk teens.

Evidence statement 3

A systematic review of studies which included a nutrition education component and adolescents in the target audience included 29 studies of which 19 had a control population and found that the majority of studies measured distal outcomes such as low birth weight and gestational weight gain and detected improvements in these outcomes in the intervention groups but it was not possible from the data collected to measure the independent contribution of the nutrition component of the intervention. This review found only one study that had evaluated a nutrition intervention that was based on a theoretical model of behaviour change.

1b) Do interventions that include the provision of food, vouchers or incentives to buy specific foods, improve pregnancy outcomes and/or the dietary intakes and nutritional status of pregnant women?

The evidence to answer this question comes from evaluations of the WIC programme in the USA that have been reported in a systematic review (D'Souza 2005, +) and also from a more recent study from Finland (Piirainen et al. 2006, 1+).

The website <http://www.fns.usda.gov/wic/aboutwic/wicataglance.htm> describes the WIC programme. In brief the target population are low-income, nutritionally at risk and include: pregnant women; breastfeeding women; non breastfeeding postpartum women; infants (up to 1st birthday) and children up to their 5th birthday.

The following benefits are provided to WIC participants: supplemental nutritious foods; nutrition education and counselling at WIC clinics and screening and referrals to other health, welfare and social services.

WIC operates through 2,000 local agencies in 10,000 clinic sites, in 50 State health departments, 34 Indian Tribal Organizations, the District of Columbia, and five territories (Northern Mariana, American Samoa, Guam, Puerto Rico, and the Virgin Islands).

WIC services are provided by: county health departments; hospitals; mobile clinics (vans); community centres; schools; public housing sites and migrant health centres and camps.

The D'Souza review reports that studies evaluating the US Special Supplemental Nutrition Programme for Women, Infants and Children (WIC) showed that prenatal WIC participation offering food supplements and (optional) nutritional counselling increased maternal dietary intake of energy, protein, minerals and vitamins, weight gain in pregnancy, head circumference and mean birth weight of babies born to women who smoked heavily during pregnancy. Energy intake was higher among heavy smokers compared to non-smokers receiving the food supplement. Earlier and longer WIC participation enhanced the beneficial effect on maternal weight gain, particularly among women who had low pre-pregnancy weight and poor early pregnancy weight gain. However the D'souza review found no evidence that prenatal WIC participation reduced rates of low birth weight.

The D'Souza review bases much of their evidence on a large randomised evaluation of WIC undertaken by Rush and colleagues (Rush 1988) which is given a ++ rating. Unfortunately this study has two flaws that might lead to important bias. The first is that a quarter of the control population enrolled in WIC and had to be excluded from the analysis. The impact of this self selection is unknown. The second is that information from hospital delivery records was unavailable for 25% of the study population. This study was therefore graded with a minus to indicate these flaws and no evidence statements were produced from this study.

A WIC study by Metcoff is also included in the D'Souza review. This study compares two groups of women who were assigned as being at risk of low and high birth-weight babies. The decision to exclude women believed to be likely to have a normal birthweight baby from the study is unusual but as it happened prior to randomisation it probably has not biased the findings the study is therefore graded as a + study. In the Metcoff study women in the intervention group received WIC Vouchers exchangeable for milk, eggs and cheese providing 40-50g/day protein and 900-1000kcal/day. Women in the control population did not get these vouchers. The study measured birth outcomes and maternal weight gain. It found that the intervention increased maternal weight gain but did not significantly effect the proportion of babies of low birth weight or the mean birth-weight. The Metcoff study recruited women at mid-pregnancy and therefore offers no evidence about the impact of food support throughout a whole pregnancy.

Evidence statement 4

One randomised control trial found no significant increase in the mean birth weight of babies or a significant reduction in low birth weight babies born to women recruited into the USA's WIC programme at mid-pregnancy compared to women in a control population who received no free dietary supplements.

Evidence statement 5

One randomised control trial found a statistically significant maternal weight gain among pregnant women recruited into the USA's WIC programme at mid-pregnancy compared to women in a control population who received no free dietary supplements.

This rapid review did not include any economic evaluations of WIC and no firm statement can be made about the cost-effectiveness of WIC.

A recent study undertaken in Finland (Pirainen et al. 2006 +) recruited 231 pregnant women at their first visit to a maternal welfare clinic in Turku South West Finland and randomised then into an intervention group and control group in a ratio of approximately 2:1. At each of the three study visits women in the intervention group received dietary counselling and foods. The counselling was designed to modify dietary intake to that recommended at the time of the study. Particular attention was given to the amount and type of fat in the diet. The intervention group were encouraged to increase their consumption of vegetables, fruits and wholegrain bread and cereals and to consume low fat cheeses and milk and use soft margarine as a

spread. Individual practical dietary advice was also provided. The foods provided to the intervention group were low fat spreads, salad dressing etc and high fibre alternatives including muesli, spaghetti, cereals. The control group received usual clinical care.

In the Piirainen study food and nutrient intakes were assessed using 3-day food diaries at each trimester. The subjects were given personal and written instructions about how to fill the food diaries. The study found no significant differences between the control group and the intervention group in pregnancy outcomes. However changes in foods eaten were detected only in the intervention group. During the course of the pregnancy the intervention group increased their intake of vegetables, fruits, soft margarine, and vegetable oils and lowered their intake of butter.

Evidence statement 6

One randomised trial + in pregnant women attending a welfare clinic in Finland found that an intervention involving the provision of healthy foods and advice delivered three times during pregnancy improved some nutritional outcome measures, but did not lead to a significant difference in pregnancy outcomes between the intervention and control groups

1c) What interventions other than those with food supplements either by themselves or in addition to counselling and educational support are effective in improving the dietary intake and nutritional status of pregnant women?

The studies considered were identified by the D'souza systematic review (D'souza 2006 +). Two randomised control trials were identified that evaluated home support. The first study was of African American women and was graded 1+ (Graham 1992). In this study women attending a clinic were initially screened for family stress and their need for support. Those included in the study were randomised to a group that received peer support from trained members of their peer group at four home visits during the second and third trimesters. The support included psychosocial support and encouragement to the family to increase support to the mother, to be present for the home visit, clinic visits, maternity classes and delivery; efforts to reduce family stress by referral to community services and acting as an advocate when needed; information about health risks of smoking and alcohol and referral to groups for cessation; increased awareness of community resources; and nutrition education and information about prenatal care and birth. The study evaluated birth outcomes in the control and intervention groups and found no significant difference in the proportion of babies of low birth-weight.

Evidence statement 7

One randomised control trial in the USA with pregnant inner city black women found that four home visits during the second and third trimester from a woman of a similar peer group who was trained to deliver a complex intervention including psychosocial/social support, nutrition education and referral to other services found no statistically significant impact on the rates of low birth weight compared to a control population receiving usual care.

The second study targeted young mothers and was undertaken in the Appalachian region of New York State (Olds 1986). The study was a four armed trial with

complex interventions including efforts to give up smoking, nutrition counselling and practical help to pregnant women. Group 1 (Control) received health & developmental screening for the child at age 1 and 2 years; Group 2 (Control) received health & developmental screening for the child at age 1 and 2 years plus free transportation to regular prenatal and well child clinics; Group 3 (Intervention) Health & developmental screening for the child at age 1 and 2 years plus free transportation to regular prenatal and well child clinics plus prenatal nurse home visits and Group 4 (Intervention) health & developmental screening for the child at age 1 and 2 years plus free transportation to regular prenatal and well child clinics plus prenatal nurse home visits plus nurse home visits during child's first two years.

The intervention group received an average of 9 home visits made during each pregnancy. These spanned the prenatal period until the child was 2 years old. Visits encouraged prenatal social support; participation in other services including WIC; over two thirds of visit time was spent on nutrition education.

The Olds' study found no significant difference in the mean birth weight of babies or rates of low birth weight between intervention and control groups and no significant difference in maternal weight gain between intervention and control groups. The study also reports significantly lower rates of premature delivery in smokers in the intervention groups, significantly greater use of WIC vouchers in the intervention group and significantly more women stopped smoking in the intervention group.

The findings of this study need to be treated with some caution because the study does not present a power calculation. Many of the group sizes were small and the sub-group analysis was based on small numbers. The study was therefore given a minus grading and no evidence statement was produced.

Key Question 1 Corroborative evidence

Reference	Practice points
Macpherson 2003	<p>The Best Fed babies project gave mothers £50 per month for ≤6 months antenatally and, if they breastfed, continued for 3 months postnatally. Vouchers could only be used in participating stores and redeemed against 'food' items excluding baby foods. The aim was to reduce the incidence of low birth weight babies.</p> <p>Points for practice for health professionals</p> <ul style="list-style-type: none"> • Method required to identify mothers receiving vouchers in general caseload • Post codes may not fully identify the target group for such an intervention • Routine needed for registration of mothers into the programme to avoid delay in receiving vouchers • Clear system required for hand over between midwives and health visitors • Good system required to identify still births and avoid distress • Link the scheme to other relevant initiatives in the area • Regard the scheme as part of a wider process <p>Practice points for participating stores</p> <ul style="list-style-type: none"> • Ensure everyone in the store knows about the scheme and how it works • Make sure that all store operators know how to process the voucher (as it differs from other vouchers) • Make sure that all operators know what the vouchers can and cannot be used for • Get the right level of detail about the intent of the scheme from the start <p>Practice points for participating women</p> <ul style="list-style-type: none"> • Make sure all the staff in the stores know about the vouchers • Advertise the scheme in the stores <p>Give more detailed information about what not to eat and what is safe to eat</p>

Wrieden 2003	<p>Intervention was a nutritional education programme for teenage pregnant women (16-18 y) many of whom were from disadvantaged backgrounds. Two midwives trained (3 h) and a research assistant assisted with practical work and assessed results. The package included 7 informal food preparation sessions, which allowed for discussion of nutritional and other topics such as pregnancy problems. The women cooked a wide variety of dishes and were given recipes and food and nutrition fact sheets.</p> <p>Due to recruitment problems (10 women, only 8%), a 1-day course was offered using material from the longer course, which provided a further 6 subjects.</p> <p>General points for practice</p> <ul style="list-style-type: none"> • Midwives found the course easy to follow and use • Attending women found the course helpful <p>An objective evaluation of the course was not possible due to poor compliance. (Only 3 post intervention interviews were completed.) In addition the women appeared to have difficulty completing a food frequency questionnaire. The authors noted that one incentive for attending such courses could be the provision of ingredients free of charge.</p>
-----------------	--

4.3 Key Question 2

What is the effectiveness of interventions designed to promote the uptake of folic acid supplements in the first trimester of pregnancy?

To answer key question two it was broken up into four component questions which related to; a) increasing awareness, b) increasing intake of folate, c) increasing uptake of folic acid supplements and d) increasing knowledge among health care professionals.

