

Folic acid: influencing low-income groups

Prepared by Lynn Stockley

for the

Food Standards Agency

MAIN REPORT

30th October 2006



Lynn Stockley & Associates
Food and Nutrition Consultancy

Strategic and Policy Development ♦ Communications ♦ Research Advice ♦ Education and Training

CONTENTS

EXECUTIVE SUMMARY	4
1.0 SUMMARY	7
Background	7
Aim and objectives	8
Review 1	8
Review 2	9
Review 3	10
Conclusions	12
2.0 AIM AND OBJECTIVES	14
3.0 METHODS	15
3.1 GENERAL PROCESS	15
3.2 REVIEW 1	15
3.2.1 Databases	15
3.2.2 Search terms	15
3.2.3 Inclusion and exclusion criteria	15
3.3 REVIEW 2	16
3.3.1 Databases	17
3.3.2 Search terms	17
3.3.3 Inclusion and exclusion criteria	17
3.4 REVIEW 3	18
3.4.1 Databases and sources of information:	18
3.4.2 Search terms:	19
3.4.3 Inclusion and exclusion criteria	19
4.0 RESULTS AND KEY FINDINGS	21
4.1 REVIEW 1	21
4.1.1 Search results for Review 1	21
4.1.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the systematic reviews/analyses identified in Review 1.	22
4.1.2.1 Breastfeeding initiation	22
4.1.2.2 Communication in maternity care	23
4.1.2.3 Fruit & Veg – promoting increased consumption	24
4.1.2.4 Physical activity promotion	24
4.1.2.5 Preconception care	26
4.1.2.6 Screening	27
4.1.2.7 Teenage pregnancy – minimising the risk of unintended pregnancy	28
4.1.2.8 UV protection	31
4.1.3 Key Findings	32
4.1.3.1 Breastfeeding initiation	32
4.1.3.2 Communication in maternity care	32
4.1.3.3 Fruit & Veg – promoting increased consumption	32
4.1.3.4 Physical activity promotion	33
4.1.3.5 Preconception care	33
4.1.3.6 Screening	33
4.1.3.7 Teenage pregnancy – minimising the risk of unintended pregnancy	34
4.1.3.8 UV protection	34

4.2 REVIEW 2	35
4.2.1 Search results for Review 2	35
4.2.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the work on pre and periconception initiatives identified in Review 2.	36
4.2.2.1 Systematic review.	36
4.2.2.2 Expert opinion.	36
4.2.2.3 Randomised Controlled trials	38
4.2.2.4 Prospective studies	38
4.2.2.5 Uncontrolled trial, with pre and post measures	39
4.2.2.6 Cross sectional surveys	39
4.2.2.7 Qualitative research	40
4.2.2.8 Case study	40
4.2.3 Key Findings	41
4.3 REVIEW 3	41
4.3.1 Search results for Review 3	41
4.3.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the work folic acid identified in Review 3.	43
4.3.2.1 Systematic reviews	43
4.3.2.2 Expert Reports/Consultations	44
4.3.2.3 Controlled trials	45
4.3.2.4 Uncontrolled trials	47
4.3.2.5 Campaign/Programme evaluations	48
4.3.2.6 Cost effectiveness analyses	52
4.3.2.7 Cross sectional surveys and prospective cohort ‘monitoring’ surveys	53
4.3.2.8 Qualitative research	64
4.3.2.9 Case studies	65
4.3.2.10 Use of theoretical models	65
4.3.3 Key Findings	66
4.3.3.1 Background	66
4.3.3.2 Effectiveness of interventions	68
4.3.3.3 Integrated campaigns	69
4.3.3.4. Folic acid in the UK	70
4.3.3.5. Theoretical models	71
5.0 CONCLUSIONS	72
Review 1: Main findings	72
Review 2: Main findings	73
Review 3: Main findings and overall conclusions	73
Gaps in Knowledge	75

LIST OF TABLES: -

TABLE 1: INCLUSION AND EXCLUSION CRITERIA FOR REVIEW 1	16
TABLE 2: INCLUSION AND EXCLUSION CRITERIA FOR REVIEW 2	18
TABLE 3: INCLUSION AND EXCLUSION CRITERIA FOR REVIEW 3	19
TABLE 4: REVIEW 1- FINALLY INCLUDED SYSTEMATIC REVIEWS/META-ANALYSES, BY FOCUS AND THEN BY DATE	21
TABLE 5: REVIEW 2 - FINALLY INCLUDED WORK, BY STUDY DESIGN AND THEN BY COUNTRY	35
TABLE 6: REVIEW 3- FINALLY INCLUDED WORK, BY STUDY DESIGN AND THEN BY COUNTRY	42

Executive Summary

Background

Current government advice is that in order to reduce the risk that their baby will develop a neural tube defect (NTD), like Spina Bifida “All women who could become pregnant are advised to take 400 micrograms a day of folic acid as a medicinal or food supplement prior to conception and until the twelfth week of pregnancy”.

In 1996 the National Health Promotion Agency in England, the Health Education Authority, launched a three year integrated programme to increase the consumption of folic acid in women of childbearing age. Although the original campaign was developed for England, it was adapted and work implemented in the other three countries of the UK. This work succeeded in raising awareness and increasing use of folic acid supplements to some extent.

However, it was less successful for younger women, those in lower socio-economic groups, and women from some minority ethnic groups.

The indication from the data that is available is that the effects of the campaign have not been sustained, and awareness and use are dropping back to the levels reported in 1997.

The purpose of this work

The aim was to carry out three complementary reviews, to provide a research basis for improving the use of folic acid supplements in the UK, particularly in low-income and younger groups of women.

The purpose of the first review was to gain a picture of the types of initiatives which are successful in encouraging women to take a positive action in order to reduce a possible future risk, for example behaviour such as attending screening, eating fruits and vegetables, or practising contraception.

The second review examined the effectiveness of various approaches to preconception care.

The third review looked at research that aimed at encouraging women, particularly those who are younger or from low-income groups, to take folic acid in the periconceptual period.

The key findings

Very few relevant research studies have been undertaken in the UK. This means that many of the findings are from other countries, and may not be applicable in the UK context. In addition many studies only collected results for a short time after the intervention, so it is difficult to say how sustained any effects were.

Work has previously been carried out on the characteristics of effective health promotion interventions, and these include using a ‘package’ of complementary components using different communication channels, locations, and health promotion approaches, and also sustaining the intervention over a long period of time. The importance of these characteristics for effective interventions, was re-inforced by the findings of all three of the reviews.

The first review covered several, diverse, topics. Although the findings that are common between these topics have been highlighted in the report, further work may be necessary to do justice to the richness of this section of the Report and to view it from a UK perspective. Generally the most effective approaches: targeted high risk groups; worked with families, peers, and organisations/places which provided access to the target groups; and included practical steps to make the ‘positive action’ easier.

The second review found little research based evidence on approaches to effective preconception care, although increasingly policies and guidance for preconception care have been developed in countries around the world. The health and social care structures in those countries with most research and/or preconceptual policies or guidance are very different to those in the UK, which limits the applicability of much of the work that was identified. Nevertheless, there is some evidence that preconception care can have a positive impact on health behaviours, including folic acid uptake. For this to happen in the UK would need changes to structures within the health care system, and to training and ongoing support for health professionals.

The third review covered awareness and knowledge of folic acid, as well as sources of folic acid information, descriptions and results of integrated national or regional campaigns, and the results of research trials. The main findings were: -

- Uptake (as recommended) reported by pregnant women and new mothers, ranged from 7% to 53%. There are some factors that are particularly associated with lower awareness and rates of uptake. One of the most important of these is the link with unintended pregnancy. The UK has about 50% unplanned pregnancies.
- Other factors which were identified as being associated with lower awareness and uptake include: lower household income; lower educational attainment; being a lone parent or unemployed or from a lower socio-economic group or younger or from other racial/ethnic groups; lacking awareness/knowledge of the potential benefits, not being convinced of efficacy; and having a less healthy lifestyle.
- The most common sources of information about folic acid tend to be mass-media advertising, magazines, newspaper articles and family and friends. Although health professionals are usually cited less frequently, their advice is regarded as more credible. Generally, family doctors seem to be a more frequent source of advice than other health professionals, including midwives. In the UK practice nurses appear to be the group who are asked most frequently about folic acid.
- Four integrated campaigns were identified which appear to have been successful in increasing uptake of folic acid supplements to some extent. These four campaigns were carried out in South Australia, Canada, the Netherlands, and the UK. In Australia, there was no evidence that the effects would be sustained. In

Canada, it was noted that even at the end of the study there was ‘considerable room for improvement’ (in uptake of folic acid supplements). In England, the authors of the evaluation report drew attention to the short duration of the campaign, particularly when compared with sustained health initiatives around smoking and HIV. In the Netherlands, there was particular concern about reaching women in lower socio-economic groups. Two other campaigns were reported, from Germany and from South West Virginia, where the effects of the interventions were limited, in particular in respect of socio-economic differences and knowledge about the appropriate timing for supplement use.

- Research trials indicate that: a) printed resources and the mass media used in isolation are not effective in the longer term, particularly for vulnerable groups; b) the health care system is well placed to provide advice on preconceptual folic acid, and it also appears to have potential to be effective. However, the preliminary conclusions from the limited number of trials which have been carried out, is that advice needs to be embedded in a structure (e.g. preconceptual counselling) and delivered in a committed and relevant way; c) using a health claim may also make it easier for women to identify relevant foods and supplements.
- There are important gaps in the research literature, which are described in detail in the report.

Conclusions

From these reviews it seems likely that efforts to increase supplement intake will have a limited effect. At the end of the UK campaigns, only 38% of pregnant women, asked retrospectively, said they had taken folic acid supplements. This, together with data from the other national and regional campaigns, indicates that even high quality and intensive national campaigns apparently result in under half of women in the target group taking supplements. Based on the information available, it also seems that campaigns have the potential to exacerbate inequalities in folic acid use between women in lower and higher socio-economic groups. If campaigns or programmes are undertaken, they should include elements that specifically target women in vulnerable groups. To achieve and maintain an effect, they need to be based on good health promotion practice, and to be sustained over a long period of time.

1.0 Summary

Background

The preventive role of folic acid in relation to neural tube defects was highlighted by research carried out in the 1980s. The Medical Research Council carried out an eight year Vitamin Study which strongly supported the role of folic acid in reducing the risk of women having a recurrence of a neural tube affected pregnancy¹.

In the United Kingdom, a Department of Health Expert Committee was asked to consider whether there was evidence that folic acid could reduce the risk of a first occurrence of neural tube defects, and in 1992 recommended that, prior to conception, and during the first 12 weeks of pregnancy, daily folic acid intake should be increased by 400micrograms in all women of childbearing age². This advice was reinforced by the Scientific Advisory Committee on Nutrition³ who recommended, “All women who could become pregnant are advised to take 400µg/d folic acid as a medicinal or food supplement prior to conception and until the twelfth week of pregnancy”.

In 1996 the National Health Promotion Agency in England, the Health Education Authority, launched an integrated programme to increase the consumption of folic acid in women of childbearing age. Although the original campaign was developed for England, it was adapted and work implemented in the other three countries of the UK. This work succeeded in raising awareness of folic acid, increasing reported usage (as recommended), increasing health professional’s knowledge and reported practice, increasing the availability of fortified foods and folic acid supplements. However, it was less effective in supporting change in younger women, and women in lower socio-economic groups.

Information collected for the Health Survey for England in 2002 also highlighted these differences. Anecdotal and qualitative evidence indicates that women in minority ethnic groups have lower levels of uptake, and this is supported by one study that found uptake levels that were four times higher for white women than Bangladeshi women.

It is difficult to assess overall trends in folic acid supplement use since the 1996-8 campaign, since much of the data is not comparable. However, figures from a routine question used in antenatal screening programme indicates that the effects of the campaign have not been sustained, and the figures are dropping back towards a level that is similar to that in 1997.

¹ MRC Vitamin Study Research Group (1991): Prevention of neural tube defects: results of the MRC Vitamin Study. *Lancet* **338**, 131-137.

² Department of Health (1992) Folic acid and the prevention of neural tube defects: Report from an Expert Advisory Committee. Department of Health, London.

³ Department of Health (2000) Report No 50: Folic Acid and the Prevention of Disease. Department of Health, London.

Aim and objectives

The aim of this work was to carry out three complementary reviews, to provide a research basis for improving the use of folic acid supplements in the UK, particularly in low-income and younger groups of women.

These three reviews are referred to in this Report as 1, 2 and 3. The objectives for each were: -

Review 1: to cover published systematic reviews or meta-analyses of research into the uptake of a range of initiatives that require 'positive precautionary action' by women, particularly those in low-income groups.

Review 2: to focus on identifying research relevant to the effectiveness of different approaches to preconception interventions on behaviour

Review 3: to focus specifically on work/schemes/studies aimed at encouraging women, particularly girls/young women and those from low-income groups, to take folic acid in the periconceptual period.

The key findings for each Review are summarised below, and should be viewed with caution, since there are important issues of transferability between topics and also between countries. The other caveat which should be noted is that many of the studies only included short term follow up, so there is very limited evidence on the sustainability of effects of interventions

Review 1

26 systematic reviews and/or meta-analyses were finally included. The range of topic areas covered was: Breastfeeding initiation; Communication in maternity care; Promoting increased fruit and vegetable consumption; Promoting physical activity; Preconception care; Screening; Minimising the risk of unintended teenage pregnancy; and UV protection.

It can be seen that the health topics covered in Review 1, and to some extent Review 2, are very diverse. The approach that has been adopted is to identify common features across each of the topic areas, in the expectation that since they are common, they are more likely to be transferable to folic acid interventions.

However, in many ways this is reducing this aspect of the work to the lowest common denominator, and may be suppressing more innovative learning from specific health topic areas. The work done in this report for Reviews 1 and 2, could be the basis for further discussion, for example through a nominal group approach. This would also help assess the relevance of the learning in a UK context.

Findings with potential to lead to effective interventions, particularly for lower income and young women include:-

- Interventions should include a 'package' of complementary components including different communication channels, locations, and health promotion approaches, and be sustained over a long period
- Focus on high risk groups

- Families should be involved, if possible
- Incorporate folic acid information into school based sex education
- Work with youth development programmes
- Peer-delivered interventions appear to be effective for young women, but they should have a specific focus; be part of a wider programme; have short enough intervals between training sessions to maintain enthusiasm; and include adequate training for peer educators on how to conduct a class
- Provide practical support e.g. easy access to supplements
- Encourage consistent use of supplements, by recommending that they are taken at the same time each day

Review 2

18 papers were finally included in this review.

Findings with potential to lead to effective interventions, particularly for lower income and young women include:-

- There appears to be little research based evidence on approaches to effective preconception care, although increasingly policies and guidance for preconception care have been developed in countries around the world. The health and social care structures in those countries with most research and/or preconceptual polices or guidance are very different to those in the UK, which limits the applicability of much of the work that was identified. However, there is some evidence that preconception care can have a positive impact on health behaviours, including folic acid uptake. There are also indications that participation in pre-conceptual care may increase the numbers of pregnancies that are intended.
- Ideally, folic acid advice would be incorporated into a structure of preconception care that reached high numbers of women of childbearing age. This would have numerous benefits for the health of mothers and infants, of which reduction in the risk of neural tube defects would only be one. However, the reality is far from this, and key barriers which would need to be addressed are: -
 - Health professionals would need adequate time, appropriate training, and a higher priority assigned to preconceptual care.
 - Structural changes would need to be incorporated into standard health care for more effective preconception care. This includes identifying timely contact points between women and health professionals

Review 3

90 papers were finally included in this review.

Awareness, knowledge, uptake levels, influences on uptake, and sources of information

A large number of studies, 55 cross-sectional and two prospective cohort monitoring surveys, provided information on folic acid awareness, knowledge and uptake among women. These indicate that uptake (as recommended) reported by pregnant women and new mothers ranges from 7% (in Croatia) to 53% (one study from the USA).

However, most countries report levels between 25-35%. The work described in this section consistently indicates that there are some factors that are particularly associated with lower awareness, knowledge, and rates of uptake.

One of the most important of these is the link with unintended pregnancy. The rates of unintended pregnancy vary considerably both within and between populations. In terms of variation between countries, some countries, such as Poland, report very low levels of planned pregnancy (10-20%), some such as the UK and USA are intermediate (about 50%), and others including Croatia and the Netherlands have very high rates of planned pregnancy (75 – 80%).

There is considerable confounding between unintended pregnancy (or lower pregnancy planning intensity ‘scores’) and the other factors which were identified as being associated with lower folic acid awareness/knowledge/uptake. These include: lower household income; lower educational attainment; being a lone parent or unemployed or from a lower socio-economic group or younger or from other racial/ethnic groups; lacking awareness/knowledge of the potential benefits, not being convinced of efficacy; and having a less healthy lifestyle.

The most common sources of information about folic acid tend to be mass-media advertising, magazines, newspaper articles and family and friends. However, although health professionals are usually cited less frequently, their advice is regarded as more credible. Generally, family doctors seem to be a more frequent source of advice than other health professionals, including midwives. In the UK practice nurses appear to be the group who are asked most frequently about folic acid.

Interventions

Only two community-based trials were identified, which is scarcely enough to draw many conclusions. An intervention consisting of printed resources only was not effective in the longer term, and was not appropriate for low-income women. Using a health claim may make it easier for women to identify relevant foods and supplements.

Two controlled trials and two uncontrolled trials assessed the effectiveness of approaches which targeted women through the health care system. The health care system seems to be well placed to provide advice on preconceptual folic acid, and it also appears to have potential to be effective. However, the preliminary conclusions from the limited number of trials which have been carried out, is that advice needs to be embedded in a structure (e.g. preconceptual counselling) and delivered in a committed and relevant way.

There was one randomised controlled trial which assessed the effectiveness of counselling during a routine gynaecological visit, followed by provision of folic acid tablets and a follow-up phone call. This intervention resulted in significant increases in uptake of folic acid, and was particularly effective in black and lower income groups and women not planning pregnancies.

There were also three uncontrolled trials, all of which focused on the provision of training for health professionals. One study used a CD Rom with physician assistant students, one evaluated training sessions for health professionals, and the other evaluated a state-wide education programme for health care providers. All of these interventions were effective in increasing knowledge.

Integrated campaigns

Four integrated campaigns were identified which appear to have been successful in increasing uptake of folic acid supplements to some extent. These four campaigns were those reported from South Australia, the range of national and local educational initiatives implemented in Canada, the Dutch Folic acid campaign, and the UK Folic acid campaigns. However, in the reports of all four campaigns the authors recognised that although there had been increases in supplement uptake, the apparent success was qualified in some way. In Australia, there was no evidence that the effects would be sustained. In Canada, it was noted that even at the end of the study there was 'considerable room for improvement' (in uptake of folic acid supplements). In England, the authors of the evaluation report drew attention to the short duration of the campaign, particularly when compared with sustained health initiatives around smoking and HIV. In the Netherlands, there was particular concern about reaching women in lower socio-economic groups.

Two other campaigns were reported, from Germany and from South West Virginia, where the effects of the interventions were limited, in particular in respect of socio-economic differences and knowledge about the appropriate timing for supplement use.

Theoretical models

One of the original intentions of this review was to identify when theoretical models had been used in interventions or evaluations (a list of models is provided in Appendix 1). In fact, only 5 studies were identified in Review 3 which explicitly mentioned the use of such models. It is difficult to reach any conclusions based on this number of papers, but the social ecological model works at a number of different levels, and many folic acid interventions appear to adopt it to some extent, although this may not be recognised by the instigators of the interventions. The only model which was used and produced findings with practical implications was the one used in the Dutch folic acid campaign, and this model was adapted from the Theory of Reasoned Action.

Gaps in Knowledge

The UK has been at the forefront of research to understand the role of folic acid in reducing the risk of pregnancies affected by neural tube defects, and was also one of the first countries to run national health promotion campaigns to increase the intake of folate in women of childbearing age. However, there have been very few research

studies from the UK to assess the effectiveness of interventions to promote uptake of folic acid supplements. There is also very little good quality qualitative research in the UK to understand the opportunities and barriers for women to take folic acid supplements. Specific gaps in knowledge have been outlined in Section 5.0 of this Report

Conclusions

Realistically it is likely that efforts to increase supplement intake will have a limited effect. In the Netherlands, at the end of the Dutch folic acid campaign, 49% of the sample of pregnant women retrospectively reported taking folic acid during the time around conception. In the UK, at the end of the national campaign 38% of pregnant women, asked retrospectively, said they had taken folic acid supplements. Extrapolating from this data could mean that high quality and intensive national campaigns apparently influenced under half of women in the target group to take supplements. However this figure is likely to be a considerable overestimate since data collected retrospectively from pregnant women gives consistently higher values than that collected from samples of women of childbearing age in the population. At the end of the UK campaigns, the highest figure for uptake (as recommended) of folic acid was in those women who actively planned pregnancy, when 65% reported taking supplements. This means that in the unlikely event that all women planned their pregnancies, the ‘ceiling’ on supplement uptake (using data collected from pregnant women) would be around 65%.

So, reducing the number of unintended pregnancies in the UK would contribute to increasing the number of women taking folic acid supplements. Establishing a system for preconception care through general practice might also increase uptake, if it was appropriately resourced and structured. However, these are major tasks that are unlikely to contribute to increasing the uptake of folic acid supplements in the UK, in the short term. From this Review there are some findings which have the potential to contribute to a limited increase in uptake in the more immediate future, although the earlier caveats relating to transferability and sustainability need to be firmly borne in mind: -

- The features of effective intervention for encouraging increased uptake of folic acid supplements reflect the general features of effective health promotion intervention. In particular, interventions tend to be more effective if they: include co-ordinated and complementary components (for example by working through settings where people spend much of their lives e.g. workplaces or the community, and using different approaches to bringing about structural, environmental and individual change); are sustained; tailored to the needs of specific subgroups; and re-inforced over time^{4 5}.
- The characteristics of those women who are least likely to take folic acid supplements are well established. They are younger, on lower incomes and

⁴ Roe L, Hunt P, Bradshaw H & Rayner M (1997) Health promotion interventions to promote healthy eating in the general population; a review. Health Education Authority, London.

⁵ Sjoström, M and Stockley L (2001): Toward public health nutrition strategies in the European Union to implement food based dietary guidelines and to enhance healthier lifestyles. *PHN* 4, 307-324.

with lower educational levels, they are more likely to be single parents, and/or belong to a minority ethnic group. Awareness of the recommendations for folic acid is lower in these groups. Only interventions specifically targeted at these groups, were successful in increasing both awareness and uptake, although the baseline differential with women in other groups persists. If interventions do not target these vulnerable groups, awareness remains low and the differential in both awareness and uptake increases between these women and those who are less 'at risk' i.e. inequalities are exacerbated. The aspects of interventions which may increase effectiveness with vulnerable groups appear to be: that the women are 'sought out', and do not themselves have to be proactive; that taking folic acid reflects what peers, friends and family are doing or saying; and that the messages which are communicated are culturally and linguistically relevant, and emphasise the most confusing aspect of the message – that the supplements need to be taken before conception.

- Health professionals are a credible source of information and advice, and the most accessible are practice nurses and general practitioners. The health care system is well placed to provide advice on preconceptual folic acid, although the preliminary conclusions from the limited number of trials which have been carried out, is that advice needs to be embedded in a structure (e.g. preconception counselling) and delivered in a committed and relevant way. There was one randomised controlled trial which assessed the effectiveness of counselling during a routine gynaecological visit, followed by provision of folic acid tablets and a follow-up phone call. This intervention resulted in significant increases in uptake of folic acid, and was particularly effective in black and lower income groups and women not planning pregnancies. Interventions of this sort are more effective if supported by guidelines, training, and by local routines which capitalise on any contact with women of childbearing age – particularly if they are in 'at risk groups e.g. through family planning clinics.
- Integrated national and regional campaigns can be successful in increasing uptake of folic acid supplements to some extent. However, they need to include elements which specifically target women in vulnerable groups, and they need to be sustained in some form. The latter is important in order to maintain levels of awareness amongst women of childbearing age, and others including health professionals, the media, data collection organisations, and people involved with community groups and young people.
- Printed resources and the mass media used in isolation are not effective in the longer term, particularly for vulnerable groups.
- Using a specific health claim explaining the role of folate in preventing birth defects appeared to increase the effectiveness of a campaign in Australia, by making it easier for women to 'find' folic acid containing foods and supplements.

2.0 Aim and Objectives

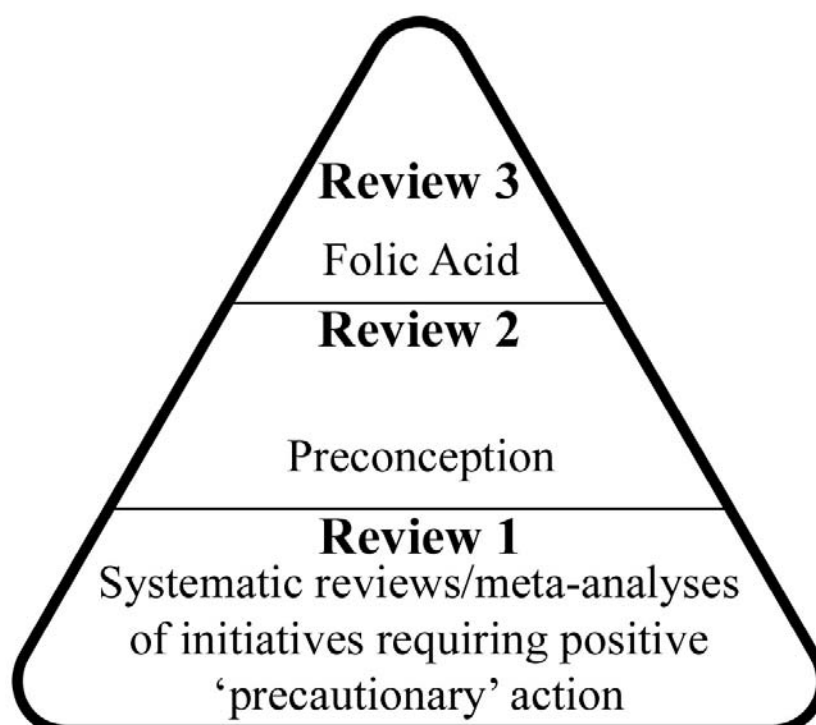
The overall aim was to carry out a literature review of work that has been done on influencing low-income groups, particularly girls/young women, to change their behaviour in relation to health. This included research with both positive and negative results, and work targeted at encouraging this population to take folic acid supplements. The intention was to provide a basis for making evidence-based recommendations for how to improve use of folic acid supplements in the UK

This was achieved by carrying out three complementary reviews, which throughout the remainder of this review are referred to as Reviews 1, 2 and 3.

The objective for Review 1 was to cover published systematic reviews or meta-analyses of research into the uptake of a range of initiatives that required ‘positive precautionary action’ by women, particularly those in low-income groups.

The objective for Review 2 was to focus on identifying research relevant to the effectiveness of different approaches to preconception interventions on behaviour (not pregnancy outcomes).

The objective for Review 3 was to focus specifically on work/schemes/studies aimed at encouraging women, particularly girls/young women and those from low-income groups, to take folic acid in the periconceptual period.



3.0 Methods

3.1 General Process

For each Review described in detail below, an initial screen of the title/abstract was done on-line to ensure that included papers broadly reflect the initial inclusion/exclusion criteria shown below. When a title/abstract could not be rejected with certainty, the abstract was obtained/downloaded for more detailed scrutiny using the initial inclusion/exclusion criteria. The criteria were then refined. Where papers could not be clearly rejected using the abstracts, the full text of the article was obtained for further scrutiny. References were downloaded to Endnote software, and were de-duplicated.

A data extraction form was designed to standardise data collection for each Review, and provide summaries of each piece of included information.

In the analyses, work/schemes/studies were organised by research design, and within that the original intention was to prioritise studies that were clearly based on a theoretical model of behavioural change. However, as described in the Results section, very few such studies were identified.

A list of theoretical models of behaviour change is provided at Appendix 1.

3.2 Review 1

3.2.1 Databases

The following databases were searched:-

- EPPI Centre
- Health Technology Assessment databases (DARE, NHS EED, HTA)
- National Electronic Library for Health – Cochrane databases
- National Library for Health – Women’s Health Specialist Library
- PubMed (including Medline)

3.2.2 Search terms

The following search terms were used in all of the databases above:-

- women AND intervention AND (participation OR uptake) AND (systematic review OR meta analysis)

An additional search was undertaken in PubMed:-

- (systematic review OR meta analysis) AND (pre conception OR peri conception) OR (pre conceptual OR peri conceptual).

3.2.3 Inclusion and exclusion criteria

Initial (scoping) criteria are shown in bold. Additional criteria developed at the stage of identifying which downloaded abstracts were likely to be relevant, and the full text obtained. These are not in bold.

Table 1: Inclusion and exclusion criteria for Review 1

	Inclusion	Exclusion	Exclusion Code
Geographical scope	Europe, USA, Canada, Australia and New Zealand	Other countries	(1)
Languages	English	Other languages	(2)
Dates	All dates	None	(3)
Types of study	Systematic reviews and meta-analyses only	Other types of study	(4)
Population group - demographics	Free-living women of childbearing age (approx 15y-45y).	Other groups	(5)
Population group – health	<p>‘Healthy’ populations, any interventions should be lifestyle or ‘non medical’.</p> <p>Includes interventions to minimise the risk of pregnancy</p>	<p>‘Unhealthy’ population receiving drug, medical or lifestyle intervention e.g. obese groups, diabetics, treatments for secondary prevention cardiovascular disease, women with previous neural tube defect affected birth.</p> <p>HIV and STD prevention initiatives are excluded.</p>	(6)
Purpose of intervention	<p>Interventions to promote a ‘positive precautionary’ behaviour e.g. physical activity, screening, initiation of breastfeeding, use of contraceptives, eating more fruit and vegetables.</p>	<p>Interventions to discourage a behaviour e.g. alcohol consumption, smoking</p> <p>Interventions which contain a mixture of encouraging and discouraging behaviours e.g. CVD prevention, healthy eating interventions.</p> <p>Interventions to maintain a positive behaviour e.g. maintenance of breastfeeding</p>	(7)
Publication status	Published	Not published, ‘grey’.	(8)
Relevance to ‘Overall Aim’	Relevant	Not relevant	(9)
Full text available	Able to obtain full text if abstract appeared to meet inclusion criteria	Not able to obtain full text if abstract appeared to meet inclusion criteria	(10)

3.3 Review 2

For this stage of work, the intention was to focus on identifying research relevant to the effectiveness of different approaches to preconception interventions on behaviour (not pregnancy outcomes). This was done in three ways:-

- a) The studies included in the systematic review by Korenbrot 2002, described in Review 1, were assessed and included if they were carried out in healthy populations of women of childbearing age, with no pre-existing disease of which

they were aware, or previously affected births, and with a behavioural (or similar) outcome

- b) Searches were done for controlled trials carried out after the scope of the Korenbrot 2002 review (i.e. after June 1999), and if they were carried out in healthy populations of women of childbearing age, with no pre-existing disease or previously affected births.
- c) More in depth searches for published and unpublished work in the UK, dated after June 1999, were carried out.