2a) What interventions are effective in increasing awareness and knowledge among pregnant women of the recommended daily intake of folate and folic acid?

No randomised trials were found that attempted to increase awareness about folic acid among women that were already pregnant. The crucial period for preventing neural tube defects is the early stages of pregnancy. Therefore awareness campaigns focus on the need to take folic acid around the peri-conceptual period. The HEA folic acid campaign (HEA 1998) and a randomised community trial in Australia (Watson 1999) have been described in the preconception review and these indicate that widespread media campaigns are successful in increasing awareness.

2b) What interventions other than folic acid fortification of food are effective in increasing dietary folate intake of pregnant women?

No randomised trials were found that attempted to increase intake of folate rich foods in pregnant women.

2c) What interventions are effective in increasing the uptake of folic acid supplements in pregnant women?

The evidence to answer this question comes from a systematic review, a well conducted randomised trial from the USA and a large multi-intervention public health campaign in England. The evidence comes from interventions aimed at women who are not yet pregnant and evidence statements about folic acid were included in the preconception review.

The systematic review by Ray (Ray 2004 +) is included in the preconception review. It provides evidence of the effectiveness of folic acid awareness campaigns. The review included four studies of folic acid public health campaigns (HEA 1998, van der Pal-de Bruin 2000, Chan 2001, de Walle 2002). An evaluation of the UK Health Education Authority campaign to increase public and professional's awareness of, and access to folic acid foods and supplements through television and magazine announcements found that periconceptual folic acid use increased from 27% to 48% (RR 1.8, 95% CI 1.3, 2.4) as a result of the campaign. A study evaluating a media campaign about the use of folic acid in the Netherlands in 1995 aimed at women planning to conceive and their healthcare professionals, found that periconceptual use of folic acid increased from 4.8% to 21% (RR 4.4, 95% CI 3.5, 5.6). This campaign included personal letters sent to health care professionals. Another study evaluating the 1995 Netherlands campaign which focussed on low-income women found that periconceptual use of folic acid increased from 5% to 36% (RR 7.2, 95% CI 4.4, 11.6). A study evaluating the South Australian 'Folate before pregnancy' campaign involving telephone messages, leaflets, newspaper announcements and occasional television announcements for the public found that folic acid use increased from 27% to 46% (RR 1.7, 95%CI 1.3, 2.3). None of the campaigns included in this review resulted in rates of consumption of folic acid supplements of over 50%.

The HEA Folic Acid Campaign was a £2.3 million national public education campaign to increase awareness of the importance of taking additional folic acid before and until the 12th week of pregnancy. It ran for three years between 1996 and 1998 and initially focused on women planning pregnancy. In its second year, activity broadened to include all women of childbearing age with the aim of increasing awareness of the benefits of folic acid for possible pregnancies which could be some years away. Young people were the target of further public education in the third year of the campaign. An evaluation of its impact on purchasing and prescribing folic acid compared rates at the beginning of the campaign to those achieved in the middle of the campaign. Eight months after the start of the campaign sales of 400mcg folic acid supplements were 40% higher. Sixteen months after the start of the campaign sales of 400mcg folic acid supplements were 47% higher (HEA 1998 +). Prescription rates of 400mcg folic acid in England were 55% higher in the third quarter of 1997 than at the start of the campaign

A trial in women who were not pregnant (Robins 2005+) which was described in the pre-conception review found that counselling by a physician accompanied by free folic acid supplements was effective in increasing uptake of folic acid supplements. (For interested readers the evidence table from this trial is repeated in this review.)

2d) What interventions are effective in increasing health professionals knowledge and awareness about recommendations for folate and folic acid in pregnant women?

The evidence to answer this question comes from the large multi-intervention HEA public health campaign in England (HEA 1998 +). The campaign targeted women and a range of health professionals. The impact of the campaign on health professionals was appropriately evaluated using quantitative questionnaires and some qualitative interviews.

The campaign used multiple methods to increase awareness these included publications, advertising, media work and professional seminars. The target audience

was dieticians, family planning doctors and nurses GPs, health promotion specialists health visitors, midwives, nutritionists, obstetricians, pharmacists, practice nurses, public health professionals school-based professionals and others in contact with young people.

The campaign among health professionals was evaluated using two quantitative surveys. Approximately 600 professionals were interviewed in 1996 before the campaign. The health professionals were recruited in equal numbers rather than weighted in terms of numbers in the workforce. Therefore the sample is not representative of all the target professionals. A second survey of approximately 1100 professionals was undertaken in 1997 and provides follow-up.

When asked about advice to women planning a pregnancy 55% of those surveyed in 1996 and 71% in 1997 spontaneously mentioned folic acid. The campaign was successful in raising awareness among health professionals about the need for folic acid supplements in women planning a pregnancy but only raised the proportion of health professionals that would spontaneously mention folic acid to pregnant women from 36% to 39%. There was also evidence that after the campaign many health professionals were unclear about the correct dosage and duration.

4.3.1 Corroborative evidence for folic acid

Reference	Practice points
Buttriss 2004	<p>This paper is an overview of strategies to increase folic acid/ folate intake in women</p> <ul style="list-style-type: none"> • Campaign (such as UK HEA) needs to target the public particularly women planning a pregnancy and childbearing women likely to have children in the future + health care professionals + school teachers + the commercial sector • Multi-component intervention to consist of advertisements in the national media + a labelling scheme for folic acid fortified foods • Authors state that achieving sufficient folate intake through dietary change is impractical in the absence of fortified foods
Elkin 2000	<p>Women with a viable singleton pregnancy of <20 weeks had their dietary intake of folic acid, intake of folic acid supplements, serum folate and knowledge of the recommendations for folic acid intake determined. 3 groups included: women with an uncomplicated obstetric history who had not given birth to a live infant since 1992 (Group 1); women with an uncomplicated obstetric history who had given birth to a live infant since 1992 (Group 2); and women who had experienced recurrent miscarriage or 2nd trimester pregnancy losses (Group 3). In 1992 the UK Department of Health advised that to prevent the occurrence of neural tube defect all women should increase their folate consumption by 400 µg in the periconceptual period. Subsequently, there was a major campaign by the HEA to improve awareness and implement the recommendations which stopped in 1998. The study found that only 25% of women with an uncomplicated obstetric history and 51% with a complicated obstetric history took supplements for the recommended time period (before conception and during the 1st 12 weeks of pregnancy). The authors recommended:</p> <ul style="list-style-type: none"> • Less emphasis should be placed on increasing intake of dietary folate • The use of folic acid supplements should be encouraged, particularly periconceptionally. • HEA literature regarding folic acid is only available in English at present and should also be available in other languages, particularly Indian and Pakistani languages since folate deficiency is more common in women of Indian and Pakistani origin. • Since at least 30% pregnancies are unplanned, fortification of selected foods consumed by women may be the only worthwhile way to prevent neural tube defects

(as in the US). Fortification should be with folic acid, the oxidised and more bioavailable form of folates, together with vitamin B12. Fortification may give health benefits for the whole population but there may also be unknown side effects including the theoretical problem of masking megaloblastic anaemia.
--

4.4 Key question 3

What is the effectiveness of interventions to reduce alcohol consumption during pregnancy?

In addressing the issue of alcohol consumption during pregnancy the wording of the key question was altered to make it clear that the interventions of interest were those applicable to the general population of pregnant women. The review found evidence to answer the following question: Excluding interventions that are aimed specifically at problem alcohol users what interventions are effective in reducing alcohol intake among the general population of pregnant women?

Evidence to answer this question comes from a systematic review (Schorling 1993 +) and two randomised trials (Chang 2005 +) and (O'Conner 2007+). Two other trials were identified but these trials had flaws and were given a minus rating (Chang 1999-) and (Reynolds 1995 -). The Chang 1999 study had no power calculation and no difference was found between the two groups. In this study both the control and intervention groups had a comprehensive alcohol assessment, and drinking fell in both groups. It appears likely that for both groups participation in the study and the overall focus on alcohol had a stronger effect than the intervention. The Reynolds study had no power calculation and a small sample size.

The systematic review by Schorling aimed to critically review studies that evaluated prenatal education and counselling to reduce alcohol intake in pregnant women. Five relevant studies were identified, none of which were randomised and only two compared a treatment group with a control group. The authors reported that only one study was of acceptable quality. The majority of participants reduced their alcohol intake or abstained by the end of pregnancy. This was even more so for women who drank more than 10 grams of absolute alcohol per day. Similar reductions were also seen in the control groups of the two studies which had control groups. The authors state that it appears that a simple message or a public health campaign may be sufficient to lead to a reduction in alcohol consumption for the majority of pregnant women that drink.

A randomised control trial conducted in the US (Chang 2005+) tested the effectiveness of a single brief intervention with pregnant women at risk for prenatal alcohol consumption and their partners. The session for each couple consisted of knowledge assessment with feedback, contracting and goal setting, and behavioural modification. Prenatal alcohol use declined in intervention and control groups after study enrolment. The study found no statistically significant difference when comparing the control group with the intervention group. However, the intervention reduced subsequent alcohol use most significantly among women with the highest consumption initially ($p < 0.01$). The effects were enhanced when a partner participated ($p < 0.05$). It is notable that women and their partners were from higher socio-economic backgrounds. The study appears to be well run with no obvious flaws and again found large reductions in reported alcohol consumption in both the control and intervention groups. It is not possible to know if alcohol consumption falls

naturally as pregnancy progresses or if being involved in a study is a factor (Hawthorne Effect).

A recent cluster randomised control trial undertaken in the US (O'Conner 2007+) evaluated a brief intervention among pregnant women who were current drinkers. Current drinkers enrolled for prenatal care at these centres received the same comprehensive assessment of alcohol use plus a standardised workbook-driven brief intervention, designed specifically to help women reduce alcohol consumption during pregnancy. The brief intervention was delivered as 10- to 15-minute sessions of counselling by a nutritionist. The authors note that women in both intervention and assessment groups reduced their drinking substantially.

The study ran a regression model and found that compared with women in the assessment-only condition, women in the brief intervention condition were 5 times more likely to be abstinent by the third trimester (odds ratio [OR] = 5.39; 95% confidence interval [CI] = 1.59, 18.25

It is important to note that in the O'Connor study the eligible study population were pre-screened for alcohol use and only 369 out of 4980 (7.5%) were enrolled.

Evidence statement 8

Studies undertaken in the USA and Europe have consistently found that women enrolled into studies that measure self reported alcohol consumption during pregnancy reduce their reported alcohol consumption as pregnancy progresses. This is found in both control and intervention groups.