The detail of the methods used for a) b) and c) are given in the next sections

3.3.1 Databases

Table III of Korenbrot 2000 was examined

The following databases were searched:-

- EPPI Centre
- National Library for Health – Women’s Health Specialist Library
- PubMed (including Medline)
- ERIC
- NELH

General internet searches were also carried out using:-

- Google Scholar
- Google

3.3.2 Search terms

The following search terms were used in all of the databases above:-
(preconception) OR (preconceptual))

Additionally, for the internet searches:-

- NOT diabetes NOT gender

3.3.3 Inclusion and exclusion criteria

Studies were included from Table III of Korenbrot 2000 if they were carried out in healthy populations of women of childbearing age, with no pre-existing disease of which they were aware or previously affected births, and with a behavioural (or similar) outcome.

For all other searches the initial (scoping) criteria are shown in Table 2, in bold. Additional criteria were developed at the stage of identifying which downloaded abstracts were likely to be relevant, and the full text obtained. These are not in bold.

Table 2: Inclusion and exclusion criteria for Review 2

	Inclusion	Exclusion	Exclusion Code
Geographical scope	UK, Europe, USA, Canada, Australia and New Zealand	Other countries	(1)
Languages	English	Other languages	(2)
Dates	After July 1999 or relevant study from Korenbrot 2000.	June 1999 or before	(3)
Types of study	All types of study/research Research studies – all designs, systematic reviews, evidence based guidance, expert committee recommendations.	Letters, comments, editorials, advice, commercial information + non systematic reviews, posters, ‘hypothesis’ papers, and research studies with inadequate data (e.g. pre – post studies which only show and discuss ‘post’ data).	(4)
Population group - demographics	Free-living women of childbearing age (approx 15y-45y).	Other groups	(5)
Population group – health	‘Healthy’ populations.	Women with pre-existing conditions, or previously affected births, or at risk of carrying a genetic disorder.	(6)
Purpose of work	Preconception initiatives without a focus on folic acid	Folic acid specific papers → Review 3	(7)
Publication status	Published	Not published, ‘grey’.	(8)
Relevance to ‘Overall Aim’	Relevant i.e. research relevant to the effectiveness of different approaches to preconception interventions on behaviour (or similar)	Not relevant e.g. pregnancy outcomes or work to validate methodology	(9)
Duplication of information	Does not duplicate research/information in another included paper	Duplicates research/information in another included paper	(10)

3.4 Review 3

This stage of the work focused specifically on work/schemes/studies aimed at encouraging women, particularly girls/young women and those from low-income groups, to take folic acid in the periconceptual period.

As well as published work, this included in-depth searches for any information on relevant experiences from other European countries. Full-text translations of all included non-English material were sought.

3.4.1 Databases and sources of information:

Electronic databases:-

EPPI Centre

Health Technology Assessment databases (DARE, NHS EED, HTA)

National Electronic Library for Health , including Cochrane databases

National Library for Health – Women’s Health Specialist Library
 PubMed (including Medline)
 ERIC

General internet searches were also carried out using:-

Google Scholar
 Google

Personally held database, including material from the Health Education Authority’s Folic acid campaign.

Unpublished and grey literature identified during internet searches, Department of Health and other leads provided during the course of the research. In addition, 4 in depth interviews were carried out with individuals who were either a) experts/work in organisations committed to relevant areas of women’s health or b) were closely involved with the HEA’s folic acid campaign, either at a national or a local level.

3.4.2 Search terms:

Search terms included ‘folic acid’ OR folate, AND supplements, AND uptake OR awareness, AND campaigns OR education, NOT homocysteine

3.4.3 Inclusion and exclusion criteria

The initial (scoping) criteria are shown in Table 3, in bold. Additional criteria were developed at the stage of identifying which downloaded abstracts were likely to be relevant, and the full text obtained. These are not in bold

Table 3:Inclusion and exclusion criteria for Review 3

	Inclusion	Exclusion	Exclusion Code
Geographical scope	UK, Europe, USA, Canada, Australia and New Zealand for research literature UK and Europe for case studies	Other countries	(1)
Languages	European languages	Other languages	(2)
Dates	Dates since 1998	Dates before 1998	(3)
Population group - demographics	Free-living women of childbearing age (approx 15y-45y).	Other groups, including pregnant women – unless the study is retrospective with the pre conceptual period included.	(4)
Population group – health	‘Healthy’ populations	Unhealthy population receiving drug or medical intervention Women, or close relatives of women, with pre-existing conditions, or previously affected births, or at risk of carrying a genetic disorder	(5)
Types of study	All types, including quantitative and qualitative research	Letters, comments, editorials, advice, commercial information, non systematic reviews.	(6)
Purpose of	Information of folic acid	Other purposes e.g. folic	(7)

work	<p>supplement use in relation to decreasing the risk of neural tube defects</p> <p>for example to assess the level of use or knowledge or attitudes; to carry out and evaluate an intervention to increase uptake.</p>	<p>acid and heart disease; folate supplementation in pregnancy; to re-iterate recommendations to increase folic acid uptake; to measure folate status; to validate research methodology.</p> <p>Studies with ntds as an outcome measure were also excluded.</p>	
Publication status	Published + 'grey' literature from scientific and reputable sources	Other literature	(8)
Relevance to 'Overall Aim'	Relevant	<u>Not relevant</u>	(9)
Sufficient information available	Able to obtain full text, or sufficiently detailed abstract.	Not able to obtain full text, and abstract did not contain sufficient data for extraction	(10)
Duplication of information	Does not duplicate research/information in another included paper	Duplicates research/information in another included paper	(11)

4.0 Results and Key findings

4.1 Review 1

4.1.1 Search results for Review 1

Database searches identified 1056 titles. These were assessed against the initial inclusion/exclusion criteria and potentially relevant abstracts were downloaded and de-duplicated. This gave 95 abstracts which were scrutinised against the refined inclusion/exclusion criteria. Full texts were requested for 30 studies, and these were re-checked, leaving 26 finally included systematic reviews and/or meta-analyses.

Table 4 shows these papers, organised by the main focus relevant to this review, for example the topic or approach used.

Appendix 2a contains a summary of each of these 26 papers, prepared using the extracted data. Each summary gives details of the citation, study design, types of study included, geographical scope, dates covered, focus, objectives, study population, results, any information on theoretical models used in included studies, authors' conclusions, and reviewers comments (this contains comment from the Centre for Reviews and Dissemination, if it is available).

Appendix 2b contains a list of the 69 papers which were excluded after the abstracts had been scrutinised, with reasons for exclusion (using the exclusion codes given in Table 1).

Table 4: Review 1-Finally included systematic reviews/meta-analyses, by focus and then by date

Focus	First author, date and title
Breastfeeding initiation	Dyson L (2005): Interventions for promoting the initiation of breastfeeding.
	Guise JM (2003): The effectiveness of primary care-based interventions to promote breastfeeding: evidence review and meta-analysis for the U.S. Preventive Services Task Force.
	Palda VA (2003): Interventions to promote breastfeeding: updated recommendations from the Canadian Task Force on Preventive Health Care.
	Fairbank L (2000): A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding.
	Tedstone A (1998) Effectiveness of intervention to promote healthy feeding in infants under one year of age: a review.
	Reid M (1998) Opportunities for and barriers to good nutritional health in women of childbearing age, pregnant women, infants under 1, and children aged 1-5.
Communication in maternity care	Rowe RE (2002): Improving communication between health professionals and women in maternity care: a structured review.
Fruit & Veg – promoting increased consumption	Ciliska D J (1999): The effectiveness of community interventions to increase fruit and vegetable consumption in people four years of age and older
Physical activity promotion	Banks-Wallace J (2002): Interventions to promote physical activity among African American women..
	Eden KB (2002): Does counseling by clinicians improve physical activity? A summary of the evidence for the U.S. Preventive Services Task Force.
	Shepherd J (2002) Barriers to, and facilitators of, the health of young people:
	Rees R (2001) Young people and physical activity: a systematic review of research on barriers and facilitators.
	Dunn AL (1996): Getting started--a review of physical activity adoption studies
Preconception	Korenbrot CC (2002): Preconception care: a systematic review.

Focus	First author, date and title
care	
Screening	Rowe RE (2004): Social and ethnic inequalities in the offer and uptake of prenatal screening and diagnosis in the UK: a systematic review.
	Black ME (2002): A systematic literature review of the effectiveness of community-based strategies to increase cervical cancer screening.
	Tseng DS (2001): Efficacy of patient letter reminders on cervical cancer screening: a meta-analysis..
	Forbes C (1999): Interventions targeted at women to encourage the uptake of cervical screening.
Teenage pregnancy – minimising the risk of unintended pregnancy	Harden A (2006) Young people, pregnancy and social exclusion: A systematic synthesis of research evidence to identify effective, appropriate and promising approaches for prevention and support..
	Kavanagh J (2006) A systematic review of the evidence for incentive schemes to encourage positive health and other social behaviours in young people
	Moos MK (2003): Counseling in the clinical setting to prevent unintended pregnancy: an evidence-based research agenda.
	Scottish Executive (2003) Enhancing Sexual Wellbeing In Scotland: A Sexual Health Relationship Strategy..
	DiCenso A (2002): Interventions to reduce unintended pregnancies among adolescents: systematic review of randomised controlled trials.
	Akinbami LJ (2001): A review of teen-tot programs: comprehensive clinical care for young parents and their children.
	Harden A, Weston R & Oakley A (1999) A Review Of The Effectiveness And Appropriateness of Peer Delivered Health Promotion Interventions For Young People.
UV protection	Saraiya M (2004): Interventions to prevent skin cancer by reducing exposure to ultraviolet radiation: a systematic review

4.1.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the systematic reviews/analyses identified in Review 1.

4.1.2.1 Breastfeeding initiation

Breast-feeding initiation in the community is relevant to the current review, rather than maintenance of breast feeding once it has been started or hospital based interventions. There are some similarities with the decision to begin taking folic acid supplements, for example: there are relatively low breast feeding initiation rates in women who are living on a low income and/or who are younger; promotion of breastfeeding can begin before conception (for example in schools), although in reality most interventions begin in the ante natal period.

Six systematic reviews and/or meta-analyses were identified which included studies on approaches to increasing the initiation of breast feeding.

The most recent of these was Dyson 2005. This consisted of a systematic review and a meta analysis. It only included randomised controlled trials, and identified seven studies for inclusion. The meta analysis was carried out on five of these studies. Overall the interventions were effective in increasing breast-feeding initiation, however there was some variation in effectiveness between the different approaches. For example, one to one support from lactation consultants, in an intervention based on the participants' needs and interests, and including follow up, proved to be effective. On the other hand, breast feeding promotion packs (non-commercial) were not effective, although this particular study was in middle-higher income group women.

The same research group published an earlier systematic review of the same topic, (Fairbank 2000). The 2000 review differs from Dyson 2005 in covering not only randomised controlled trials, but also other controlled studies and ‘before and after’ studies. It identified 59 studies for final inclusion. It seems that some interventions can be effective. For example, small informal health education classes increased initiation rates among women from different income and ethnic groups; one to one health education, peer counselling, or a combination of these were also effective in groups of low income women. Multi-faceted interventions comprising a media campaign, together with a peer support programme and other activities, also resulted in increased initiation rates. The types of intervention which did not appear to be effective included: breast-feeding literature alone or in combination with more formal non interactive health education; social support from health professionals was not particularly effective, programmes directed at health professionals increased knowledge, but did not change attitudes; and media campaigns alone had the potential to improve attitudes, but not behaviour.

Palda 2003 and Guise 2003 effectively cover the same material. The Palda reference focuses on the levels of evidence and recommendations for the Canadian Task Force on Preventive Health Care, whilst the Guise reference reports the original systematic review for a scientific peer reviewed journal. The review and meta analysis included randomised controlled trials, and where these were lacking used ‘best evidence. 33 studies were identified, of which two were assessed as a good quality and 12 were fair. The synthesis of the studies, which took into account the level and quality of evidence, found that the most promising approaches were: individual or group health education sessions lasting 30 to 90 minutes, which were able to increase breast-feeding initiation by 20 to 30 per cent; there was fair evidence to recommend peer counselling; either ‘in person’ or telephone support by itself could increase short and long-term breast-feeding rates; if this was then used to strengthen the effect of educational initiatives, it increased initiation rates by about five to 10 per cent. The two approaches which were not effective were written materials either alone or in combination with other methods, and commercial discharge packs.

The other two systematic reviews which were identified were Tedstone 1998 and Reid 1998. These two reviews were part of a series commissioned by the Department of Health and the Health Education Authority, which assessed the effectiveness of health education interventions. The former was a review of research using traditional methodologies, whilst the other was a complementary review drawing upon qualitative research. The findings are not described in any detail here since there are superseded by the findings of the more recent reviews described above.

None of the 6 reviews specifically mentioned or brought out any theoretical models used in designing interventions.

4.1.2.2 Communication in maternity care

This area appeared to be potentially relevant to the uptake of folic acid supplements and so was included in this report. However, it became apparent that it is only of

limited relevance, with most of the studies concentrating on methods of record keeping, and tools and skills training for health professionals.

One review, Rowe 2002, was identified, and this focused on communication between health professionals and women in antenatal and intrapartum care.

The review included randomised controlled trials and quasi randomised controlled trials, carried out since 1966. 11 studies were included. No meta analysis was carried out because of the heterogeneity of the data. 10 of the studies focused on aspects of antenatal care. The authors concluded that some interventions may help reduce anxiety about antenatal testing and may alter the uptake of some specific tests. However several of the studies were methodologically weak, and the Centre for Reviews and Dissemination commentary on this review agreed that the author's conclusions were appropriately cautious.

4.1.2.3 Fruit & Veg – promoting increased consumption

Initiatives to increase the consumption of fruit and vegetables may have some relevance to increasing the uptake of folic acid supplements. Both include a positive precautionary action, and fruit and vegetable intake tends to be lowest in lower income groups and in young people.

One systematic review on this topic was identified, Ciliska 1999. This included randomised controlled trials, other controlled trials and cohort studies. There are two published versions of this review (for full citations see Appendix 2a). The first was published in the Journal of Nutrition Education, and identified 60 relevant articles. One of these was judged to be of good quality, 17 were moderate, and 42 weak. The authors also wrote a more structured review which is reported in the Centres for Reviews and Dissemination (CRD) databases. This included 15 moderate to strong studies. The review was judged by CRD to be reasonably well conducted, and the author's results and conclusions were consistent with the primary studies included in the review.

The Ciliska review covered the general population aged over four years, and the analysis of the studies considered results from studies targeted at parents of young children, school-age children, and adults. There were five studies which targeted adults. Three of these reported effective interventions. However the other two were not effective. The first of these compared tailored and non tailored information, and found no differences between groups. There was also no change in a study which was concerned with general advice for a healthy heart. Overall, the authors concluded that the more effective interventions gave clear messages about increasing fruit and vegetable consumption; incorporated multiple strategies that reinforce the messages; involved the family; were more intensive; were provided over a longer period of time; and were based on a theoretical framework (one of the effective studies for adults used the Stages of Change model). They also considered that the review supported the use of peer educators and para professionals with low- income women.

4.1.2.4 Physical activity promotion

As with the other topics covered in this section, interventions to increase physical activity in women may have some parallels with increasing folic acid

supplementation. Five systematic reviews were identified which addressed physical activity in women.

The most recent of these was the review by Banks Wallace 2002. This focused on interventions to promote physical activity among African American women, defined as interventions where this group constituted at least 35% of the sample. It covered all dates since 1984, and included all types of experimental design. 18 studies were included and, all of these included educational interventions to alter physical activity behaviour. 14 of the 18 studies also included dietary behaviours i.e. they did not focus only on increasing physical activity. The interventions included group sessions, supervised exercise, and individual education and counselling. Four of the interventions were based on theoretical models. Overall the studies yielded mixed results in terms of their effectiveness in promoting physical activity. The authors concluded that study design and measurement limitations together with the insufficient replication of the components of the interventions means that the evidence is not adequate to provide a solid base for practice. The CRD provided comment on this review, and pointed out a number of weaknesses. However, the comment supported the authors' conclusions, and the main learning from this review was for further research, rather than for the development and implementation of interventions.

The next review, by Eden 2002, focused on a specific approach to promoting activity, provision of counselling by doctors - mostly in primary care practice. The review searched for studies after 1994, and included controlled trials, case control studies and observational studies. Eight trials were included. Five studies targeted physical activity alone, while three had other behavioural targets e.g. dietary change, smoking cessation. The studies varied, with different levels of input from the clinician and other staff, varying lengths of time for counselling, and different emphases to the physical activity advice. Six trials were based on a theoretical model, with the most common being the 'Stages of Change' model which was used in four studies. Overall, the authors concluded that because most of the studies had at least one methodological limitation it was difficult to assess the effectiveness of the interventions. The CRD comment supports this, despite some limitations to the review.

The Shepherd 2002 review had a wide remit, covering barriers and facilitators to the health of young people (11-16y) including mental health, physical activity and healthy eating, especially in socially excluded groups. Since physical activity was a discrete component of the review, it has been included in this report. The review covered all dates, and all types of study- except that non intervention studies were only included if they were carried out in the UK. No information was provided on whether theoretical models had been used in the included studies. In relation to physical activity the facilitators for change included: providing practical support, for example bike racks and shower; support from family and friends (2 soundly evaluated interventions used peer education). Barriers included: teachers were not always considered approachable; motivations were varied in relation to increasing physical activity, with some young people feeling a sense of achievement and others feeling apathetic or pressurised; older teenagers were worried about money and finding jobs, which sometimes limited physical activity if costs were involved. The authors concluded that multi-component interventions are likely to be the most effective; the whole school approach is important; and feedback is helpful in achieving objectives;

peer led interventions may be particularly useful for young women; if teachers are involved sufficient time is needed for training, and more understanding is needed of how to promote better teacher student relationships.

The Rees 2001 review was carried out by the same research group as the previous review. However, it focused specifically on young people (11-16y) and physical activity. It included all dates, and all types of study - except that non intervention studies were only included if they were carried out in UK after 1990. The review gave some information on theoretical models used in the included studies. 28 studies were included, of which the 16 examined young people's views, and 12 were evaluations of the effectiveness of interventions. The latter category provided ambivalent results, with any effects restricted to young women. The views of young people were similar to those reported in the subsequent 2002 study, although in this review there was more emphasis on the need for less traditional school based activities, for example dance and aerobics.

The final review, Dunn 1996, is not described in detail here. This is because it predates the reviews which are described in detail above, and is also not particularly well structured with no synthesis of results.

4.1.2.5 Preconception care

Studies on the effectiveness and approaches to preconception care are particularly relevant to the issue of increasing uptake of folic acid supplements

One systematic review, Korenbrot 2002, was identified which addressed this. The review included studies published between 1990 and 1999, with any type of control group, including observational trials with a comparison group. It did not include any information on theoretical models used in included studies. The study population covered was very wide, including women who presented voluntarily for preconception care, women who were referred for preconception care, and population studies which included all sexually active women of reproductive age whether they intended to become pregnant or not.

19 studies were included. The reviewers reported the results under four categories. three of these relate to specific disease conditions, anatomical congenital anomalies, diabetes mellitus, and hyper phenylalanaemia. The results section of the review focused more on the effectiveness of preconception interventions in reducing the risk of these diseases rather than the approaches used. The last category was more general, but it only included one RCT and one retrospective observational study. In both studies, the preconception care included 1) risk assessment; 2) patient education about identified risks and contraception use during risk reduction; and 3) referrals for patients with identified risks. The RCT did not find any increase in risks being addressed by their doctor compared with the control group. The observational study found that preconception care was associated with increased rates of intended pregnancy among low income women, the relative risk for intended pregnancy for preconception care versus usual family planning services was 1.52.

The author's conclusions were that the concept of readiness for pregnancy for all women needs to be encouraged. The CRD has a number of criticisms of the study, but said that the evidence appeared to support the authors' conclusions.

The main body of the review gives more detail about each of the individual studies which were included. Since this area is potentially very relevant to increasing the uptake of folic acid supplements, each of the included studies will be examined in more detail to assess what learning they may provide for increasing folic acid uptake. This is done in Review 2 of this Report, together with additional searches for any other work relevant to pre- conception interventions in the UK, particularly amongst low-income women.

4.1.2.6 Screening

Four systematic reviews were identified which covered screening in women of child-bearing age. One of these was concerned with pre-natal screening, and the remaining three focused on cervical screening.

The review which covered pre-natal screening, Rowe 2004, focused specifically on the United Kingdom. All types of study carried out in the UK and published between 1980 and 2001, were included. The review was particularly concerned to assess whether there were social inequalities in either the offer or the uptake of pre-natal testing in the UK. 20 studies were finally included, and the types of screening covered screening for Down's syndrome, neural tube defects, haemoglobin disorders and HIV. Only six studies reported data according to women's social class or education level and none found any significance social inequalities in testing. However some studies suggested that women of South Asian origin might be more disadvantaged. The authors concluded that the review provides some evidence of ethnic inequalities in access to pre-natal testing.

Black 2002, carried out a systematic review of the effectiveness of community-based strategies to increase cervical cancer screening. All types of study, published from 1989 to 1999, were included. 42 studies were identified, of which only one was assessed as good quality, with 18 being moderate. Among the good quality or moderate studies, 10 were aimed at disadvantaged women. Of the 19 moderate or strong studies, 7 reported a theoretical basis, with the most popular being the Social Cognitive model. The most frequently used intervention was mass media campaigns, alone or combined with individual strategies; followed by individual education using lay health educators; and last, letters of invitation. Improvements ranged from 61% for educational videos to 12% from a physician letter compared to a no intervention group. Of the 4 studies that used mass-media campaigns alone, only one was effective and that study targeted specific subpopulation with language specific material. All of the studies that combined mass-media campaigns with other strategies were effective. Letters of invitation were effective but required a centralised registry to identify eligible women. The five studies with no improvements identified limitations such as under staffing, low power to detect differences, and failures to address system barriers. The authors concluded that mass media campaigns combined with direct tailored education to women and/or health care providers seemed most successful.

Tseng 2001 specifically looked at studies relevant to the efficacy of patient letter reminders on increasing cervical cancer screening uptake. Only randomised controlled trials published between 1966 and 2000 were included. Ten trials were identified and included in a meta analysis. The analysis showed that mailed patient reminders increased the uptake of cervical screening, although this approach was less effective

in lower socio-economic groups. The CRD commented on this review and identified some weaknesses, but on the whole supported the author's conclusions.

Finally, Forbes 2002, assessed the effectiveness of a range of interventions at increasing the uptake of cervical cancer screening. This review included all randomised controlled trials and quasi randomised controlled trials included in electronic databases. No information was provided on theoretical models used in the included studies. Thirty-five studies were included (27 RCTs and eight quasi-RCTs. 1) In general invitation letters were effective at encouraging women to attend. There was also some limited evidence that telephone invitations increased uptake, but it was unclear whether this practice was more effective than invitation letters. It was also unclear as to whether sending invitation letters with appointments was any more effective than sending invitation letters alone. However, there was some evidence to suggest that invitation letters with fixed appointments were more effective than invitations with open appointments. 2) There was insufficient evidence in the form of statistically significant findings from good quality trials to support any particular educational intervention, but overall the consensus from the studies examining educational interventions was in favour of the intervention over the no intervention/usual care control 3) Amongst ethnic minority groups there appeared to be some limited evidence to support the use of lay members of the community in presenting culturally-tailored information. However, the findings may vary according to ethnic group and further research is required 4) The only study which examined the use of video/slide presentations was of reasonable quality and showed a statistically significant increase uptake. The authors concluded that there was some evidence to support the use of invitation letters to increase the uptake of cervical screening. There was limited evidence to support educational interventions but it was unclear what format was most effective.

4.1.2.7 Teenage pregnancy – minimising the risk of unintended pregnancy

Systematic reviews which covers studies to minimise the risk of unintended pregnancies, particularly teenage pregnancies, have been included in this report, since they are particularly relevant to the issue of uptake of folic acid supplements. There are parallels in terms of the required behaviours being positive and precautionary and the at-risk population groups are similar. There is also a direct interaction between the two topics, since folic acid supplements are less likely to be taken in women who did not intend to become pregnant.

Seven relevant systematic reviews were identified.

The most recent of these, Harden 2006, was published in the UK by a research group from the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI Centre). This review covered all dates in electronic databases, all types of study including qualitative research and process evaluation, and studies including young people under 20y. It had two themes, the first was concerned with the social exclusion which can affect young parents, and the second focused on interventions that might have a role in lowering rates of unintended teenage pregnancy. The teenage pregnancy review included 15 studies: 10 evaluations of interventions, and 5 studies of young people's views. All the interventions were multi-component and based in the USA. Six of the intervention studies provided sound evidence of the value of two particular approaches to targeting the social exclusion associated with unintended

teenage pregnancy: a) early childhood interventions consisting of preschool education, parenting support, and social skills development; and b) youth development programmes combining community service and student learning, or providing a programme of academic and social development. A meta-analysis indicated that these approaches reduced the risk of pregnancy by 39%. The qualitative research revealed three recurrent themes in the experiences of young people: dislike of school; poor material circumstances and unhappy childhoods; and low expectations for the future. There was no information on theoretical models used in the included studies.

There were two other systematic reviews from this research group which focused on health education approaches for young people, but included studies relevant to minimising unintended pregnancies, and these are included in this section.

The first, Kavanagh 2006, looks at the role of incentive schemes in encouraging positive health and social behaviours in young people. This review included studies published after 1985, of all designs including process evaluations, and including young people 11 to 19 years. The searches produced 9,843 records. These were narrowed down to a total of 181 reports of 129 separate studies which were included in the first, mapping stage of the review. The majority of studies were conducted in the USA (n=88), with only 28 studies being carried out in the UK. A wide range of incentives was employed, from cash payments to entry into raffles or lotteries. An example of the type of incentive in teenage pregnancy studies was the 'Dollar a day' programme, where teenage mothers were given a dollar a day for every day they were not pregnant at a monthly pregnancy test. Financial incentives in the form of cash payments or reduced-cost access to a range of resources were used in over half of the studies. Eight studies focused on pregnancy prevention. Sixteen outcome evaluations met the inclusion criteria and were judged to be methodologically sound. Analysis of these 16 studies showed that single or dual component incentive schemes are effective in encouraging positive health behaviours where a simple or single action is required, rather than a sustained health behaviour change. The initial review identified a total of 34 process evaluations focused on one or more areas of health behaviour. Seven studies were on pregnancy prevention. The main findings were that a) The required behaviours need to be logged and rewarded consistently b) Interventions designed to foster the required behaviour need to be implemented properly and consistently c) Large-scale incentive-based schemes in particular require staff with the necessary skills and commitment to supporting young people through a scheme, and in turn such schemes require sound systems in place to support them d) Consideration should be given to ensuring that the size or type of incentive on offer is sufficient to motivate change in young people. There was no information on theoretical models used in the included studies.

The other relevant review from the EPPI centre, Harden 1999, addressed the use of peer delivered health promotion interventions. The review covered all dates in electronic databases, most designs of study including process evaluations with a formal evaluation, and covered young people 11-24 years. One of the quality assessment criteria for the studies was whether a theoretical framework was used. There were two relevant (i.e. to minimise risk of pregnancy) interventions and these were both in school settings: 1) a peer-delivered intervention which aimed to provide young people with insight into issues connected with early parenthood; to provide

support and training to the peer leaders (young mothers aged 17 to 26) and to enable these young women to acquire a range of communication skills, self-confidence and self-worth. The peer leaders delivered sessions covering the realities of being a young mother (e.g. the cost of being a single parent) and information on contraception in youth clubs and schools, using presentations, discussion, quizzes and question-and-answer sessions. The authors of the study concluded that extended sessions in the intervention were needed, older adults (as long as they were not teachers) did not affect the delivery of the intervention, the intervention should narrow its focus to one topic (e.g. the realities of being a young parent) and that the intervention should be incorporated into a wider programme of sex education. In addition, they question whether school culture can accommodate peer education and suggest it may be more suited to youth club settings.

2) Another study evaluated a sexual health intervention implemented in secondary school in Germany, which aimed to train a group of young people to educate their peers on sexuality, love, partnership, pregnancy prevention and STDs through one off-class sessions using interactive teaching methods. Principles of ‘empowerment’ informed this project. The sessions were generally positively received but there was some difficulty dealing with some situations arising in the classroom (e.g. how to get everyone to participate), and female only sessions went better than male-only sessions. Views on the training revealed that a non-traditional relationship between the trainer and peer educator contributed to eagerness to learn and motivation. Overall, the authors of the study concluded that the peer education project demonstrated all the principles of ‘good practice’ in health promotion, including empowerment and participation. More specifically, they recommended that the intervals between the training sessions should be shortened to maintain enthusiasm and commitment, and that training should ensure more emphasis on how to conduct a class.