Evidence statement 9

A randomised control trial evaluating a brief intervention from a trained counsellor to reduce alcohol consumption among pregnant women who were drinkers involving goal setting and including a woman's partner did not lead to a significant reduction in reported alcohol consumption when compared to a control group that did not receive the intervention. However, in both the control and intervention groups reported drinking fell.

Evidence statement 10

A cluster randomised trial used a questionnaire to screen 4980 disadvantaged US pregnant women attending six Special Supplemental Nutrition Program for Women, Infants and Children (WIC) clinics and found 345 (6.9%) were drinking post conception. From these women 183 were randomised to receive a brief intervention about alcohol from a nutritionist and 162 were an assessment only control population. Although drinking fell substantially in both the intervention and the assessment only group a statistical model found that the odds ratio for abstinence by the third trimester in women in the brief intervention group was 5.39 (95% confidence interval 1.59 to 18.25) compared to women at similar WIC clinics offering alcohol assessment only.

4.5 Key question 4

What is the effectiveness of interventions designed to promote the intake of oily fish or omega-3 supplements in pregnant women at risk?

Only one study was found which was related to this question. This was a case control study undertaken in a clinic in London (Odent et al. 1996 +). Cases were 499 women undergoing prenatal care in an East London Hospital between January 1991 and December 1992. Controls were the next woman on the birth register with the same parity as a case. All controls were women that did not receive the counselling but did attend for prenatal care. The cases received a counselling session of approximately 20 minutes duration at a hospital antenatal clinic before 20 weeks gestation. The session covered women's current diet, their likes and dislikes and explained the benefits of eating oily fish. An objective was to raise consciousness about fetal growth and the needs of the developing brain. The women were advised to reduce intake of transfatty acids found in biscuits and cakes and increase their intake of oily fish. According to the women's tastes and needs they were offered a selection of printed recipes for oily fish dishes. The controls received no dietary intervention.

The study was unable to demonstrate that advice to eat fish resulted in important improved pregnancy outcomes. Birth weight was slightly higher 3349g compared to 3284g but not significantly, neonatal head circumference was slightly greater 34.65cm compared to 34.45 which was statistically significant and gestational age at delivery slightly later 39.57 weeks compared to 39.44 weeks.

The study used a simple intervention and was on the whole adequately undertaken. The only significant difference was for head circumference. However no power calculation is reported so it is unclear if the lack of effect found was due to the study being underpowered. Two other possibilities for a lack of effect are that the dietary counselling had little or no impact on fish eating or that increased fish consumption after the early stages of pregnancy has little impact on the outcomes measured.

A questionnaire was given to 40 random cases that received the intervention. Of which 39 completed; 32 mentioned that they ate more fish; 19 mentioned that they had eliminated certain foods; 13 claimed the advice had influenced their breakfast habits and five claimed it had no influence on their eating habits. The questionnaire data offers some weak evidence that counselling has an impact on some women's dietary behaviour.

Evidence statement 11

An observational case control study did not find a significant difference in birth outcomes among women given counselling about the benefits of eating sea fish at 20 weeks gestation and women not given this advice.

4.6 Key question 5

What interventions increase the uptake of food safety advice?

The search strategy found no studies that had evaluated different ways of providing food safety advice to pregnant women. Given the importance of food safety during pregnancy this appears to be an area where research is required. A study from the USA was identified that did not make the inclusion criteria for this rapid review. This study indicated that warnings about the mercury content of some types of fish resulted in a fall in fish consumption in the USA (Oken E. Decline in fish consumption

among pregnant women after a national mercury advisory. *Obstet Gynecol* 2003). This weak evidence suggests that specific government warnings about the safety of a particular food result in a fall in consumption of that food.

4.7 Key question 6

What interventions increase the uptake of advice on allergy prophylaxis during pregnancy?

The search strategy did not find any relevant systematic reviews or randomised control trials for this topic.

One UK qualitative study was identified which provides some contextual evidence (Turke 2005).

4.7.1 Evidence on allergy prophylaxis from a qualitative study

Reference	Practice points
Turke 2005	<p>GPs were advised that pregnant mothers with a family history of atopy may wish to avoid peanuts during pregnancy/lactation. The study explored the experiences of mothers who had and hadn't avoided peanuts and those with and without a family history of atopy. GPs should:</p> <ul style="list-style-type: none"> • Be consistent and give clear information and advice on peanut avoidance during pregnancy/lactation • Should describe the risks to the child and also when peanuts can safely be introduced in the child's diet • Should stress the importance of a family history of atopy in influencing the mother's decision to avoid peanuts • Should include the individual's choice in the decision making process

5. Overview and Discussion

This rapid review identified evidence to answer a number of key questions about nutrition for pregnant women. Using appropriate databases and search engines the world's literature was comprehensively searched for relevant studies. In addition stakeholders and members of the programme development group committee could also suggest studies for inclusion. It is therefore unlikely that any major study of relevance to the key questions and covered by the inclusion criteria was missed. It should be noted however that studies from outside the UK were only included in this rapid review if they were randomised control trials or in a systematic review that was included in this rapid review.

Little published research evidence was found about ways to increase the intake of oily fish or omega-3 supplements and no studies were found that evaluated different ways to deliver food safety and allergy prophylaxis advice.

The Foods Standards Agency advice to pregnant women includes eating at least two servings of fish a week, including one of oily fish. Only one intervention study was found that had evaluated a method to increase fish consumption in pregnant women (Odent 1996+). This study offers some evidence that encouragement to eat fish can have an effect on consumption. In this study the intervention group received counseling about the benefits of oily fish and support to consume fish. As part of the study a sample of 40 women in the intervention group were questioned about the impact of the intervention on their diets. The majority 32 indicated that they had eaten more fish. However although these women may have eaten more fish this did not have a significant impact upon the birth outcomes that were measured. There are a number of possible reasons. Firstly it is likely that the intervention only had a modest impact on total fish consumption, secondly an increase in fish consumption after the early stages of pregnancy might have little impact on the birth outcomes measured and thirdly the study was too small to demonstrate a small impact on birth outcomes.

No studies were found that looked at the dissemination of food safety advice. One study was identified which did not fulfill the criteria for inclusion. Nevertheless as this was the only study found the findings are reported and it indicated that a government warning about a health risk from a food leads to a fall in consumption (Oken, 2003). This is unsurprising as food scares are known to damage consumer confidence and reduce consumption. Food safety advice during pregnancy is important and the lack of studies in this area is disappointing.

No studies were found that evaluated methods of providing advice on allergy prophylaxis during pregnancy. This is perhaps unsurprising as ways to reduce allergy in children through interventions during pregnancy is a topic of current research and some uncertainty. It might be the case that the evidence base for effective interventions needs to mature before studies are undertaken to evaluate the most appropriate method of disseminating advice.

For the remaining three key question areas some evidence was available.

Alcohol

This review focussed on interventions in the general population of pregnant women and did not consider interventions in problem drinkers. A number of studies

evaluated ways to reduce alcohol consumption among pregnant women and the most striking finding was that in all studies drinking as measured by self reporting fell in both the intervention group and the control group. If it is accepted that reported alcohol consumption reflects actual consumption albeit inaccurately then this suggests that either being enrolled in a study and its consequent focus on alcohol is sufficient to reduce alcohol consumption or that a reduction in alcohol consumption is a natural occurrence as a pregnancy develops.

A recent evaluation of a brief intervention in women who were pre-screened for alcohol consumption after becoming pregnant (O'Connor 2007) reported a significant benefit from the brief intervention when measured using a logistic regression analysis. This study first screened 4980 pregnant women and found that only 7.5% were drinking alcohol and therefore eligible to take part and be randomised into the intervention group or control group. In this study alcohol consumption fell substantially in both the intervention and control population. It is therefore surprising that a regression model reported in the study paper found that compared with women in the assessment-only condition, women in the brief intervention condition were 5 times more likely to be abstinent by the third trimester (odds ratio [OR] = 5.39; 95% confidence interval [CI] = 1.59, 18.25). This finding is not consistent with the rest of the literature and should be treated with some caution until repeated and a similar effect found in other populations.

Overall the evidence suggests that most women who are not problem drinkers abstain from drinking when pregnant and raising awareness of the dangers of drinking and asking women about their current drinking is probably sufficient. A recent systematic review of the foetal effects of low-to-moderate alcohol consumption in pregnancy found that, for most outcomes, there was no consistent evidence of adverse effect across different studies. (Gray R. Review of the foetal effects of prenatal alcohol exposure. Report to DH 2006).

Folic acid and folate

The crucial period for preventing neural tube defects is the early stages of pregnancy. Therefore awareness campaigns focus on the need to take folic acid around the peri-conceptual period. The HEA folic acid campaign (HEA 1998) and a randomised community trial in Australia (Watson 1999) described in the preconception review indicate that widespread media campaigns are successful in increasing awareness. Although public health campaigns can be an effective way of disseminating important health information a systematic review (Ray 2004 +), which was included in the preconception review, found that in no evaluation of a campaign was the post-campaign rate of folic acid supplement use greater than 50%. This suggests that strategies in addition to health campaigns are needed.

Interventions to increase the use of folic acid supplements have been covered in the pre-conception review. A randomised control trial by Robins in the USA evaluated counselling from a physician accompanied by provision of free folic acid supplements in women who were not yet pregnant and found that this was effective in increasing self reported use of folic acid. It would be likely that this intervention would also increase folic acid use in women that were known to be pregnant.

An important challenge for using increased intake of folic acid supplements as a mechanism to reduce neural tube defects is ensuring that women receive the supplements during the appropriate period. As many pregnancies are not planned

women who might become pregnant should be encouraged to take supplements. In cases when such an approach fails there is a need to identify and then encourage those in the very early stages of pregnancy to take the required supplement.

Recruiting pregnant women into dietary studies is difficult and no randomised trials or UK studies were found that measured dietary folate in pregnant women before and after an intervention.

To ensure that efforts to increase the intake of folate and folic acid among women are appropriately supported by health professionals it is necessary that health professionals are aware of the issues. There is no up to date evidence about this but a survey undertaken as part of the evaluation of the HEA Folic Acid Campaign (HEA 1998+) indicates that knowledge especially about dosage could be improved among many health professionals with contact with women of child bearing age.

Dietary advice and counselling

Only one of the included studies evaluated the impact of diet advice or counselling alone on the nutrition of pregnant women. This study undertaken in Scotland (Anderson 1995+) found that dietary advice and information alone helped improve knowledge about diet but did not improve dietary behaviour. This suggests that dietary advice alone is not sufficient for behaviour change.

A major difficulty in evaluating the role of dietary counselling in improving the diets of pregnant women is the lack of high quality studies. In a review by Nielsen, of published papers from 1980 onwards describing prenatal nutrition intervention programmes that included a nutrition education component and had at least some adolescents in the target audience, only one of the 27 studies identified was based explicitly on a theoretical model of behaviour change. A review by van Teijlingen reported that there was some evidence to suggest that educational interventions have a modest effect but much of this evidence was flawed. The review concluded that there was a dearth of research in this area and that high quality research was needed.