The Scottish Executive also undertook a systematic review to inform the development of their Sexual Health Relationship Strategy. This is included in this report, although the source papers contain no information about methodology or scope. The main findings were that:

- 1) School based sex and relationships education, particularly linked to contraception services, youth development services, community based education and the inclusion of parents in information and prevention programmes have been shown to help in reducing teenage pregnancy.
- 2) The following are characteristics of more effective services and interventions
 - Focus on improving contraceptive use and at least one other behaviour likely to prevent pregnancy and/or STI transmission
 - Long term services and interventions
 - Focus on high risk groups and working through opinion leaders and peer educators
 - Services which are accessible, for example in terms of location, staff attitude, opening hours and confidentiality
 - Encouraging an open and non judgemental discussion about sex, sexuality and contraception Inclusion of personal skills development such as negotiation and refusal skills
 - Having a multi agency approach and working with communities

- 3) The greatest barriers to positive sexual health are in groups such as looked after young people, those excluded from school, and young people from deprived areas.
- 4) Evidence is available to suggest that creative programmes, whether designed to prevent teenage pregnancy or support teenage parents are more holistic in approach and aim to address some of the identified factors associated with risk. This highlights the need for multi-component approaches aimed at preventing pregnancy and/or poor outcomes associated with unintended pregnancy

DiCenso 2002, published a systematic review which included both published and unpublished randomised controlled trials, carried out between 1970 and 2000, and including young people aged 11-18 year. 26 trials were identified. The results of a meta analysis were not particularly encouraging. The interventions did not delay initiation of sexual intercourse; did not improve use of birth control; and did not reduce pregnancy rates. There were significantly fewer pregnancies in young women who received a multi-faceted programme (although there were some methodological issues with this study), and abstinence programmes and one school based programme were associated with an increase in number of pregnancies.

Finally, two systematic reviews focused on specific approaches to minimise unintended pregnancies. Moos 2003, assessed the usefulness of counselling in a clinical setting to prevent unintended pregnancy. This review included: all types of studies including those using qualitative methods; studies carried out between 1985-2000; in young people aged 12 to 19 years. Four studies addressed the effectiveness of counselling. Overall the authors concluded there were insufficient good-quality studies to assess the effectiveness of this approach. However, some of the specific studies contain learning which may be relevant the uptake of folic acid supplements. In one study women who were taking the contraceptive pill had more unprotected days if there was a lower level of partner support, they were not married, or did not consider it important to avoid pregnancy. The women who were more likely to take the Pill consistently, took it at the same time each day, read and understand all of package information, and took the pill at a routine time other than right before bed. In terms of attitudes, teenage pregnancy was associated with subjects coming from a community where adolescent pregnancy rates are high, and socially tolerated. The authors of the review attempted to assess the theoretical underpinnings of the included studies, but said that it was difficult to do so. CRD comment supported the author's conclusions.

Akinbami 2001, looked at repeat pregnancy rates in young women who attended teen-tot programmes. There were no specified inclusion or exclusion criteria and the review included studies carried out between 1980-2000. One randomised trial and three case control studies were identified. The authors concluded that the programmes had moderate success in preventing repeat pregnancies. However, the CRD thought that perhaps the conclusions were overly positive.

4.1.2.8 UV protection

Theoretically there are some similarities between UV protection and taking folic acid supplements, since both require a positive precautionary action.

Only one systematic review was identified which covered this area, Saraiya 2004. This included primary research studies, carried out between 1966 and 2000. The main findings were that there was evidence of effectiveness for education and policy approaches to promoting UV protection behaviours in primary schools, and in recreation and tourism settings. However there was inadequate evidence of effectiveness in other settings, including child care centres, secondary schools, colleges, occupational settings, and health care settings. Other interventions where there was insufficient evidence were: media only campaigns, interventions directed at parents or care-givers of children and community-wide multi-component interventions.

4.1.3 Key Findings

4.1.3.1 Breastfeeding initiation

Overall interventions to increase breastfeeding initiation can be effective, including interventions in women living on a low income.

Those which are most effective include:

- one to one support from lactation consultants, peer counselling, and ‘in person’ or telephone support
- small informal health education classes
- multi-faceted interventions

Those which are not effective include:-

- breast feeding ‘packs’, either commercial or non commercial
- written material alone, or in combination with more formal non interactive health education or other approaches
- social support interventions from health professionals
- programmes focusing solely on health professionals
- media campaigns alone

4.1.3.2 Communication in maternity care

None

4.1.3.3 Fruit & Veg – promoting increased consumption

Overall interventions to increase fruit and vegetable consumption can be effective, including interventions in women living on a low income.

Those which were most effective included:

- Focused messages, rather than a ‘package’
- Involve families, if possible
- Intensive and sustained interventions
- Interventions which use a theoretical model
- The use of peer educators or para professionals

Those which were not effective included:-

- Tailored information (one study only)
- The desired ‘behaviour’ being one of a ‘package’ of behaviours

4.1.3.4 Physical activity promotion

Overall, the evidence for promoting physical activity, particularly in low income groups, young people, and women, does not seem particularly strong. The main points which can be made here are from non intervention studies, describing facilitators and barriers for young people. These are:-

Physical activity promotion may be helped by:-

- providing practical support
- eliciting support from family and friends
- undertaking multi-component interventions
- embedding initiatives in a whole school approach
- providing feedback on progress to individuals
- using peer led approaches for young women
- placing more emphasis on less traditional school based activities

Physical activity promotion may be hindered by:-

- teachers were not always considered approachable
- costs

4.1.3.5 Preconception care

See Review 2

4.1.3.6 Screening

Main findings:-

Overall interventions to increase screening can be effective, although they tend to be less effective in women living on a low income and some ethnic groups may be disadvantaged.

Those which were most effective included:

- mass media campaigns combined with direct tailored education to women and/or health care providers
- mailed patient reminders, although this approach was less effective in lower socio-economic groups. Although these can be effective they require a centralised registry. There is some evidence to suggest that invitation letters with fixed appointments are more effective than invitations with open appointments. There is also some limited evidence that telephone invitations increase uptake
- there was limited evidence to support educational interventions but it is not clear what format is most effective. One study which examined the use of video/slide presentations was of reasonable quality and showed a statistically significant increase in uptake
- amongst ethnic minority groups there appeared to be some limited evidence to support the use of lay members of the community in presenting culturally-tailored information.

Those which were not effective included:-

- mass-media campaigns in isolation

4.1.3.7 Teenage pregnancy – minimising the risk of unintended pregnancy

Overall, interventions to minimise teenage pregnancy have variable results. The one systematic review and meta-analysis which only included randomised controlled trials, concluded that generally primary prevention interventions to reduce teenage pregnancy were not effective.

Those which were most effective included:

- multi-component, multi agency interventions
- early childhood interventions consisting of preschool education, parenting support, and social skills development
- youth development programmes combining community service and student learning, or providing a programme of academic and social development
- peer-delivered interventions may have potential but benefit from: a specific focus ; being part of a wider programme; having female only sessions; having short enough intervals between training sessions to maintain enthusiasm; ensuring adequate training for peer educators on how to conduct a class
- School based sex and relationships education
- Long term services and interventions
- Focus on high risk groups and working through opinion leaders and peer educators
- Services which are accessible, for example in terms of location, staff attitude, opening hours and confidentiality
- Encouraging an open and non judgemental discussion about sex, sexuality and contraception Inclusion of personal skills development such as negotiation and refusal skills
- In relation to taking the contraceptive pill, consistent use is more likely if it is taken at the same time each day – but not just before going to bed, and the package information is read and understood.

Those which were not effective included:-

- incentive schemes are effective in encouraging positive health behaviours where a simple or single action is required, rather than a sustained health behaviour change.
- abstinence programmes
- teenage pregnancy was associated with subjects coming from a community where adolescent pregnancy rates are high, and socially tolerated, groups including looked after young people, those excluded from school, and young people from deprived areas.

4.1.3.8 UV protection

Some interventions to reduce UV exposure are better supported by evidence than others.

There was most evidence for education and policy approaches to promoting UV protection behaviours in primary schools, and in recreation and tourism settings.

4.2 Review 2

4.2.1 Search results for Review 2

The searches identified 441 titles. These were assessed against the initial inclusion/exclusion criteria and potentially relevant abstracts were downloaded and de-duplicated. This gave 154 abstracts which were scrutinised against the refined inclusion/exclusion criteria. Of these 53 were identified as more appropriate for consideration in Review 3. Full texts were requested for 25 studies, and these were re-checked, with 18 being finally included.

Table 5 shows these papers, organised by study design, and then by country.

Appendix 3a contains a summary of each of these 18 papers, prepared using the extracted data. Each summary gives details of the citation, study design, geographical scope, study population, objectives, methods, results, any information on theoretical models used in included studies, and authors' conclusions.

Appendix 3b contains a list of the 83 papers which were excluded after the abstracts had been scrutinised, with reasons for exclusion (using the exclusion codes given in Table 2).

Table 5: Review 2 - Finally included work, by study design and then by country

Study Design	Country	First author, date and title
Systematic Review	English Language	Boulet SL (2006b): Preconception Care in International Settings
Expert Opinion	Canada	Public Health Agency of Canada (2000) Family-Centred Maternity and Newborn Care: National Guidelines
	USA	Centers for Disease Control and Prevention (2006) Recommendations to improve preconception health and health care - United States: a report of the CDC/ATSDR Preconception care work group and the Select Panel on Preconception Care
		American College of Obstetricians and Gynecologists (2005): ACOG Committee Opinion number 313, September 2005. The importance of preconception care in the continuum of women's health care.
Randomised Controlled Trial	USA	Jack BW (1998): Addressing preconception risks identified at the time of a negative pregnancy test. A randomized trial.
Prospective study	Hungary	Czeizel AE (1999): Ten years of experience in periconceptual care.
	USA	Moos MK (1996): The impact of a preconceptional health promotion program on intendedness of pregnancy.
Uncontrolled trial, pre and post measures	USA	Bernstein PS (2000): Improving preconception care
Cross sectional survey	Netherlands	Elsinga J (2006): Preconception counselling initiated by general practitioners in the Netherlands: reaching couples contemplating pregnancy
		van Heesch PN (2006): Dutch community midwives' views on preconception care.
		Poppelaars FA (2004): Current practice and future interest of GPs and prospective parents in pre-conception care in The Netherlands
		de Jong-Potjer LC (2003): Women's interest in GP-initiated pre-conception counselling in The Netherlands
		de Weerda S (2001): Psychological Impact of Preconception Counseling: Assessment of Anxiety before and during Pregnancy

	UK	Heyes T (2004): Preconception care: practice and beliefs of primary care workers.
	USA	Boulet SL (2006a): A Perspective of Preconception Health Activities in the United States.
		Frey (2006): Preconception Healthcare: What Women Know and Believe.
Qualitative research	USA	Stanford JB (2000): Defining dimensions of pregnancy intendedness.
Case Study	Belgium	Ebrahim SH (2006): Models of Preconception Care Implementation in Selected Countries.

4.2.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the work on pre and periconception initiatives identified in Review 2.

The main findings are described below. None of the work identified was based explicitly on a theoretical model.

4.2.2.1 Systematic review.

Boulet 2006b published a systematic review, which was identified during internet searches. This focused on preconception care programmes, declarations, reports, and recommendations published internationally between 1980 and 2005. The review excluded scientific evidence relating to specific pre conception interventions, and is thus significantly different from the earlier Korenbrot 2002 review. It describes initiatives by geographical area, and within Europe mentions the national preconception care campaign in Belgium, which is described here in more detail by Ebrahim 2006 (case study). Initiatives in France focus more on preconception care for women with diabetes than for the general population. Hungary is mentioned in several studies described later in the current review. Hungary established a family planning service under the direction of WHO in 1989, consisting of 32 regional health centres that provided peri conception care free of charge. The number and scope of the centres was increased in 1996. An evaluation of the programme is described by Czeizel 1999 (prospective study). Boulet notes that despite the various scientific studies from the Netherlands (several of which are mentioned in later sections of the current review) only two preconception clinics have been described in the literature. Similarly, only two preconception clinics have been described in the UK, one in London and one in Glasgow. Both of these focused on women with previous adverse pregnancy outcomes. The review concludes by recommending an integrated approach to preconception care, including risk assessment, health promotion, and intervention.

4.2.2.2 Expert opinion.

The USA is similar to the UK in that around half of all pregnancies are unintended. It is recognised that pre conception care needs to address not only women who are planning pregnancy, but all women of reproductive age. In 2005 the American College of Obstetricians and Gynaecologists agreed a Committee Opinion on the importance of preconception care, emphasising the importance of optimising women's health before and between pregnancies as an ongoing process.

In 2006 the Centers for Disease Control and Prevention produced perhaps the most thorough piece of work to date. This consisted of both a literature review and expert

opinion relating to improving preconception health and healthcare in the USA. The data extraction in Appendix 3a provides more detail, but a summary of the main relevant findings and recommendations are reproduced here:-

1. The best evidence for the effectiveness of these specific components of preconception care has been documented when the focus of delivery was on a single risk behaviour and accompanying intervention, rather than delivery of multiple interventions.
2. Interventions that address multiple pregnancy-related risk behaviours simultaneously have not been systematically evaluated and are less commonly delivered.....One study has reported the effectiveness of comprehensive preconception care; however, the findings have limited applicability for the implementation of preconception health-care services in the United States because the study was conducted in Hungary
3. Only a limited number of studies regarding effectiveness of interventions have been tested for increasing preconception screening, counselling, and intervention in primary care settings.
4. A limited number of studies have assessed the best methods for integrating interventions to achieve maximum impact and optimize the use of limited resources.
 - As with other types of preventive care services, time constraints limit physicians' ability to deliver health promotion interventions. Preconception care interventions can potentially be integrated into a limited number of model visits to focus on specific content at different visits, as is done for well-child care .
 - Integrated and coordinated care services might also provide additional support to improve health outcomes. For example, an evaluation of the quality of care in the National Centers of Excellence in Women's Health indicated that women served in these centers, compared with community samples, received more clinical preventive services and had higher satisfaction levels
 - Other approaches (e.g. self-management) to integrated service of delivery has been illustrated in CDC's recommendations in Strategies for Reducing Morbidity and Mortality from Diabetes.
5. Preconception care should be tailored to meet the needs of the individual woman.

These findings led to a series of recommendations:-

- Each woman, man, and couple should be encouraged to have a reproductive life plan.
- Increase public awareness of the importance of preconception health behaviours and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.
- As a part of primary care visits, provide risk assessment and educational and health promotion counselling to all women of childbearing age to reduce reproductive risks and improve pregnancy outcomes.
- Increase the proportion of women who receive interventions as follow-up to preconception risk screening, focusing on high priority interventions (i.e., those with evidence of effectiveness and greatest potential impact).

- Use the interconception period to provide additional intensive interventions to women who have had a previous pregnancy that ended in an adverse outcome
- Offer, as a component of maternity care, one prepregnancy visit for couples and persons planning pregnancy.
- Increase public and private health insurance coverage for women with low incomes to improve access to preventive women's health and preconception and interconception care.
- Integrate components of preconception health into existing local public health and related programs,
- Increase the evidence base and promote the use of the evidence to improve preconception health.
- Maximize public health surveillance and related research mechanisms to monitor preconception health.

The Public Health Agency of Canada also produced national guidelines for preconception care in 2000. These were developed by carrying out a survey of users, a consultation, and the involvement of representatives of the various disciplines concerned. Again, more detailed information is provided in Appendix 3a. The main relevant recommendations were:-

- Women and men from diverse backgrounds should be involved in all aspects of preconception care.
- Health care providers need accurate and up-to-date information on preconception health issues.
- Preconception care and programs should be offered through a number of venues, in various community locales, and through a variety of creative approaches. It is recommended that preconception care and education be incorporated into school curricula and the workplace, delivered through the media, and offered through community-based agencies.
- Identify women and families with inadequate support and to try to link them up with appropriate community resources.