Food supplements

Evidence on the effectiveness of food supplementation to pregnant women came from US studies and a study undertaken in Finland. The studies undertaken in the USA evaluated individual parts of the WIC programme. The largest study by Rush et al was flawed mainly because a large proportion of the control population enrolled at alternative WIC centres and received the same benefits as the intervention group. This highlights a major difficulty in attempting to evaluate an intervention such as food supplements in vulnerable and needy groups, which is the ethical and practical problem of denying the control population something that has a real monetary value. In the Rush study a clear difficulty was that the women randomised to the control group were entitled to receive the benefits gained by the intervention group and many of these women were not prepared to forgo these benefits for the sake of a research project.

The study by Metcoff looked at the provision of vouchers exchangeable for milk, eggs and cheese. After adjusting for baseline differences in maternal weight no significant difference in mean birth weight was found between the intervention and

control groups However in a sub set of smokers the intervention had a positive impact on birth weight. It is possible that food supplement interventions are more effective in those at highest risk.

The more recent study from Finland is interesting as it suggests that a combination of the free provision of healthy foods and appropriate dietary advice can improve diet but this improvement might not be sufficient to influence the commonly measured birth outcomes such as birth weight and head size at birth. It seems likely that in many populations particularly in developed countries that it would be difficult to achieve statistically significant changes in birth outcomes from a dietary intervention in pregnant women.

The ease of demonstrating a benefit from the provision of free food to pregnant women is likely to depend upon the population and outcomes studied. In evaluations of the WIC programme birth outcomes were measured and no differences were found except in heavy smokers in one study (Metcoff 1985). It is possible that crude birth outcomes such as weight and length of babies are not easily influenced by changes in diet and it is noteworthy that in no study was the long term effect of a dietary intervention during pregnancy monitored.

Other types of support interventions

Other than those interventions which were mainly about advice or food supplements two randomised control trials were identified that evaluated home support. The first study was of African American women and was graded 1+ (Graham 1992) but the second study was of poor quality (Olds 1986 -). In the Graham study women attending a clinic were initially screened for family stress and their need for support. Those included in the study were randomised to a group that received peer support from trained members of their peer group at four home visits during the second and third trimesters. The study evaluated birth outcomes in the control and intervention groups and found no significant difference in the proportion of babies of low birth-weight. The Olds study whilst of poor quality also found no impact on birth outcomes.

Although both of these studies could not demonstrate a significant effect of home support it is a broad area and many components that might make up a home support programme have not been evaluated in the literature. It is probably correct to conclude that there is a lack of evidence about the effectiveness of home support programmes.

Summary

Overall, the evidence that was found and included in this rapid review was rarely of a high quality. For a number of areas evidence is completely lacking. Studies on improvement in access to healthy foods, food shopping, food storage and food preparation are lacking. There was no evidence to answer questions about the best way to provide advice about food hygiene or the best way to provide advice about how to avoid allergies. Some tentative conclusions can be reached about alcohol, diet advice and food supplements. With regards to alcohol the evidence suggests that the vast majority of women reduce their drinking during pregnancy. It is likely that a brief intervention reminding pregnant women about the dangers of excessive alcohol is sufficient to lower alcohol consumption during pregnancy. In terms of intervening to improve diets. There is no evidence to indicate that diet advice alone is sufficient to change dietary behaviour but optimum strategies have not been

evaluated. Evidence to support the provision of food supplements has also been undermined by the lack of high quality studies.

6. Additional references

- Buttriss J (2004) Strategies to increase folate/folic acid in women: an overview. Nutrition Bulletin 29: 234-44.
- Elkin A, Higham J (2000) Folic acid supplements are more effective than increased dietary folate intake in elevating serum folate levels. BJOG; 107(2): 285-89.
- Gray R. Review of the fetal effects of prenatal alcohol exposure. Report to DH 2006
- MacPherson I (2003). Best Fed Babies Evaluation Report. Centre for community health research and evaluation. Glasgow Caledonian University.
- Oken E. Decline in fish consumption among pregnant women after a national mercury advisory. Obstetrics & Gynecology 2003;102:346-351
- Ray JG, Singh G, Burrows RF (2004) Evidence for suboptimal use of periconceptional folic acid supplements globally. BJOG: an International Journal of Obstetrics and Gynaecology 111: 399-408.
- Robbins JM, Cleves MA, Collins HB, Andrews N, Smith LN, Hobbs CA. Randomized trial of a physician-based intervention to increase the use of folic acid supplements among women. Am-J-Obstet-Gynecol. 2005 Apr; 192(4): 1126-32
- Turke J, Ventre C, Dean T (2005) Maternal experiences of peanut avoidance during pregnancy/ lactation: An in-depth qualitative study. Pediatric Allergy and immunology 16: 512-518.
- Wreiden WL, Symon A (2003) The development of a pilot evaluation of a nutrition education intervention programme for pregnant teenage women (food for life). J Hum Nutr Dietet 16: 67-71.

References of the studies that met the review's inclusion criteria are presented in Appendix A

Appendix A – Included Studies

Systematic reviews

D'Souza L, Renfrew M, McCormick F, Dyson L, Wright K, Henderson J, Thomas J
Food support programmes for low-income and socially disadvantaged
childbearing women in developed countries. National Institute for Health and
Clinical Excellence, London.

Nielsen JN, Gittleson J, Anliker J, O'Brien K (2006) Interventions to improve diet and
weight gain among pregnant adolescents and recommendations for further
research. *Journal of the American Dietetic Association* Vol 106 No 11 pp
1825-1840.

Schorling JB (1993) The prevention of prenatal alcohol use: a critical analysis of
intervention studies. *Journal of Studies on Alcohol* 54: 261-267.

van Teijlingen E, Wilson B, Barry N et al. (1998) Effectiveness of interventions to
promote healthy eating in pregnant women and women of childbearing age: a
review. London: Health Education Authority.

Randomised controlled trials

Chang G, Wilkins-Haug L, Berman S, Goetz MA. Brief intervention for alcohol use in
pregnancy: a randomized trial. *Addiction* 1999;94:1499–1508

Chang G, Mcnamara TK, Orav EJ, Koby D, Lavigne A, Ludman B, Vincitorio NA,
Wilkins-Huang L. (2005) Brief intervention for prenatal alcohol use: a
randomised trial. *Obstetrics and Gynecology* 105 (5): 991-8.

O'Connor MJ, Whaley SE. Brief intervention for alcohol use by pregnant women. *Am
J Public Health*. 2007 Feb;97(2):252-8

Piirainen T, Isolauri E, Lagström H, Laitinen K. Impact of dietary counselling on
nutrient intake during pregnancy: a prospective cohort study. *British Journal
of Nutrition*, Volume 96, Number 6, December 2006 , pp. 1095-1104(10)

Reynolds KD, Coombs DW, Lowe JB, Peterson PL, Gayoso E. Evaluation of a self-
help program to reduce alcohol consumption among pregnant women. *Int J
Addict*. 1995 Mar;30(4):427-43.

Other study designs undertaken in UK

Anderson, A.S., Campbell, D.M., Shepherd, R. (1995), "The influence of dietary
advice on nutrient intake during pregnancy", *British Journal of Nutrition*, Vol.
73 No.2, pp.163-77

Odent MR, McMillan L, Kimmel T. Prenatal care and sea fish. *Eur J Obstetr Gynecol
Reproduct Biol*. 1996;68:49–51

Doyle W, Wynn AHA, Crawford MA, Wynn SW. Nutritional counselling and supplementation in the second and third trimester of pregnancy, a study in a London population. *J Nutr Med* 1992; 3: 249-256

Changing preconceptions. The Health Education Authority Folic Acid Campaign 1995-1998. HEA1998

Appendix B – Excluded Studies

Study found by literature searches	Reason for exclusion
Arshad SH (2005) Primary prevention of asthma and allergy. <i>Journal of Allergy and Clinical Immunology</i> 116: 1.	Not an intervention to promote allergy prophylaxis advice
Atallah AN, Hofmeyr GJ, Duley L (2005) Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. <i>Oxford: The Cochrane Library</i> .	This SR examines effectiveness of calcium
Bhutta ZA, Khan I (2004) Multiple-micronutrient supplementation for women during pregnancy. <i>The Cochrane Database of Systematic Reviews</i> (Protocol), Issue 3. Art. No: CD004905. DOI: 10.1002/14651858.CD004905.	Protocol only
Blondel B, Breart G (1995) Home visits during pregnancy: consequences on pregnancy outcome, use of health services, and women's situations. <i>Seminars in Perinatology</i> Vol 19 (4) 263-271.	Not a nutrition intervention
Chang G, Goetz MA, Wilkins-Haug L et al. (2000) A brief intervention for prenatal alcohol use an in-depth look. <i>Journal of Substance Abuse Treatment</i> 18: 365-369.	Not RCT
Floyd RL, Ingersoll K et al. (2003) Reducing the risk of alcohol-exposed pregnancies: A study of motivational intervention in community settings. <i>Pediatrics</i> 111 (5 11): 1131-1135.	Not RCT
Gregory J, Locksmith MD, Patrick Duff MD. (1998) Preventing neural tube defects: the importance of periconceptional folic acid supplements. <i>The American College of Obstetricians and Gynecologists</i> 91: 6 1027-34.	Not intervention study to promote advice about folic acid supplements/ dietary folate
Hermann ME, Dannemann A, Gruters A et al. (1996) Prospective study on the atopy preventive effect of maternal avoidance of milk and eggs during pregnancy and lactation. <i>European Journal of Pediatrics</i> 155: 770-774.	Study examines the effectiveness of maternal avoidance, rather than promotion of advice to avoid antigens
Jewell D, Young G (2005) Interventions for nausea and vomiting in early pregnancy. <i>Oxford: The Cochrane Library</i> .	This SR examines treatments
Kramer MS (2003) Energy and protein intake in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 4. Art. No: CD000032. DOI: 10.1002/14651858.CD000032.	This SR includes supplements and advice - both of which are covered in the Food Support Review - which is more recent, up-to-date and used high quality criteria
Kramer MS (1996) Energy/protein restriction for high weight-for-height or weight gain during pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 2. Art. No: CD000080. DOI: 10.1002/14651858.CD000080.	Withdrawn
Kramer MS (1996) High protein supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 2. Art. No: CD000105. DOI: 10.1002/14651858.CD000105.	Withdrawn
Kramer MS (1996) Isocaloric balanced protein supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 2. Art. No: CD000118 DOI: 10.1002/14651858.CD000118.	Withdrawn
Kramer MS (1996) Nutritional advice in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 2. Art. No: CD000149. DOI: 10.1002/14651858.CD000149.	Withdrawn
Kuiper S, Maas T, van Schayck CP et al. (2005) The primary prevention of asthma in children study: Design of a	Intervention not for pregnant women

multifaceted prevention program. <i>Pediatric Allergy and Immunology</i> 16: 321-331	
Kulier R, de Onis M, Gulmezoglu AM et al. (1998) Nutritional interventions for the prevention of maternal morbidity. <i>International Journal of Gynecology & Obstetrics</i> 63: 321-246.	Effectiveness of vitamins and minerals
Mahomed K (2005) Folate supplementation in pregnancy. <i>Oxford: The Cochrane Library</i> .	This SR examines effectiveness of folate supplements
Mahomed K (1997) Iron and folate supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> : Issue 4 John Wiley & Sons, Ltd Chichester	This SR examines effectiveness of iron and folate supplements
Mahomed K (1999) Iron supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> : Issue 4 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of iron supplements
Mahomed K, Gülmezoglu AM (1997) Maternal iodine supplements in areas of deficiency. <i>The Cochrane Database of Systematic Reviews</i> Issue 4 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of iodine supplements
Mahomed K, Gulmezoglu AM (2005) Pyridoxine (vitamin B6) supplementation in pregnancy. <i>Oxford: The Cochrane Library</i> .	This SR examines effectiveness of B6 supplements
Mahomed K, Gulmezoglu AM (2005) Vitamin D supplementation in pregnancy. <i>Oxford: The Cochrane Library</i> .	This SR examines effectiveness of vitamin D supplements
Mahomed K. Zinc supplementation in pregnancy (1997) <i>The Cochrane Database of Systematic Reviews</i> Issue 3 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of zinc supplements
Makrides M, Duley L, Olsen SF (2001) Fish oil and other prostaglandin precursor supplementation during pregnancy for reducing pre-eclampsia, preterm birth, low birth weight and intrauterine growth restriction. <i>The Cochrane Database of Systematic Reviews</i> (Protocol) Issue 4. Art. No: CD003402. DOI: 10.1002/14651858.CD003402.	Protocol
Makrides M, Crowther CA (2001) Magnesium supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> : Issue 4 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of magnesium supplements
Malcolm CA, McCulloch DL, Montgomery C et al. (2003) Maternal DHA supplementation during pregnancy and visual evoked potential development in term infants: a double blind, prospective, randomised trial. <i>Archives of Disease in Childhood</i> 88: 383-390.	Study examines effectiveness of DHA supplements, rather than effectiveness of advice to take these supplements
Martindale S, McNeill G, Devereux G et al. (2005) Antioxidant intake in pregnancy in relation to wheeze and eczema in the first two years of life. <i>American Journal of Respiratory and Critical Care Medicine</i> 171: 121-128.	Not an intervention study
Mathews F (1996) Antioxidant nutrients in pregnancy: a systematic review of the literature. <i>Nutrition Research Reviews</i> Vol 9 pp 175-195.	Review does not examine effectiveness of advice promotion
Mathews F, Yudkin P, Neil A (1998) Folates in the periconceptional period: are women getting enough? <i>British Journal of Obstetrics and Gynaecology</i> 105: 954-959.	Not an intervention study
Mihrshahi S, Peat JK, Marks GB et al. (2003) Eighteen-month outcomes of house dust mite avoidance and dietary fatty acid modification in the Childhood Asthma Prevention Study (CAPS). <i>Journal of Allergy and Clinical Immunology</i> 111:162-8.	Intervention is about effectiveness of avoidance rather than effectiveness of advice to avoid antigens
Montgomery C, Speake BK, Cameron A et al. (2003)	Study of effectiveness of DHA

Maternal docosahexaenoic acid supplementation and fetal accretion. <i>British Journal of Nutrition</i> 90: 135-145.	supplements
Pena-Rosas JP, Viteri FE, Mahomed K (2004) Oral iron supplementation with or without folic acid for women during pregnancy. <i>The Cochrane Database of Systematic Reviews</i> (Protocol) Issue 2. Art. No: CD004736. DOI: 10.1002/14651858.CD004736.	Protocol
Rees A-M, Austin M-P, Parker G (2005) Role of omega-3 fatty acids as a treatment for depression in the perinatal period. <i>Australian and New Zealand Journal of Psychiatry</i> 39: 274-280.	Not an intervention to promote uptake of advice on Omega-3
Robbins JM, Cleves MA, Collins HB, et al (2005) A randomized trial of a physician based intervention to increase the use of folic acid supplements among women. <i>American Journal of Obstetrics and Gynecology</i> 92: 1126-32	Pregnant women excluded from study
Rumbold A, Crowther CA (2005) Vitamin C supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 1 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of vitamin C supplements
Rumbold A, Crowther CA (2005) Vitamin E supplementation in pregnancy. <i>The Cochrane Database of Systematic Reviews</i> Issue 2 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of vitamin E supplements
Rumbold A, Middleton P, Crowther CA (2005) Vitamin supplementation for preventing miscarriage. <i>The Cochrane Database of Systematic Reviews</i> Issue 2 John Wiley & Sons, Ltd Chichester	This SR examines effectiveness of vitamin supplements
Say L, Gülmezoglu AM, Hofmeyr GJ (2003) Maternal nutrient supplementation for suspected impaired fetal growth. <i>The Cochrane Database of Systematic Reviews</i> Issue 1 John Wiley & Sons, Ltd Chichester.	This SR examines effectiveness of maternal nutrient supplementation
Schoetzau A, Gehring U, Franke K et al. (2002) Maternal compliance with nutritional recommendations in an allergy preventive programme. <i>Archives of Disease in Childhood</i> Volume 86 (3): 180-184.	Intervention not during pregnancy
Stade B, Bailey C, Dzendoletas D et al. (2003) Psychological and/or educational interventions for reducing prenatal alcohol consumption in pregnant women and women planning pregnancy. <i>The Cochrane Database of Systematic Reviews</i> (Protocol) Issue 2. Art. No: CD004228. DOI: 10.1002/14651858.CD004228.	Protocol
Troxell H, Anderson J, Auld G et al. (2005) Omega-3 for baby and me: Material development for a WIC intervention to increase DHA intake during pregnancy. <i>Maternal and Child Health Journal</i> 9 (2).	Not an evaluation of an intervention
van den Broek N, Kulier R, Gulmezoglu AM et al. (2005) Vitamin A supplementation during pregnancy. Oxford: The Cochrane Library.	This SR examines effectiveness of vitamin A supplements
Williams P, McHenry J, McMahon A et al. (2001) Impact evaluation of a folate education campaign with and without the use of a health claim. <i>Australian and New Zealand Journal of Public Health</i> 25 (5).	Not RCT
Young GL, Jewell D (2002) Interventions for leg cramps in pregnancy. <i>Cochrane Database of Systematic Reviews</i> (1).	This SR examines treatments for leg cramps
Study suggested by stakeholder or committee member	Reason for exclusion
Hermann J, Williams G, Hunt D. Effect of nutrition education by para-professionals on dietary intake, maternal weight gain and infant birthweight in pregnant Native American and Caucasian adolescents. <i>Journal of Extension</i> , 2001 39(1)	Not RCT included in Nielsen review

<p>Buescher PA et al (1993). Prenatal WIC participation can reduce low birth weight and newborn medical costs: A cost-benefit analysis of WIC participation in North Carolina. <i>J Am Diet Assoc</i> 93: 163-177</p>	<p>Not RCT</p>
<p>Caan B et al (1987) Benefits associated with WIC supplemental feeding during the interpregnancy interval. <i>American Journal of Clinical Nutrition</i> 45:29-41</p>	<p>Not pregnant women</p>
<p>Dubois S et al (1997). Ability of the Higgins Nutrition Intervention Programme to improve adolescent pregnancy outcomes. <i>J Am Diet Assoc</i> 97(8):871-8.</p>	<p>Included in the Nielsen review</p>
<p>Khoury J, Henriksen T, Christophersen B, Tonstad S. Effect of a cholesterol-lowering diet on maternal, cord, and neonatal lipids, and pregnancy outcome: a randomized clinical trial. (<i>Am J Obstet Gynecol</i> 2005)</p>	<p>Not applicable to any key question</p>
<p>Attala A and Henderson L (2003) Preconception and Pregnancy – what women should be eating? <i>International Journal of Health Promotion and Education</i>, 41 (2), 36-40</p>	<p>Not intervention study</p>
<p>Attree, P. (2005). Low-income mothers, nutrition and health: a systematic review of qualitative evidence. <i>Matern.Child Nutr.</i> 1, 227-240.</p>	<p>Not intervention study</p>
<p>Charles, D., Ness, A. R., Campbell, D., Davey, S. G., & Hall, M. H. (2004). Taking folate in pregnancy and risk of maternal breast cancer. <i>BMJ</i> 329, 1375-1376.</p>	<p>Not applicable to any key question</p>
<p>Erkkola, M., Karppinen, M., Jarvinen, A., Knip, M., & Virtanen, S. M. (1998). Folate, vitamin D, and iron intakes are low among pregnant Finnish women. <i>Eur.J Clin.Nutr.</i> 52, 742-748.</p>	<p>Not intervention study</p>
<p>Robinson, S. M., Crozier, S. R., Borland, S. E., Hammond, J., Barker, D. J., & Inskip, H. M. (2004). Impact of educational attainment on the quality of young women's diets. <i>Eur.J Clin.Nutr.</i> 58, 1174-1180.</p>	<p>Not intervention study</p>
<p>Rogers, I. & Emmett, P. (1998). Diet during pregnancy in a population of pregnant women in South West England. ALSPAC Study Team. <i>Avon Longitudinal Study of Pregnancy and Childhood. Eur.J Clin.Nutr.</i> 52, 246-250.</p>	<p>Included in background section but not included in review</p>
<p>Turner, R. E., Langkamp-Henken, B., Littell, R. C., Lukowski, M. J., & Suarez, M. F. (2003). Comparing nutrient intake from food to the estimated average requirements shows middle- to upper-income pregnant women lack iron and possibly magnesium. <i>J Am.Diet.Assoc.</i> 103, 461-466.</p>	<p>Not intervention study</p>
<p>Manwell LB, Fleming MF, Mundt MP, Stauffacher EA, Barry K. Treatment of problem alcohol use in women of childbearing age: results of a brief intervention trial. <i>Alcohol Clin Exp Res.</i> 2000 Oct;24(10):1517-24.</p>	<p>Study with problem drinkers</p>
<p>Mouratidou T, Ford F, Prontzou F, Fraser R. Dietary assessment of a population of pregnant women in Sheffield</p>	<p>Not intervention study</p>

UK. British journal Nutrition 2006, 96, 929-935	
Clinical Nutrition Updates. Essential fatty acids supplements for uncomplicated pregnancy. Issue 266.ARBOR nutrition.	Not intervention study
Wrieden WL, Symon A. The development and pilot evaluation of a nutrition education intervention programme for pregnant teenage women (food for life). J Hum Nutr Diet. 2003 Apr;16(2):67-71	Included as corroborative evidence
Symon A, Wrieden WL. A qualitative study of pregnant teenagers' perceptions of the acceptability of a nutritional education intervention. Midwifery. 2003 Jun; 19(2): 140-7	Not intervention study
Herrick K et al. Maternal consumption of high meat, low carbohydrate diet in late pregnancy: Relation to adult cortisol concentrations in offspring	Not applicable to any key question

Appendix C

Three sets of literature searches were undertaken to identify: systematic reviews, randomised controlled trials, and other study types.