4.2.2.3 Randomised Controlled trials

The only randomised controlled trial (Jack 1998) which was identified was one which was included in the Korenbrot 2002 systematic review. Women in the study were assigned randomly to either a usual care group or intervention group. The latter were informed about any risks which were identified. Their primary care clinician was also informed. There was no difference between the groups in the percentage of risks addressed, and so notifying women and clinicians of identified preconception risks did not improve preconception care. The authors conclude that more organised intervention systems and ways of motivating both clinicians on women to address preconception risks, are needed.

4.2.2.4 Prospective studies

Two prospective studies were identified. The first of these, Moos 1996, was identified from the Korenbrot 2002 systematic review. This was a study carried out in the USA, which reported that women who were offered a preconception health promotion programme were more likely to identify their pregnancies as intended than a group who did not take part in the programme. The authors conclude that preconception

programmes could prove useful for promoting intendedness of pregnancy in low income women.

The other prospective study (Czeizel 1999) followed women who participated in the Hungarian peri conceptual care programme, over a 10 year period. The results indicate that the programme was effective in improving many aspects of peri conceptual care, including reduction in smoking and alcohol consumption, and increase uptake of folic acid containing multivitamin supplements. The paper does not provide data relating directly to increased uptake of supplements, but reports significant reductions in congenital abnormalities.

4.2.2.5 Uncontrolled trial, with pre and post measures

The only study which was identified which fell into this category (Bernstein 2000) assessed a combination of education about preconception care and a standardised form, provided to staff at an inner-city hospital and gynaecology clinic. Data was collected from a convenience sample of women before the intervention, and from a second convenience sample after the intervention. A repeat provider survey was carried out. The intervention led to improvements in screening for risk factors (for nutrition this rose from 9% to 50%), and documentation of preconception care. However, staff knowledge and attitudes were not significantly changed.

4.2.2.6 Cross sectional surveys

Five of the cross sectional studies described here were carried out in the Netherlands. The Netherlands differs from both the UK and countries like the USA, in that a far higher proportion - around 80% - of pregnancies are planned.

Poppelaars (2004) carried out a survey to assess whether women and GPs would be interested in preconception care initiatives. 60% of the women planning a pregnancy said that they would visit such a clinic, and 63% of doctors were in favour of the introduction of clinics. de Jong Potjer (2003) reported a similar survey, and this gave similarly high figures with more than 70 per cent of women saying that they would be interested. It is difficult to know how far this finding can be extrapolated, since the participants have a higher socio-economic class than the population averages, and GPs were able to exclude women if their social circumstances (in the doctor's opinion) would make the offer inappropriate. The same research group published a later study (Elsinga 2006), to assess whether women who are planning a pregnancy within the year can be reached by a peri conceptual care programme offered by general practitioners. As in the previous study, the general practitioners excluded a large number of women, and 33% of pregnancies occurred in women who had been excluded. The authors' concluded that efforts would be needed to decrease the exclusion of women by doctors, and to increase interest amongst women.

van Heesch (2006) explored the opinions of midwives on their role in providing preconception care, and reported that 83% were willing to provide such care and 55% felt it should be part of their professional domain. However for this to happen, more training would be needed, and time would have to be made available.

The remaining report from the Netherlands (de Weerda 2001) assessed anxiety levels before and after preconception counselling, since it has been suggested that this could

lead to adverse psychological effects. In this study, counselling did not appear to have any impact on anxiety levels.

The next study is the only study reported in the Review 2 searches, which was carried out in UK. Heyes (2004) carried out a questionnaire survey in Barnsley to assess the beliefs and attitudes of primary health care practitioners towards pre-conceptual care. Few practices had a written policy on the topic, with most respondents providing advice on an opportunistic basis, and had done so less than five times in the previous 3 months. GPs and practice nurses were most commonly involved. Staff agreed that advice about smoking (rated as very important by 96% of the group), drug use (94%), folic acid (79%), genetic counselling (71%), chronic disease, alcohol, and maternity care and screening for rubella, genital infections, hepatitis, human immunodeficiency virus and cervical cytology were important. They felt that advice about diet (29%), exercise, supplements, food safety, occupational hazards, state benefits, and screening for nutritional status were less important. Although respondents felt that pre-conceptual care was effective, and important to women of childbearing age, it was not a high priority in their workload. They indicated that this care was best provided in general practice and that they had the appropriate skills. Barriers to providing it included lack of resources and lack of contact with women planning to conceive. Few had received any relevant training since qualifying in their discipline.

The last two studies in this section were carried out in the USA. Frey (2006) carried out a survey of women attending 'Well women' examinations at family care practices. Nearly all of the women realised the importance of pre-conception care, but only 39% could recall their doctor ever discussing it. Over 95% were aware of risks associated with drug use, alcohol, tobacco, medical medication and abuse. Just under 80% were aware of the advice to take folic acid supplements.

Boulet (2006a) used information collected at a National Summit on pre-conception care to assess the types and scope of programmes in the United States. 23 states reported a Priority Need that focused on pre-conception care, and 42 states had a Performance Measure associated with it. It seems that the importance of pre-conception care has been widely recognised in the USA at a structural level.

4.2.2.7 Qualitative research

Only one small qualitative study was identified (Stanford 2000). This was an in-depth exploration of the influences on women's intentions to become pregnant, carried out in 27 women in the USA. The results indicate the importance of a woman's perceptions of her significant relationships, particularly her relationship with her partner, as playing a key role in at least some dimensions of pregnancy intendedness.

4.2.2.8 Case study

Ebrahim (2006) described approaches to pre-conceptual care in four countries, only one of which met the inclusion criteria for this review – and that was work from Belgium (previously mentioned in 4.2.2.1). This case study provided a more in-depth picture of the plans for developing pre-conceptual care in Belgium. This consists of evidence-based guidelines; a campaign targeting both the general public and health care providers to help market pre-conception care in primary care settings, using a social marketing approach to develop tools for professionals and an information campaign among men and women of reproductive age. The final step will be an

evaluation to assess behavioural changes both within the community and amongst providers.

4.2.3 Key Findings

Relatively little research based evidence on approaches to effective preconception care was identified in this section, although increasingly policies and guidance for preconception care have been developed in countries around the world. The USA appears to be in the forefront of this. The Centre for Diseases Control published a detailed evaluation of the available evidence and recommendations in 2006, and 42 States have performance measures which relate to preconceptual care.

There is some evidence for the effectiveness of preconception care having a positive impact on health behaviours, and also indications that participation in pre-conceptual care may increase the numbers of pregnancies which are intended.

Cross sectional studies from the Netherlands, and one from the United Kingdom, indicate that most women, doctors, and other relevant health professionals support the idea of preconception care, although in practice it happens rarely. Lack of time, and possibly motivation and prioritisation amongst health professionals appear to be important barriers. The one randomised controlled trial which was identified in this section found that informing doctors and women about identified preconception risks did not increase the level of intervention. However, an uncontrolled trial that was identified indicated that providing education and standardised forms was effective in increasing screening, although this did not affect staff knowledge and attitudes.

Taken together the studies identified in this section indicate that :-

- Key barriers for implementation of preconceptual care by health professionals include time, appropriate training, and prioritisation.
- Structural changes need to be incorporated into standard health care for more effective preconception care. This includes identifying timely contact points between women and health professionals
- Approaches outside the health care system have not been well researched, although the Centers for Disease Control mentions self-management

4.3 Review 3

4.3.1 Search results for Review 3

The searches identified 782 titles. These were assessed against the initial inclusion/exclusion criteria and potentially relevant abstracts were downloaded and de-duplicated. This gave 240 abstracts which were scrutinised against the refined inclusion/exclusion criteria. Of these 118 were identified as possibly relevant.

Since it would not be feasible to retrieve the full texts for this large number of papers, a decision was made that although all 118 abstracts would be included in the analysis, full text would only be retrieved for papers where a) the abstract provided insufficient information to assess the work or b) the work was an evaluation of an intervention or campaign to increase the uptake of folic acid supplements or c) the work provided

detailed information on uptake by socio economic or ethnic group or d) the work was from the UK. This reduced the number of full texts which had to be retrieved to 76.

All 118 abstracts/full texts were re-checked, with 90 being finally included.

Table 6 shows these papers, organised by study design and then by country. Appendix 4a contains a summary of each of these 90 papers, prepared using the extracted data. Each summary gives details of the Citation; Full text (F) or Abstract (A) used for data extraction; Study design; Country; Study population; Any information specifically relevant to Low Income (LI) or ethnic (As=Asian; Ac=Afrocaribbean; AA=African American; O=Other) women; Which study population best describes the sample (1) women of childbearing age 2) women - planning pregnancy 3) pregnant women/new mothers asked retrospectively about pre conception 4) combination of 1-3); Objectives of study; Focus of work (1) population or subgroup supplement uptake levels 2) knowledge or awareness or attitudes 3) research intervention 4) population wide intervention or campaign 5) Expert Committee report); Methods; Results; Any information on theoretical models used; and Authors conclusions

Appendix 4b contains a list of the 150 papers which were excluded after further scrutiny, with reasons for exclusion (using the exclusion codes given in Table 3).

Table 6: Review 3- Finally included work, by study design and then by country

Study design	Country	First Author and date
Systematic reviews	Global	Ray 2004
	USA	Quinn 2005
Expert Reports/Consultations	Australia and New Zealand	Food Standards Australia New Zealand 2004
	Ireland	Food Safety Authority of Ireland 2006
	UK	Folic Acid Roundtable
Controlled trials	Australia	Watson 2001; Watson 2002; Williams 2001.
	USA	Johnson 2002; Lawrence 2003; Robbins 2005; Watkins 2004.
Uncontrolled trials	Netherlands	de Weerd 2002
	UK	Edwards 1999
	USA	Chacko 2003; DiPietro 2001; Hauser 2004; Morgan 2004; Quillin 2000
Campaign/Programme evaluations	Australia	Chan 2001
	Canada	Public Health Agency of Canada 2003
	Germany	Egen 2003
	N.Ireland	Health Promotion Agency for Northern Ireland 1999
	Netherlands	de Walle 2002; van der Pal-de Bruin 2003
	UK	Raats 1998
	USA	Centres for Disease Control 1999
Cost effectiveness analysis	Netherlands	de Weerd 2004
Cross sectional surveys + prospective cohort 'monitoring' (in bold font)	Australia	Bower 2004 and 2005; Watson 2006
	Canada	Einarson 2006; French 2003; Morin 2001; Morin 2002a; Morin 2002b; Neimanis 1999; Tam 2005
	Croatia	Gjergja 2006
	Denmark	Knudsen 2004
	Ireland	Oleary 2001; McDonnell 1999; Ward 2004
	Netherlands	Bakker 2003; de Jong-van den Berg 1998; de Walle 2002

Study design	Country	First Author and date
	New Zealand	Allen 2000; Schader 1999
	Norway	Braekke 2003; Daltveit 2004; Vollset 2000
	Poland	Szumska 1999
	Spain	Cano-Serral 2006; Coll 2004; Garcia Carballo 2003
	Sweden	Lundqvist 2004
	UK	Blake 2003; Glasgow Perinatal Effectiveness Committee 1998; Haslam 2003; Howell 2001; ICM 2004; Johnson 2000; Langley-Evans 2002; Mathews 1998; Neill 1999; Relton 2005 ; Rogers 1998; Sen 2001; Sillender 2000a and b; Wald 2005.
	USA	Ahluwalia 2001; Alozie Arole 2003; Carmichael 2006; Centres for Disease Control 1999, 2001, 2004, 2005; de Jong-van den Berg 2005; Goldberg 2006; Hilton 2002; Kloeblen 1999a and b; Lynch 2002; Power 2000; Rosenberg 2003; Cleves 2004; Perlow 2001
Qualitative research	UK	Health Education Authority 1999
Case Studies	Europe (18 countries)	Eurocat 2005

4.3.2 Extraction of information relevant to the uptake of folic acid supplements in the UK, from the work folic acid identified in Review 3.

4.3.2.1 Systematic reviews

The systematic review which is most relevant to the current work was that published by Ray 2004. This covered worldwide literature up until 2003, but differs from the current work in that it focused specifically on three aspects of folic acid supplement use: 1) the rate of use (i.e. not awareness) pre- and periconceptionally 2) the demographic characteristics associated with low rates of use and 3) folic acid use in relation to public awareness campaigns.

A total of 52 studies were included in the review. The main findings were that 1) reported preconceptional folic acid use varied from 0.9% to 50%, the reported rate of periconceptional supplement use ranged from 0.5% to 52%. 2) the most significant predictors of reduced periconceptional folic acid use were a low level of formal education, immigrant status, young maternal age, lack of a partner and an unplanned pregnancy 3) Four studies (UK campaign- Raats 1998; Dutch campaign - van der Pal 2000 & de Walle 2002; Australian campaign - Chan 2001) examined the effect of mass media campaigns on periconceptional folic acid use. The reported rates increased significantly, by a factor of 1.7 to 7.2, but in no study was the post-campaign uptake rate above 50%.

The authors drew out a number of practical implications for the future:-

- Family planning initiatives should clearly also promote folic acid supplement use
- In view of the low rates of planned pregnancy in many countries, better approaches are needed to ensure that folic acid is taken as soon as possible after conception (before neural tube closure at 22–28 days).
- It seems that the best public health programs, which encourage supplementation as an important way of increasing folate intake, reach at most 50% of women.

This is a very strong argument for folic acid fortification of a centrally processed and widely eaten food.

- Whilst public education programs should seek to increase folic acid consumption among all women of reproductive age the review suggests that some women may not receive or comprehend this message. Lack of correct use seems especially true among young, single women, those without a formal education and those who are recent immigrants. Thus, methods should be developed to better deliver this message, paying attention to language and cultural barriers, literacy, and ready access to health care providers and inexpensive folic acid-containing vitamin tablets before conception
- 'Antenatal care' could be reframed as something that starts before conception
- Efforts are needed to ensure that primary care practitioners, especially those most likely to see young women, become/ remain knowledgeable about the proper use of folic acid before conception

The other systematic review which was identified focused specifically on statewide programmes of folic acid education, which used the social ecological model. This is a multifaceted approach to health promotion, which includes environmental, behavioural, and social policy changes that help individuals adopt healthy behaviours. 10 articles were included in this review, and the main findings were that most statewide folic acid campaigns do not incorporate all levels of the social ecological model, although, most include interventions in at least two levels. The authors found that campaign evaluation focused on measuring folic acid knowledge, or awareness, or uptake, rather than on which components of the campaign were effective. Use of models like the social ecological model, to inform evaluation, might help to address this.

4.3.2.2 Expert Reports/Consultations

Two recent Expert Reports/Consultations were identified during the searches for this review. FSANZ (Food Standards Australia and New Zealand) issued a consultation when mandatory fortification was being considered (FSANZ 2004). This included the conclusion that despite campaigns, advice to take supplemental folic acid is not followed by a majority of women. Some of the reasons for this seem to be that a) a large percentage of pregnancies are unplanned b) some women do not know about the benefits of folic acid c) even when women do know, knowledge does not always lead to behaviour change and d) other barriers such as cost, access and compliance issues.

The Food Safety Authority for Ireland (2006) recommended that the policy of advising folic acid supplements to all women of childbearing age who are sexually active and may become pregnant is needed, alongside a policy of mandatory food fortification in Ireland, in order to provide optimal protection for pregnancies against the risk of NTDs. The report went on to say that to encourage uptake of supplements an integrated national health promotion programme needs to be launched.

In the UK the Folic Acid Roundtable (2004), was an expert panel of healthcare professionals and patient organizations. Their recommendations were produced in conjunction with the finding of a cross sectional survey, which is described later in this Report, and included: -

- Government should finance a clear, consistent and innovative health campaign.

- Key healthcare professional groups should routinely discuss and recommend folic acid supplementation to all women who are ovulating and sexually active.
- Healthcare professional organisations should be involved in the continuing education of their respective members.
- Manufacturers of sanitary products, pregnancy and ovulation testing kits, baby formula, and foods fortified with folic acid should include information on their packaging.
- Department of Health should develop Primary Care Trust (PCT) targets for increasing folic acid supplementation and uptake.

4.3.2.3 Controlled trials

Two controlled trials have been reported from Australia. The first of these was a randomised community intervention trial that was originally reported in 1999⁶. The two papers which are included in this review and which describe the intervention, and subsequent follow up evaluation are Watson 2001, and Watson 2002. The study population was a random sample of women of child-bearing age (15-44 years) living in six local government areas (LGAs) in Victoria. One LGA from each pair was randomly selected for the public health promotion intervention, consisting of a brief programme from late July to early October 1997 using printed material only, and no radio or television coverage. Evaluations of awareness then took place in November-December 1997 and March-April 2000. The intervention had a significant impact on folate awareness (4% increase in 1997 which reduced to a 3.3% increase from baseline by 2000). Folate awareness was highest in women aged 25-34 years, with lower awareness in women aged less than 25 years. Folate awareness increased in all age groups since 1997, but the impact of the intervention remained only in the 35-44 year age group. The authors concluded that the intervention based on printed matter was also less effective for socially disadvantaged women. In the Watson 2002 study, the researchers carried out additional analyses to assess whether the evaluation interviews themselves had an effect on women, and concluded that the interview itself was another exposure to folate information with women's responses to it depend on how much information they have already had, and whether or not they have assimilated this.

The other 'controlled trial' from Australia (Williams 2001) did not use a control group, but compared effects of an intervention in the same group, but in two different time periods. It set out to measure the impact of a multimedia folate education campaign, run nationally from July 1998 to June 1999, with and without the use of health claims. Awareness of the role of folate in the prevention of birth defects rose from 21% at baseline to 29% in November 1998 and 44% in May 1999. Awareness of the recommendation to take folate before pregnancy rose by 8% in the first six months of the campaign (without health claims) and by 22% in the second half (when health claims were incorporated). It seems that including a specific health claim explaining the role of folate in preventing birth defects appeared to increase the impact of the folate education campaign. This was in the context of foods rather than supplements, but the finding is also potentially relevant to sales of supplements.

⁶ Watson MJ, Watson LF, Bell RJ, Halliday JL, Burford N & Brennecke SP (1999): A randomized community intervention trial to increase awareness and knowledge of the role of periconceptional folate in women of child-bearing age. *Health Expect* **2**, 255-265.

The other four controlled trials are from the USA.

Johnson 2002 tested the impact of an educational seminar on high school students' knowledge of folic acid supplementation, with 345 boys and girls, in 3 different school districts. The students were allocated to a control or an intervention group, and each completed a pretest and post-test questionnaire. The intervention consisted of a seminar and slide presentation, delivered in school time. Controlling for pre-test scores, students in the intervention group had more knowledge about folic acid and prevention of NTDs compared with the control group ($p=0.001$). Education modules incorporated into the high school curriculum increased folic acid knowledge in this study.

Robbins 2005 carried out a randomised controlled trial, to determine the effect of a physician intervention during routine gynaecologic visits on folic acid uptake. Women were assigned randomly to either receive brief folic acid counselling, a reminder phone call, and 30 folic acid tablets, or to receive counselling about other preventive health behaviours and a folic acid informational pamphlet. Self-reported folic acid use was compared at baseline and at 2 months. Weekly folic acid intake increased in the intervention group by 68%, compared with 20% in the control group ($p=0.008$). The women who were most influenced by the intervention were black and lower income and not planning pregnancies (black women in the intervention group increased to weekly use of folic acid was almost 3 times that of black women in the control group).

Lawrence 2003 carried out a controlled trial with a sample of 18 to 39 years women who belonged to a Health Plan, in order to compare the effectiveness of two interventions to increase the use of multivitamins among women of childbearing age. The first intervention was that information and "starter kits" of 100 multivitamins were mailed to the group, whilst the other group received the information through primary care providers. There was a small but significant increase in the percentage of women using multivitamins in the direct mail group at the beginning of the intervention period ($p=0.006$), but this increase was not sustained after the interventions ended. It seemed that despite reaching women of childbearing age with messages about regularly using multivitamins, only a small temporary increase was found in uptake, and that was amongst women who received messages in the mail.

Watkins 2004 used a similar approach, with a controlled trial with women between the ages of 18 and 45 who visited family planning clinics. The purpose was to evaluate interventions that provided either free folic acid supplements or fortified breakfast cereal. Three clinics provided folic acid pills and educational materials to clients, two provided fortified cereal and educational materials, and one clinic provided educational materials only. Overall women who took part by receiving pills, cereals or educational materials demonstrated an increased knowledge about folic acid at a later visit. Although knowledge was not directly associated with increased self-reported folic acid consumption or increased serum folate levels, the odds of reporting folic acid consumption within two days of a visit were twice as large for participants who answered one or two of the knowledge questions correctly. The authors concluded that knowledge about folic acid was one of the best predictors of self-reported folic acid consumption. The 'free folic acid supplements' arm of the trial was

the only one where the increase in reported consumption of folic acid reached significance (23–42%, $p = 0.03$).

4.3.2.4 Uncontrolled trials

One trial has been reported from the Netherlands (deWeerd 2002). This assessed whether preconception counselling improves folate status of women planning pregnancy, specifically in "users" or "nonusers" of supplements before counselling. Estimated mean red cell folate levels of women who reported no use of folic acid supplements before counselling increased significantly after 4 months. Red cell folate levels of women who reported taking supplements (44%) remained stable up to 1 year after counselling. The study suggests that addressing periconceptional folic acid use at a preconceptional consultation improves folate status among women planning to conceive, particularly in those women who are not already taking a supplement.

Edwards 1999 reported a small study from the UK, and this evaluated the effectiveness of training sessions for health professionals, including midwives, health visitors, practice nurses and family planning staff. Each session consisted of factual information, a brainstorming session about what pregnant women eat and a nutrition game involving calculating a day's intake of folic acid. With every group trained there was an improvement in knowledge. The greatest change was that staff realized how difficult it is to consume the recommended amount of folic acid from food alone. Before the training session 42% of the health professionals thought that women could eat enough folic acid and after the training this had fallen to just 1%. Practice Nurses were the group who reported being asked most frequently about folic acid (82%), compared with GPs (55%) and dietitians (13%).

There were five uncontrolled trials from the USA, and the first two described here both focused on college age women. Di Pietro 2001 carried out a very small study (with no statistical analysis) to evaluate assess the effects of a seminar, consisting of a 45 min Powerpoint presentation follow upon college age women's knowledge about folic acid. A questionnaire was used for pre and post test, with a 4 wk follow up. Average scores increased, and this appeared to be maintained at follow up.

Quillin 2000 reported another small study with this group, but in this case the intention was assess awareness and consumption of folic acid, and to test the hypothesis that Health Belief Model and Foetal Health Locus of Control Scale variables are associated with vitamin consumption practices and can be changed. It is the latter part of the objective that is most interesting for the current review. The researchers found very little association between either of the models and multivitamin consumption, and in particular, locus of control variables were very weak.

Morgan 2004 examined the effectiveness of incorporating CD-ROM technology to increase the knowledge of folic acid among physician assistant students. Knowledge scores increased by 22.45% from pre-test to post-test, and the study suggests that the CD-ROM is effective and may be helpful in encouraging students to recommend daily folic acid intake to their patients.

Hauser 2004 evaluated the impact of an educational programme on the knowledge and practice behaviour of health care providers. A survey was mailed to selected

Florida health care providers to determine baseline knowledge and practice behaviour. After a statewide educational initiative, another mail survey was sent to the same groups of providers to determine the effect. There was significant increase in knowledge and in the percentage of health care providers who recommended the periconceptional use of folic acid, although newer graduates had a more appropriate knowledge about folic acid use but were less likely to recommend it to their patients. The authors highlighted the need for continued education as well as efforts to modify provider behaviour.

Finally Chacko 2003 carried out a study to assess knowledge of NTDs, use of multivitamins and folate- and folic acid-fortified food and factors associated with knowledge and prevention practices among sexually active minority adolescent and young adult women. A trained health educator implemented a folic acid promotion programme between 1999 and 2000 at 3 clinics. When a young woman indicated interest in taking a daily multivitamin, the nurse gave a 3-month supply of multivitamin tablets to her. The follow-up survey was conducted by first randomly selecting approximately 25% of young women of all racial/ethnic groups. 72% of the sample was black and 28% were Hispanic. At enrolment, 52% had heard of folic acid, 45% had heard of NTDs, and daily multivitamin intake was very low at 9%. Significantly more Hispanic than black young women had heard of NTDs. In young women with low education level for age, regular birth control use was significantly associated with knowledge. The programme follow-up survey indicated that 88% to 92% had knowledge of NTDs and folic acid, and 67% reported taking a daily multivitamin. The results of this small study were therefore promising.

4.3.2.5 Campaign/Programme evaluations

In South Australia there was a short campaign with a fairly limited budget (\$40,000 from 1994-5 (Chan 2001). This covered both health professionals and women of childbearing age. It included information and guidelines for professionals, information materials for women placed in a variety of outlets e.g. pharmacies, surgeries, community centres, shops, and libraries. There was media coverage, including women's magazines and radio. Evaluation was by computer-assisted telephone interviews undertaken by random dialling throughout the State before and after the campaign, and by self-administered questionnaires to health professionals and women in the postnatal period. Significant increases in knowledge about folate followed the campaign. Health professionals and women in the postnatal period had higher initial levels of knowledge about folate, which also increased significantly. The proportions of women taking periconceptional folic acid supplements, and of health professionals advising women planning a pregnancy about folate, also increased significantly, and folic acid tablet sales doubled. The authors concluded that a short and cost limited campaign could be effective. However, without follow up it is difficult to know how long the effects were sustained.

In Canada (Public Health Agency of Canada 2003) there has been a range of national and local educational initiatives, including development and dissemination of Canadian clinical practice guidelines, national conferences and local public health campaigns. Evaluation of folate awareness was carried out prior to mandatory fortification, from November 1997 to March 1998 (Phase 1) and after fortification had been implemented for two years, from November 2000 to March 2001 (Phase 2). Data was collected through random telephone surveys in the three sites. There was a

significant increase in the proportion of women aged 19-44 who knew the importance of folic acid. The proportion of women taking a vitamin supplement containing folic acid increased significantly between the two time periods in Newfoundland, but increased non-significantly in Ontario. However, in Ontario, the proportion of women who reported taking supplements with at least 400 micrograms folic acid per dose increased. In the Phase II Newfoundland sample, women who were trying to conceive or who were sexually active and not using birth control were more likely to be taking supplements containing folic acid than women who were using birth control or who had taken permanent measures to prevent pregnancy. There was a 37 % increase in use of supplements containing folic acid among women with a chance of pregnancy in Phase II in Newfoundland, and there was a non significant increase in Ontario sample. The authors concluded that although there were some increases over three years in folic acid supplement use, considerable room for improvement remained.

Egen 2003 described a programme in Munich, Germany. This included sending two personalised letters within a ten month period to gynaecologists in Munich. A copy of the official recommendations and a list of folic acid medicines available on the market were enclosed. All pharmacies in Munich were visited. They were given material for themselves and brochures for their customers, e.g., when selling a pregnancy test. In the official pharmacists' journal, which every pharmacy obtains once a week, an article about folic acid and its implications for the closure of the neural tube was published. At a press conference, journalists working for press, radio and television were informed about folic acid prophylaxis. Subsequently, all daily newspapers, including the tabloids covering Munich, a women's magazine and a scientific journal published articles on the topic, and two radio stations and one television station broadcasted features. Other publications also carried information. The programme was evaluated by two cross sectional studies carried out before and after the information campaign. Before the intervention, 3.8% of the women implemented folic-acid-prophylaxis compared with 9.3% afterwards, which was a non-significant increase. The awareness of the folic acid before pregnancy correlated with socio-economic status and rose significantly from 28% to 42% after intervention. Before the intervention, 38% of the gynaecologists recommended folic acid and this rose significantly to 74%. However the increase amongst pharmacists, from 38% to 43%, was not significant. The overall conclusion was that the effect of the intervention was small, and that any nationwide information campaign should focus on women with lower socio-economic status.

In Northern Ireland a folic acid campaign was initiated by the Health Promotion Agency for Northern Ireland (1999). The campaign included a variety of different approaches including television advertising, leaflets, posters and magazine articles. A cross sectional survey was carried out in 1996 and repeated in 1999, as part of Northern Ireland's Social Omnibus survey. The main findings were that: -

- there was a significant increase in the overall level of awareness of folic acid (73% in 1999 compared with 45% in 1996, with awareness levels highest among the 25-44y age group.
- television advertising was found to be the main source of respondent awareness
- there was some evidence of an increase in respondent knowledge of why folic acid should be taken as well as when it should be taken.

- 55%, of respondents could recall either seeing or hearing at least one element of the agency's campaign, with 47% be able to recall the folic acid television advertisement, 20% the poster, 15% the leaflet, and 10% the magazine article.
- 94% per cent, of women in the target group said they would take a supplement.

Van der Pal de Bruin (2003) described the Dutch folic acid campaign that began in 1995, and the results of an evaluation. The national campaign included: advertisements in newspapers and women's magazines, TV and radio commercials and posters in the waiting rooms of GPs, midwives and gynaecologists, information for women wishing to conceive was available free at the pharmacist. An additional local campaign was targeted at women in lower socio-economic groups. In order to evaluate the campaign two cross-sectional surveys were carried out to assess the effectiveness of the national and additional local campaign. The first survey was just before the start of the national campaign, the second survey was 1 year after the campaign. Data were collected in four regions in the Netherlands. In the west and north regions, only the national campaign was conducted. In the southeast regions, the national and the additional local campaigns were both implemented. Data were gathered by means of a structured questionnaire handed to pregnant women visiting a midwife, obstetrician or general practitioner for the first or second prenatal visit (around 12 or 16 weeks of pregnancy respectively). The main results were:-

- The percentage of women who reported that they had heard of preconceptual folic acid increased from 41.7% to 77.3%. There was no difference in knowledge between the region with the national campaign and the region with the additional local campaign in 1995 and 1996. In 1995, women with a low level of education in the region with the national campaign were slightly less likely to indicate an accurate knowledge of the matter than women with a high level of education in this region, but in 1996, this difference had more or less disappeared.
- Overall, the mean score for perceived safety increased. In both 1995 and 1996, women with a low level of education had a lower mean score on perceived safety than women with a high level
- The mean score for subjective norm increased significantly. No difference was found in increase in mean score for subjective norm from 1995 to 1996 across regions. In 1995, the mean score for subjective norm in women with a low level of education was similar to that for women with a high level. In 1996, there was a difference, but this difference occurred only in the region with the national campaign.
- Folic acid use during the time around conception increased from 16.8% in 1995 to 48.6% in 1996. In both 1995 and 1996, use was higher in women with a high level of education. The difference in folic acid use between women of different educational levels remained the same in the region with the national campaign and increased in the region with the additional local campaign

de Walle (2002) also assessed socioeconomic differences in awareness and use of folic acid supplements 3 years after the 1995 campaign, in a separate study. 50% of the women with a lower educational level used folic acid, while this figure was 80% for the group with higher education. Awareness and use of folic acid increased after the 1995 campaign. However, socioeconomic differences with respect to awareness and use of folic acid remained and even increased with respect to knowledge of the advised period.