The Cochrane Database of Systematic Reviews (CDSR) and DARE were searched to identify systematic reviews.

The Cochrane Database of Systematic Reviews on the Cochrane Library Issue 3 2005 was searched 27th September 2005 via the Wiley InterScience interface using the search strategy below.

- #1 (advice or advis* or access* or assess* or consum* or deficien* or educat* or counsel* or choice* or choos* or instruct* or incentive* or recommend* or retain* or retention or guid* or inform* or knowledge or attitude* or belief* or habit* or pattern* or practice* or train* or supplement* or prefer* or program* or require* or consum* or standard* or intervent* or healthy or fortif* or behavior change* or behaviour change* or marketing or motivat*) [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #2 advice or advis* or access* or assess* or consum* or deficien* or educat* or counsel* or choice* or choos* or instruct* or incentive* or recommend* or retain* or retention or guid* or inform* or knowledge or attitude* or belief* or habit* or pattern* or practice* or train* or supplement* or prefer* or program* or require* or consum* or standard* or intervent* or healthy or fortif* or behavior change* or behaviour change* or marketing or motivat* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #3 diet* or food* or eat or eats or eaten or eating or nutrition* or fruit* or vegetable* or nutrient* or vitamin c or thiamin or niacin or folate* or micronutrient* or macronutrient* or multivitamin* or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink* or alcohol [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #4 diet* or food* or eat or eats or eaten or eating or nutrition* or fruit* or vegetable* or nutrient* or vitamin c or thiamin or niacin or folate* or micronutrient* or macronutrient* or multivitamin* or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink* or alcohol [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
- #5 ([#1 AND #3](#))
- #6 ([#2 AND #4](#))
- #7 [MeSH descriptor](#) Diet [explode all trees in](#) MeSH products
- #8 [MeSH descriptor](#) Food [explode all trees in](#) MeSH products
- #9 [MeSH descriptor](#) Nutrition [explode all trees in](#) MeSH products
- #10 [MeSH descriptor](#) Nutritional Status [explode all trees in](#) MeSH products
- #11 [MeSH descriptor](#) Diet Therapy [explode all trees in](#) MeSH products
- #12 [MeSH descriptor](#) Fruit [explode all trees in](#) MeSH products
- #13 [MeSH descriptor](#) Vegetables, [this term only in](#) MeSH products
- #14 [MeSH descriptor](#) Iron, Dietary, [this term only in](#) MeSH products
- #15 [MeSH descriptor](#) Calcium, Dietary, [this term only in](#) MeSH products
- #16 [MeSH descriptor](#) Dietary Fats [explode all trees in](#) MeSH products
- #17 [MeSH descriptor](#) Dietary Proteins [explode all trees in](#) MeSH products
- #18 [MeSH descriptor](#) Vitamins [explode all trees in](#) MeSH products
- #19 [MeSH descriptor](#) Zinc, [this term only in](#) MeSH products
- #20 [MeSH descriptor](#) Magnesium, [this term only in](#) MeSH products
- #21 [MeSH descriptor](#) Selenium, [this term only in](#) MeSH products
- #22 [MeSH descriptor](#) Sodium, Dietary, [this term only in](#) MeSH products
- #23 [MeSH descriptor](#) Alcoholic Beverages [explode all trees in](#) MeSH products
- #24 [MeSH descriptor](#) Energy Intake [explode all trees in](#) MeSH products
- #25 [MeSH descriptor](#) Nicotinic Acids, [this term only in](#) MeSH products
- #26 [MeSH descriptor](#) Riboflavin, [this term only in](#) MeSH products
- #27 [MeSH descriptor](#) Pyridoxine, [this term only in](#) MeSH products
- #28 [MeSH descriptor](#) Folic Acid [explode all trees in](#) MeSH products

- #29 ([#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28](#))
 #30 ([#5 OR #6 OR #29](#))
 #31 [MeSH descriptor](#) Health Education [explode all trees in](#) MeSH products
 #32 [MeSH descriptor](#) Health Promotion [explode all trees in](#) MeSH products
 #33 [MeSH descriptor](#) Patient Education [explode all trees in](#) MeSH products
 #34 [MeSH descriptor](#) Health Knowledge, Attitudes, Practice [explode all trees in](#) MeSH products
 #35 [MeSH descriptor](#) Health Behavior [explode all trees in](#) MeSH products
 #36 [MeSH descriptor](#) Life Style [explode all trees in](#) MeSH products
 #37 [MeSH descriptor](#) Communications Media [explode all trees in](#) MeSH products
 #38 ([#31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37](#))
 #39 ([#38 AND #3](#))
 #40 ([#38 AND #4](#))
 #41 ([#38 AND #29](#))
 #42 ([#30 OR #39 OR #40 OR #41](#))
 #43 television or video or radio or internet or book or books or booklet* or leaflet* or pamphlet* or newspaper* or magazine* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
 #44 television or video or radio or internet or book or books or booklet* or leaflet* or pamphlet* or newspaper* or magazine* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
 #45 ([#3 AND #43](#))
 #46 ([#4 AND #44](#))
 #47 ([#42 OR #46](#))
 #48 [MeSH descriptor](#) Maternal Nutrition [explode all trees in](#) MeSH products
 #49 ([#47 OR #48](#))
 #50 [MeSH descriptor](#) Food Handling [explode all trees in](#) MeSH products
 #51 food stor* [in](#) Record Title [or](#) food hand* [in](#) Record Title [or](#) food hygiene [in](#) Record Title [or](#) food prepar* [in](#) Record Title [or](#) food safe* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
 #52 food stor* [in](#) Abstract [or](#) food hand* [in](#) Abstract [or](#) food hygiene [in](#) Abstract [or](#) food prepar* [in](#) Abstract [or](#) food safe* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
 #53 ([#49 OR #50 OR #51 OR #52](#))
 #54 mother* or maternal [in](#) Record Title [or](#) childbear* next women [in](#) Record Title [or](#) childbear* next women [in](#) Record Title [or](#) pregnan* next woman [in](#) Record Title [or](#) pregnan* next women [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
 #55 pregnan* next teenager* [in](#) Record Title [or](#) pregnan* next girl* [in](#) Record Title [or](#) pregnan* next adolescen* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
 #56 mother* or maternal [in](#) Abstract [or](#) childbear* next women [in](#) Abstract [or](#) childbear* next women [in](#) Abstract [or](#) pregnan* next woman [in](#) Abstract [or](#) pregnan* next women [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
 #57 pregnan* next teenager* [in](#) Abstract [or](#) pregnan* next girl* [in](#) Abstract [or](#) pregnan* next adolescen* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
 #58 [MeSH descriptor](#) Pregnancy [explode all trees in](#) MeSH products
 #59 [MeSH descriptor](#) Pregnancy in Adolescence [explode all trees in](#) MeSH products
 #60 [MeSH descriptor](#) Pregnant Women [explode all trees in](#) MeSH products
 #61 ([#54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60](#))
 #62 ([#53 AND #61](#))

The Database of Abstracts of Reviews of Effects (DARE) was searched 27th September 2005 via the CAIRS interface (available within CRD) using the search strategy below.

s advice(2w)(diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)
 s advis\$(2w)(diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or

s booklet\$ and (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)

s leaflet\$ and (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)

s pamphlet\$ and (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)

s newspaper\$ and (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)

s magazine\$ and (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or (vitamin(w)c) or thiamin or niacin or folate\$ or (folic(w)acid) or micronutrient\$ or macronutrient\$ or multivitamin\$ or magnesium or selenium or zinc or pyridoxine or riboflavin or (nicotinic(w)acid\$) or (dietary(w)salt) or (sodium(w)dietary) or (dietary(w)sodium) or (dietary(w)sodium) or (alcoholic\$(w)drink\$) or alcohol or (alcoholic(w)beverage\$) or (energy(w)intake) or (iron(w)dietary) or (calcium(w)dietary) or (dietary(w)fats) or (dietary(w)proteins) or vitamin\$)

s s40 or s41 or s42 or s43 or s44 or s45 or s46 or s47 or s48 or s49 or s50 or s51 or s52 or s53 or s54 or s55 or s56 or s57 or s58

s s39 or s59

s food(w)(stor\$ or hand\$ or prepar\$ or hygien\$)

s s60 or s61

s mother\$ or maternal or childbear\$ or pregnan\$

s s62 and s63

s 1/xno or 2/xno

s s64 and s65

A second set of searches were conducted on the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL and PsycINFO databases to identify randomised controlled trials.

The Cochrane Central Register of Controlled Trials on the Cochrane Library Issue 3 2005 was searched on 27th September 2005 via the Wiley InterScience interface using the search strategy below.

#1 (advice or advis* or access* or assess* or consum* or deficien* or educat* or counsel* or choice* or choos* or instruct* or incentive* or recommend* or retain* or retention or guid* or inform* or knowledge or attitude* or belief* or habit* or pattern* or practice* or train* or supplement* or prefer* or program* or require* or consum* or standard* or intervent* or healthy or fortif* or behavior change* or behaviour change* or marketing or motivat*) [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL

- #2 advice or advis* or access* or assess* or consum* or deficien* or educat* or counsel* or choice* or choos* or instruct* or incentive* or recommend* or retain* or retention or guid* or inform* or knowledge or attitude* or belief* or habit* or pattern* or practice* or train* or supplement* or prefer* or program* or require* or consum* or standard* or intervent* or healthy or fortif* or behavior change* or behaviour change* or marketing or motivat* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #3 diet* or food* or eat or eats or eaten or eating or nutrition* or fruit* or vegetable* or nutrient* or vitamin c or thiamin or niacin or folate* or micronutrient* or macronutrient* or multivitamin* or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink* or alcohol [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #4 diet* or food* or eat or eats or eaten or eating or nutrition* or fruit* or vegetable* or nutrient* or vitamin c or thiamin or niacin or folate* or micronutrient* or macronutrient* or multivitamin* or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink* or alcohol [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
- #5 ([#1 AND #3](#))
- #6 ([#2 AND #4](#))
- #7 [MeSH descriptor](#) Diet [explode all trees in](#) MeSH products
- #8 [MeSH descriptor](#) Food [explode all trees in](#) MeSH products
- #9 [MeSH descriptor](#) Nutrition [explode all trees in](#) MeSH products
- #10 [MeSH descriptor](#) Nutritional Status [explode all trees in](#) MeSH products
- #11 [MeSH descriptor](#) Diet Therapy [explode all trees in](#) MeSH products
- #12 [MeSH descriptor](#) Fruit [explode all trees in](#) MeSH products
- #13 [MeSH descriptor](#) Vegetables, [this term only in](#) MeSH products
- #14 [MeSH descriptor](#) Iron, Dietary, [this term only in](#) MeSH products
- #15 [MeSH descriptor](#) Calcium, Dietary, [this term only in](#) MeSH products
- #16 [MeSH descriptor](#) Dietary Fats [explode all trees in](#) MeSH products
- #17 [MeSH descriptor](#) Dietary Proteins [explode all trees in](#) MeSH products
- #18 [MeSH descriptor](#) Vitamins [explode all trees in](#) MeSH products
- #19 [MeSH descriptor](#) Zinc, [this term only in](#) MeSH products
- #20 [MeSH descriptor](#) Magnesium, [this term only in](#) MeSH products
- #21 [MeSH descriptor](#) Selenium, [this term only in](#) MeSH products
- #22 [MeSH descriptor](#) Sodium, Dietary, [this term only in](#) MeSH products
- #23 [MeSH descriptor](#) Alcoholic Beverages [explode all trees in](#) MeSH products
- #24 [MeSH descriptor](#) Energy Intake [explode all trees in](#) MeSH products
- #25 [MeSH descriptor](#) Nicotinic Acids, [this term only in](#) MeSH products
- #26 [MeSH descriptor](#) Riboflavin, [this term only in](#) MeSH products
- #27 [MeSH descriptor](#) Pyridoxine, [this term only in](#) MeSH products
- #28 [MeSH descriptor](#) Folic Acid [explode all trees in](#) MeSH products
- #29 ([#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28](#))
- #30 ([#5 OR #6 OR #29](#))
- #31 [MeSH descriptor](#) Health Education [explode all trees in](#) MeSH products
- #32 [MeSH descriptor](#) Health Promotion [explode all trees in](#) MeSH products
- #33 [MeSH descriptor](#) Patient Education [explode all trees in](#) MeSH products
- #34 [MeSH descriptor](#) Health Knowledge, Attitudes, Practice [explode all trees in](#) MeSH products
- #35 [MeSH descriptor](#) Health Behavior [explode all trees in](#) MeSH products
- #36 [MeSH descriptor](#) Life Style [explode all trees in](#) MeSH products
- #37 [MeSH descriptor](#) Communications Media [explode all trees in](#) MeSH products
- #38 ([#31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37](#))
- #39 ([#38 AND #3](#))
- #40 ([#38 AND #4](#))
- #41 ([#38 AND #29](#))
- #42 ([#30 OR #39 OR #40 OR #41](#))
- #43 television or video or radio or internet or book or books or booklet* or leaflet* or pamphlet* or newspaper* or magazine* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #44 television or video or radio or internet or book or books or booklet* or leaflet* or pamphlet* or newspaper* or magazine* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL

- #45 ([#3 AND #43](#))
- #46 ([#4 AND #44](#))
- #47 ([#42 OR #46](#))
- #48 [MeSH descriptor](#) Maternal Nutrition [explode all trees in](#) MeSH products
- #49 ([#47 OR #48](#))
- #50 [MeSH descriptor](#) Food Handling [explode all trees in](#) MeSH products
- #51 food stor* [in](#) Record Title [or](#) food hand* [in](#) Record Title [or](#) food hygiene [in](#) Record Title [or](#) food prepar* [in](#) Record Title [or](#) food safe* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #52 food stor* [in](#) Abstract [or](#) food hand* [in](#) Abstract [or](#) food hygiene [in](#) Abstract [or](#) food prepar* [in](#) Abstract [or](#) food safe* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
- #53 ([#49 OR #50 OR #51 OR #52](#))
- #54 mother* or maternal [in](#) Record Title [or](#) childbear* next women [in](#) Record Title [or](#) childbear* next women [in](#) Record Title [or](#) pregnan* next woman [in](#) Record Title [or](#) pregnan* next women [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #55 pregnan* next teenager* [in](#) Record Title [or](#) pregnan* next girl* [in](#) Record Title [or](#) pregnan* next adolescen* [in](#) Record Title [in](#) Cochrane Reviews [and](#) CENTRAL
- #56 mother* or maternal [in](#) Abstract [or](#) childbear* next women [in](#) Abstract [or](#) childbear* next women [in](#) Abstract [or](#) pregnan* next woman [in](#) Abstract [or](#) pregnan* next women [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
- #57 pregnan* next teenager* [in](#) Abstract [or](#) pregnan* next girl* [in](#) Abstract [or](#) pregnan* next adolescen* [in](#) Abstract [in](#) Cochrane Reviews [and](#) CENTRAL
- #58 [MeSH descriptor](#) Pregnancy [explode all trees in](#) MeSH products
- #59 [MeSH descriptor](#) Pregnancy in Adolescence [explode all trees in](#) MeSH products
- #60 [MeSH descriptor](#) Pregnant Women [explode all trees in](#) MeSH products
- #61 ([#54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60](#))
- #62 ([#53 AND #61](#))

MEDLINE (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 September week 2. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$

or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.

7. diet/ or exp food/ or nutrition/ or exp fruit/ or vegetables/ or dietary iron/ or dietary calcium/ or exp dietary fats/ or exp dietary proteins/ or exp dietary carbohydrates/ or exp vitamins/ or exp riboflavin/ or exp nicotinic acids/ or exp pyridoxine/ or zinc/ or folic acid/ or magnesium/ or selenium/ or sodium, dietary/ or exp alcoholic beverages/ or exp energy intake/

8. 7 and (1 or 2)

9. 5 or 6 or 8

10. health education/ or health promotion/ or patient education/ or health knowledge, attitudes, practices/ or health behavior/ or life style/ or exp communications media/

11. 10 and (3 or 4)

12. 10 and 7

13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.

14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.

15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.

16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.

17. 15 or 16

18. 7 and (13 or 14)

19. 9 or 11 or 12 or 17 or 18

20. exp maternal nutrition/

21. 19 or 20

22. (mother\$ or maternal).ti,ab.

23. (childbear\$ adj (woman or women)).ti,ab.

24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.

25. pregnancy/ or pregnancy in adolescence/

26. female/

27. 25 and 26

28. 22 or 23 or 24 or 27

29. 21 and 28

30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.

31. 30 and (22 or 23 or 24 or 27)

32. 29 or 31

33. exp asia/ or exp africa/ or exp south america/ or exp developing countries/

34. 32 not 33

35. animals/

36. 34 not 35

37. RANDOMIZED CONTROLLED TRIAL.pt.

38. CONTROLLED CLINICAL TRIAL.pt.

39. RANDOMIZED CONTROLLED TRIALS.sh.

40. RANDOM ALLOCATION.sh.

41. DOUBLE BLIND METHOD.sh.

42. SINGLE BLIND METHOD.sh.

43. or/37-42

44. (ANIMALS not HUMAN).sh.
45. 43 not 44
46. CLINICAL TRIAL.pt.
47. exp CLINICAL TRIALS/
48. (clin\$ adj25 trial\$).ti,ab.
49. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj25 (blind\$ or mask\$)).ti,ab.
50. PLACEBOS.sh.
51. placebo\$.ti,ab.
52. random\$.ti,ab.
53. RESEARCH DESIGN.sh.
54. or/46-53
55. 54 not 44
56. 55 not 45
57. 45 or 56
58. 36 and 57

EMBASE (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 week 39. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. exp diet/ or exp food/ or exp nutrition/ or exp nutritional status/ or exp diet therapy/ or exp fruit/ or vegetable/ or iron intake/ or calcium intake/ or exp fat intake/ or exp protein intake/ or exp vitamin/ or zinc/ or magnesium/ or selenium/ or sodium intake/ or exp alcoholic beverage/ or exp dietary intake/

8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or patient education/ or attitude/ or exp health behavior/ or exp life style/ or exp mass communication/
11. 10 and (3 or 4)
12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.
15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. exp maternal nutrition/
21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.
25. exp pregnancy/ or adolescent pregnancy/
26. female/
27. 25 and 26
28. 22 or 23 or 24 or 27
29. 21 and 28
30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.
31. 30 and (22 or 23 or 24 or 27)
32. 29 or 31
33. exp asia/ or exp africa/ or exp south america/ or exp developing country/
34. 32 not 33
35. exp animal/
36. 34 not 35
37. clinical trial/
38. randomized controlled trial/
39. randomization/
40. single blind procedure/
41. double blind procedure/
42. crossover procedure/
43. placebo/
44. randomi?ed controlled trial\$.tw.
45. rct.tw.
46. random allocation.tw.
47. randomly allocated.tw.
48. allocated randomly.tw.
49. (allocated adj2 random).tw.
50. single blind\$.tw.
51. double blind\$.tw.
52. ((treble or triple) adj blind\$).tw.
53. placebo\$.tw.
54. prospective study/

55. or/37-54
56. case study/
57. case report.tw.
58. abstract report/ or letter/
59. or/56-58
60. 55 not 59
61. 36 and 60
62. limit 61 to yr="1990 - 2005"

CINAHL (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 week 3 September. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. exp diet/ or exp food/ or exp nutrition/ or exp fruit/ or exp vegetables/ or iron/ or iron compounds/ or calcium/ or calcium compounds/ or exp dietary fats/ or exp dietary proteins/ or exp dietary carbohydrates/ or exp vitamins/ or riboflavin/ or exp niacin/ or pyridoxine/ or zinc/ or exp folic acid/ or magnesium/ or selenium/ or sodium chloride, dietary/ or exp alcoholic beverages/ or energy intake/ or exp dietary supplements/ or eating behavior/ or food habits/
8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or patient education/ or health knowledge/ or exp health behavior/ or life style/ or exp communications media/ or attitude to health/ or health beliefs/ or attitude to pregnancy/ or health information/
11. 10 and (3 or 4)

12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.
15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. exp maternal nutrition/
21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.
25. pregnancy/
26. female/
27. 25 and 26
28. 22 or 23 or 24 or 27
29. 21 and 28
30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.
31. 30 and (22 or 23 or 24 or 27)
32. 29 or 31
33. exp asia/ or exp africa/ or exp south america/ or exp developing countries/
34. 32 not 33
35. animals/
36. 34 not 35
37. exp clinical trials/
38. clinical trial.pt.
39. (clinic\$ adj trial\$1).tw.
40. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj (blind\$3 or mask\$3)).tw.
41. randomi?ed control\$ trial\$.tw.
42. random assignment/
43. random\$ allocat\$.tw.
44. placebo\$.tw.
45. placebos/
46. quantitative studies/
47. allocat\$ random\$.tw.
48. or/37-47
49. 36 and 48
50. limit 49 to yr="1990 - 2005"

PsycINFO (via Ovid) was searched 3rd October 2005 for the period 1990 to 2005 September week 4. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.

2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. exp diets/ or exp food/ or exp nutrition/ or iron/ or dietary supplements/ or calcium/ or exp proteins/ or exp carbohydrates/ or exp vitamins/ or nicotinic acid/ or zinc/ or folic acid/ or magnesium/ or sodium/ or exp alcoholic beverages/
8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or client education/ or health knowledge/ or health attitudes/ or health behavior/ or lifestyle/ or exp communications media/
11. 10 and (3 or 4)
12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.
15. ((diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol) adj2 (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$)).ti.
16. ((diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol) adj2 (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food saf\$).ti,ab.

21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girl\$ or adolescen\$)).ti,ab.
25. pregnancy/ or adolescent pregnancy/
26. 22 or 23 or 24 or 25
27. 21 and 26
28. limit 27 to human
29. limit 28 to ("0400 empirical study" or 1800 quantitative study or "2000 treatment outcome/randomized clinical trial")
30. limit 29 to yr="1990 - 2005"

A third set of searches were conducted on the MEDLINE, EMBASE, CINAHL and PsycINFO database to identify other study types.

MEDLINE (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 September week 2. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. diet/ or exp food/ or nutrition/ or exp fruit/ or vegetables/ or dietary iron/ or dietary calcium/ or exp dietary fats/ or exp dietary proteins/ or exp dietary carbohydrates/ or exp vitamins/ or exp riboflavin/ or exp nicotinic acids/ or exp pyridoxine/ or zinc/ or folic acid/ or magnesium/ or selenium/ or sodium, dietary/ or exp alcoholic beverages/ or exp energy intake/

8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or patient education/ or health knowledge, attitudes, practices/ or health behavior/ or life style/ or exp communications media/
11. 10 and (3 or 4)
12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.
15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. exp maternal nutrition/
21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.
25. pregnancy/ or pregnancy in adolescence/
26. female/
27. 25 and 26
28. 22 or 23 or 24 or 27
29. 21 and 28
30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.
31. 30 and (22 or 23 or 24 or 27)
32. 29 or 31
33. exp asia/ or exp africa/ or exp south america/ or exp developing countries/
34. 32 not 33
35. animals/
36. 34 not 35
37. RANDOMIZED CONTROLLED TRIAL.pt.
38. CONTROLLED CLINICAL TRIAL.pt.
39. RANDOMIZED CONTROLLED TRIALS.sh.
40. RANDOM ALLOCATION.sh.
41. DOUBLE BLIND METHOD.sh.
42. SINGLE BLIND METHOD.sh.
43. or/37-42
44. (ANIMALS not HUMAN).sh.
45. 43 not 44
46. CLINICAL TRIAL.pt.
47. exp CLINICAL TRIALS/
48. (clin\$ adj25 trial\$).ti,ab.
49. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj25 (blind\$ or mask\$)).ti,ab.
50. PLACEBOS.sh.
51. placebo\$.ti,ab.
52. random\$.ti,ab.
53. RESEARCH DESIGN.sh.
54. or/46-53

55. 54 not 44
56. 55 not 45
57. 45 or 56
58. 36 not 57
59. limit 58 to yr="1990 - 2005"

EMBASE (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 week 39. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. exp diet/ or exp food/ or exp nutrition/ or exp nutritional status/ or exp diet therapy/ or exp fruit/ or vegetable/ or iron intake/ or calcium intake/ or exp fat intake/ or exp protein intake/ or exp vitamin/ or zinc/ or magnesium/ or selenium/ or sodium intake/ or exp alcoholic beverage/ or exp dietary intake/
8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or patient education/ or attitude/ or exp health behavior/ or exp life style/ or exp mass communication/
11. 10 and (3 or 4)
12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.

15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. exp maternal nutrition/
21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.
25. exp pregnancy/ or adolescent pregnancy/
26. female/
27. 25 and 26
28. 22 or 23 or 24 or 27
29. 21 and 28
30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.
31. 30 and (22 or 23 or 24 or 27)
32. 29 or 31
33. exp asia/ or exp africa/ or exp south america/ or exp developing country/
34. 32 not 33
35. exp animal/
36. 34 not 35
37. clinical trial/
38. randomized controlled trial/
39. randomization/
40. single blind procedure/
41. double blind procedure/
42. crossover procedure/
43. placebo/
44. randomi?ed controlled trial\$.tw.
45. rct.tw.
46. random allocation.tw.
47. randomly allocated.tw.
48. allocated randomly.tw.
49. (allocated adj2 random).tw.
50. single blind\$.tw.
51. double blind\$.tw.
52. ((treble or triple) adj blind\$).tw.
53. placebo\$.tw.
54. prospective study/
55. or/37-54
56. case study/
57. case report.tw.
58. abstract report/ or letter/
59. or/56-58
60. 55 not 59
61. 36 not 60
62. limit 61 to yr="1990 - 2005"

CINAHL (via Ovid) was searched 27th September 2005 for the period 1990 to 2005 week 3 September. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.
4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.
5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
7. exp diet/ or exp food/ or exp nutrition/ or exp fruit/ or exp vegetables/ or iron/ or iron compounds/ or calcium/ or calcium compounds/ or exp dietary fats/ or exp dietary proteins/ or exp dietary carbohydrates/ or exp vitamins/ or riboflavin/ or exp niacin/ or pyridoxine/ or zinc/ or exp folic acid/ or magnesium/ or selenium/ or sodium chloride, dietary/ or exp alcoholic beverages/ or energy intake/ or exp dietary supplements/ or eating behavior/ or food habits/
8. 7 and (1 or 2)
9. 5 or 6 or 8
10. health education/ or health promotion/ or patient education/ or health knowledge/ or exp health behavior/ or life style/ or exp communications media/ or attitude to health/ or health beliefs/ or attitude to pregnancy/ or health information/
11. 10 and (3 or 4)
12. 10 and 7
13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.
14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.
15. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or

micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.
16. ((television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.
17. 15 or 16
18. 7 and (13 or 14)
19. 9 or 11 or 12 or 17 or 18
20. exp maternal nutrition/
21. 19 or 20
22. (mother\$ or maternal).ti,ab.
23. (childbear\$ adj (woman or women)).ti,ab.
24. (pregnan\$ adj (woman or women or teenager\$ or girl or girls or adolescen\$)).ti,ab.
25. pregnancy/
26. female/
27. 25 and 26
28. 22 or 23 or 24 or 27
29. 21 and 28
30. food handling/ or (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food safe\$).ti,ab.
31. 30 and (22 or 23 or 24 or 27)
32. 29 or 31
33. exp asia/ or exp africa/ or exp south america/ or exp developing countries/
34. 32 not 33
35. animals/
36. 34 not 35
37. exp clinical trials/
38. clincial trial.pt.
39. (clinic\$ adj trial\$1).tw.
40. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj (blind\$3 or mask\$3)).tw.
41. randomi?ed control\$ trial\$.tw.
42. random assignment/
43. random\$ allocat\$.tw.
44. placebo\$.tw.
45. placebos/
46. quantitative studies/
47. allocat\$ random\$.tw.
48. or/37-47
49. 36 not 48
50. limit 49 to yr="1990 - 2005"

PsycINFO (via Ovid) was searched 3rd October 2005 for the period 1990 to 2005 September week 4. The strategy used is below:

1. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ti.
2. (advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$).ab.
3. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or

multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ti.

4. (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol).ab.

5. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ti.

6. ((advice or advis\$ or access\$ or assess\$ or consum\$ or deficien\$ or educat\$ or counsel\$ or choice\$ or choos\$ or instruct\$ or incentive\$ or recommend\$ or retain\$ or retention or guid\$ or inform\$ or knowledge or attitude\$ or belief\$ or habit\$ or pattern\$ or practice\$ or train\$ or supplement\$ or prefer\$ or program\$ or require\$ or consum\$ or standard\$ or intervent\$ or healthy or fortif\$ or behavior change\$ or behaviour change\$ or marketing or motivat\$) adj2 (diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol)).ab.

7. exp diets/ or exp food/ or exp nutrition/ or iron/ or dietary supplements/ or calcium/ or exp proteins/ or exp carbohydrates/ or exp vitamins/ or nicotinic acid/ or zinc/ or folic acid/ or magnesium/ or sodium/ or exp alcoholic beverages/

8. 7 and (1 or 2)

9. 5 or 6 or 8

10. health education/ or health promotion/ or client education/ or health knowledge/ or health attitudes/ or health behavior/ or lifestyle/ or exp communications media/

11. 10 and (3 or 4)

12. 10 and 7

13. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ti.

14. (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$).ab.

15. ((diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol) adj2 (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$)).ti.

16. ((diet\$ or food\$ or eat or eats or eaten or eating or nutrition\$ or fruit\$ or vegetable\$ or nutrient\$ or vitamin c or thiamin or niacin or folate\$ or micronutrient\$ or macronutrient\$ or multivitamin\$ or folic acid or magnesium or selenium or zinc or pyridoxine or riboflavin or nicotinic acid or dietary salt or alcoholic drink\$ or alcohol) adj2 (television or video or radio or internet or book or books or booklet\$ or leaflet\$ or pamphlet\$ or newspaper\$ or magazine\$)).ab.

17. 15 or 16

18. 7 and (13 or 14)

19. 9 or 11 or 12 or 17 or 18

20. (food stor\$ or food hand\$ or food hygiene or food prepar\$ or food saf\$).ti,ab.

21. 19 or 20

22. (mother\$ or maternal).ti,ab.

23. (childbear\$ adj (woman or women)).ti,ab.

24. (pregnan\$ adj (woman or women or teenager\$ or girl or girl\$ or adolescen\$)).ti,ab.

25. pregancy/ or adolescent pregnancy/

26. 22 or 23 or 24 or 25

27. 21 and 26

28. limit 27 to human
29. limit 28 to ("0400 empirical study" or 1800 quantitative study or "2000 treatment outcome/randomized clinical trial")
30. 28 not 29
30. limit 30 to yr="1990 - 2005"