Van der Pal de Bruin (2003) concluded that the mass media approach used in the campaign was effective in informing women about folic acid use. However, lower income women were not reached to the same extent. This difference already existed before the onset of the campaign and persisted after the campaign had been implemented. In the region with the additional local campaign, women with a low level of education derived as much benefit from the campaign as their better educated counterparts. This indicates that the subjective norm changed more in a positive direction than in the region with only the national campaign. The authors postulated that as women with a low level of education seem to be more sensitive to the social environment, this could be the key to success in reducing differences in folic acid use between women of different educational levels.

In 1996 the National Health Promotion Agency in England, the Health Education Authority, launched an integrated programme to increase the consumption of folic acid in women of childbearing age (Raats 1998). Although the original campaign was developed for England, it was adapted and work implemented in the other three countries of the UK. There were three strands to the campaigns: to encourage the consumption of foods naturally rich in folate; to increase the availability and intake of foods fortified with folic acid; and to encourage the use of appropriate dose folic acid supplements in women planning a pregnancy. The programme included a) public communication including media advocacy b) working with health professionals, and c) working within the commercial sector. Strategic qualitative research was commissioned during the campaign planning and development stage, and quantitative tracking surveys were also carried out at intervals throughout the campaign. The main results were:-:

- Spontaneous awareness of folic acid among women of child-bearing age increased from 9% in 1995 to 49% in 1998
- Prompted awareness among women of child-bearing age rose from 51% in 1995 to 89 % in 1998
- The percentages of pregnant women and new mothers claiming to have taken folic acid rose between 1997 and 1998: when trying for baby 24 % to 38 %; during the first 12 weeks of pregnancy from 54% to 68 %; at some time during pregnancy from 73 % to 76%
- 1 % of health professionals spontaneously identified folic acid as ‘very important’ for women planning a pregnancy in 1997, compared with 55 % in 1996
- 49 % of health professionals who had seen Campaign Information claimed to have changed their practice as a result
- The range of fortified products and supplements increased
- The number of licensed 400 microgram folic acid supplements increased from one in 1996 to two in 1998
- The number of unlicensed 400 microgram folic acid supplements increased from nine in 1996 to 17 in 1998
- Prescription rates for folic acid increased

The authors concluded that the campaign appeared to have increased awareness and use of folic acid, but noted that the three year duration of the campaign is a relatively short period for a Health Promotion Initiative, particularly when compared with ongoing efforts to reduce smoking or to raise awareness about HIV.

Finally, the Centers for Disease Control (1999) reported on the evaluation of a year-long community information campaign in southwestern Virginia. The campaign included television and radio public service announcements, a news conference, newspaper advertisements, and billboards. Printed materials included brochures, posters, information cards, food labels, flyers, banners, and display boards. Focus groups and readability tests were conducted to help develop print materials. A local grocery store chain helped promote the use of folate-dense foods, folic acid vitamin supplements, fortified cereals, and multivitamin supplements by having volunteers specially label specific foods and hand out educational materials. Volunteers also distributed green ribbons in the communities to promote folic acid awareness. Local school board members and teachers developed a folic acid teaching packet for use in health education and biology classes for students in grades 5-12 and college-level nursing programs. The campaign activities and results were evaluated using precampaign and postcampaign random sample telephone surveys to assess folic acid awareness and knowledge.

- Reported awareness increased significantly, from 31% in 1997 to 54% in 1998, and to 75% in 1999 (sustainability survey),
- Among women who reported hearing about the benefits of folic acid, the proportion who correctly answered that one benefit of folic acid was to help prevent certain birth defects increased from 77% in 1997 to 81% in 1998 and to 88% in 1999.
- Among women who reported in the postcampaign survey that they had heard about folic acid, knowledge about ways to increase consumption increased from 55% in 1997 to 73% in 1999, but correct knowledge about the best time to take folic acid (before or during pregnancy) did not increase.
- Women who had heard of folic acid cited television and health-care providers as the two leading sources of information.

In this campaign, awareness was increased, and this increase continued after the end of the campaign. However, knowledge about the correct timing did not increase, and the evaluation did not assess any impact on uptake of supplements.

4.3.2.6 Cost effectiveness analyses

Only one cost effectiveness analysis was identified (de Weerd 2004). The purpose of this was to assess costs and effectiveness of preconception counselling for all women planning pregnancy in The Netherlands with regard to folic acid supplementation and smoking cessation. Costs and effects were estimated based on 200,000 women approached yearly and uptake rates of 50% and 75%. Effectiveness and potential savings were based on hospital costs of neural tube defects, low birth weight, very low birth weight and perinatal death attributable to maternal smoking. Total costs were estimated at 5.1 million dollars and 7.2 million dollars, at uptake rates of 50% and 75%, respectively. If 50% of women would seek preconception counselling, 22 neural tube defects, 98 low-birth-weight infants, 10 very-low-birth-weight infants and 7 perinatal deaths could be avoided. At 75% uptake, 33 neural tube defects, 146 low- and 15 very-low-birth-weight infants, and 11 perinatal deaths could be avoided. Overall the net costs of preconception counselling were estimated to be 3.7 million dollars and 5 million dollars. However, the authors pointed out that in light of many other preventable adverse outcomes and the potential of preconception counselling to prevent significant lifetime costs for affected children, the net costs here are overestimated.

4.3.2.7 Cross sectional surveys and prospective cohort ‘monitoring’ surveys

Health Professionals

Three surveys were about the knowledge, attitudes and practice of health professionals. These are summarised in Table 7. One of these was a study of a sample of midwives in Sweden (Lundqvist 2004), which concluded that midwives play an important role in information about the need of folic acid intake for women in childbearing age. Changes in local routines, guidelines and further education of midwives would subsequently provide information about the importance of folic acid to women in childbearing age. The other two were in the USA, and one was a very small sample of student pharmacists (Lynch 2002), which indicated that these students lack the specific knowledge needed to effectively counsel women in future clinical practice. Power 2000 reported an authoritative study of obstetrician-gynaecologists, which demonstrated that they are generally aware of the link between folate intake and neural tube defects. Surprisingly over half say that they ask their non pregnant patients about folate intake.

The remainder of the surveys (n=55) were in women, either samples of women of childbearing age, or retrospective data collected from pregnant women or new mothers. The main results are shown in Table 8, and presented very briefly below by country.

Australia

The studies carried out suggest that around 60% of women may be aware of folic acid. Studies carried out with pregnant women/new mothers indicate that uptake (as recommended) is around 28%-46%. Younger women, women with less education, less income, of non-English speaking background and women who were not married were less likely to take folate supplements. 53% of women cited a general practitioner or obstetrician as a source of folate information and 45% cited family or friends.

Canada

Studies with pregnant women/new mothers indicate that about 63-76% of women are aware of the message, and that uptake (as recommended) is around 40% for those with planned pregnancies and 21% for those with unplanned pregnancies. Use was more common among women of Jewish descent. Supplement consumption was associated with pregnancy planning intensity score, knowledge, and belief in the usefulness of supplements, regular exercise, and perceived good health. Health professionals were seen as the most effective information source, but the most common sources of folate information were magazines/newspapers, doctors, and television/radio.

Croatia

Studies with pregnant women/new mothers indicate that about 72% of women are aware of the message, and that uptake (as recommended) is around 14%. Women seem to get information about folic acid from the media, health professionals and friends, but 64% received the information too late.

Denmark

Studies with pregnant women/new mothers indicate that uptake (as recommended) is around 22%. Lower uptake was found in younger women, those with less education, and smokers.

Ireland

Studies with pregnant women/new mothers indicate that up to 67% of women are aware of the message, and that uptake (as recommended) is around 16-24%. Higher uptakes were associated with planned pregnancy and relative affluence. Less affluent women tended to use their general practitioner more as a source of advice. One of the reported barriers was that folic acid (supplements were) not 'visible' enough when women wanted to find them.

Netherlands

More recent studies with pregnant women/new mothers indicate that up to 41%-63% of women are aware of the message, and that uptake (as recommended) is around 36%, although in one earlier study it was less than 5% (de Jong-van den Berg 1998). Awareness was lower in non western women, but usage was not significantly different between non-western and western women (56% versus 69%). Awareness was higher in women who were older, of western descent, had a higher level of education, or had a planned pregnancy.

New Zealand

Studies with pregnant women/new mothers indicate that about 63% of women are aware of the message, and that uptake (as recommended) is around 35% for those with planned pregnancies and 3% for those with unplanned pregnancies. The main sources of advice were general practitioners (48%) or media advertising, either in the form of a magazine, or health pamphlet or television promotion (20%).

Norway

Studies with pregnant women/new mothers indicate that uptake (as recommended) is around 17%. In samples of women of childbearing age 32-46% of women were aware of the need for folic acid, and use of a folic acid supplement before or early in the last pregnancy was reported by 10% in 1998 and by 47% in 2000. This is a large increase, and the data and causes need to be more clearly understood. The strongest determinants of knowledge were pregnancy intention and educational level.

Poland

In samples of women of childbearing age 15% of women were aware of the need for folic acid, and 13% used a folic acid supplement.) Commonly cited sources of information were general practitioners (43.0%) and magazines (41.7%).

Spain

Studies with pregnant women/new mothers indicate that about 86% of women are aware of the message, and that uptake (as recommended) is around 7%. Use was associated with awareness of the need to take folic acid together with having had preconceptional counselling. It was more likely that supplements would be used correctly if prescribed by a family doctor

United Kingdom

Studies with pregnant women/new mothers indicate that about 66-81% of women are aware of the message, and that uptake (as recommended) is 21-48%, in most of the surveys but in one study was only 9% (Rogers 1998). In samples of women of childbearing age 69% of women were aware of the need for folic acid.

Age: Blake 2003 only focused on women planning a pregnancy, and in this group reported that overall uptake (as recommended) use was 55%, and 32% of those aged 16-24, 59% of those aged 25-34, and 60% of those aged 35y or more.

Ethnic groups: Howell 2001 reported that white women were 5.7 times more likely to have taken folic acid supplements before conception than Bangladeshi women, after controlling for the variables, age, school leaving age, social class, parity, planned pregnancy and 'heard of folic acid'. The uptake levels were 29% for white women and 7% for Bangladeshi women.

Time trends: Wald (2005) assessed changes in preconceptual folic acid use between 1999-2004 using the results from a routine question used in antenatal screening programme for Downs syndrome and NTDs. The percentage of women who reported taking folic acid before pregnancy were: 1999 - 37%; 2000 - 37%; 2001 - 35%; 2002- 31%; 2003 - 32%; 2004 - 27%. This indicates that there has been a decline of around 10% since 2000.

Factors associated with lower uptake: -

- area deprivation levels,
- lower household income
- lone parent
- unemployed
- lower socio-economic group
- low educational attainment
- younger
- unplanned pregnancy,
- less knowledgeable /lack of awareness of the potential benefits, not being convinced of efficacy
- not planning to breastfeed
- smoking

Sources of information:-

- Women were four times more likely to get advice on taking folic acid from a GP than a midwife and nine times more likely than from family/friends
- Supplements were most frequently bought from a chemist (50%) or supermarket (22%) or obtained on prescription from a GP (22%).
- Advice increased from all sources following the HEA campaign, with nurses reaching statistical significance. GPs were significantly more likely to prescribe folic acid preconceptionally

USA

Studies with pregnant women/new mothers indicate that about 73% of women are aware of the message, and that uptake (as recommended) is <20 - 53%. In samples of women of childbearing age 30-69% of women were aware of the need for folic acid, and 23-42% used a folic acid supplement. Lower awareness was associated with less education; being black, Hispanic, or from other racial/ethnic groups; entering prenatal care after the first trimester; having an unintended pregnancies; younger than 25 years old, nulliparous, smoking, having no previous miscarriage and no fertility treatments, eating less breakfast cereal; eating less than five fruits and vegetables a day, and being obese.) Women reported obtaining information about folic acid from magazine or newspaper articles (31%). Those learning about folic acid from radio or television and health-care providers increased 23% and 19%, respectively.

Table 7: Cross sectional surveys - health professionals

Country	First Author – date	Knowledge and practice
Sweden	Lundqvist 2004	79% of midwives informed women about folic acid
USA	Lynch 2002	Student pharmacists A: 74% knew when supplementation should begin. 56% were able to correctly identify either the recommended level or good sources of folic acid (57.6-65.2%).
	Power 2000	Obstetricians and Gynecologists A: 53% screen their nonpregnant patients of childbearing age.

Table 8: Cross sectional and prospective 'monitoring' surveys of women's awareness/knowledge and use of periconception folic acid supplements, by country

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
Australia	Bower 2004	Up to 30-40% increase in women taking periconceptional folic acid supplements		1) Supplement use is strongly correlated with educational and socioeconomic status;
	Bower 2005		A: 62.3% aware of the correct message before pregnancy, U: 28.5% reported taking 200 microg + supplements p.d.	1) Less aware women more likely to be younger, first pregnancy, single, in a de facto relationship, have no tertiary education, be a public patient, have smoked, not to have engaged in exercise, and not to have planned their pregnancy
	Watson 2006		U: 36% in Victoria and 46% in New South Wales .	1) Younger women, women with less education, less income, of non-English speaking background and women who were not married were less likely to take folate supplements 2) 53% of women cited a general practitioner or obstetrician as a source of folate information and 45% cited family or friends
Canada	Einarson 2006		U: 51% in women planning pregnancy	2) Health professionals were seen as the most effective information source
	French 2003	A: 95% of women had heard of folate, but only 25% knew that it could prevent birth defects.		1) Lack of awareness of the importance of folate was the most common reason given for choosing not to use folic acid supplements 2) The most common sources of folate information were magazines/newspapers, doctors, and television/radio.
	Morin 2001		A:76.3% identified folic acid as the one vitamin specifically associated with reduction of birth defects. U: 49.4% of all women took vitamins prior to pregnancy.	
	Morin 2002a		A: 70% aware of the preventive role of folic acid U: 25%	1) Supplement consumption was associated with pregnancy planning intensity score 3) knowledge, and belief in the usefulness of supplements
	Morin 2002b		U: Only 13.5% of fetuses were exposed to adequate doses of folic acid	

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
	Neimanis 1999		A: 63% U: 21% for those with unplanned pregnancies. 40% for those with planned pregnancies	3) Knowledge, regular exercise, perceived good health, and planned pregnancy associated with use
	Tam 2005		U: 28%	1) Use was more common among women of Jewish descent 3) Not taking folic acid associated with unplanned pregnancy and a lack of knowledge
Croatia	Gjergja 2006		A: 72% U: 14.4%	2) get information about FA from the media, health professionals and friends 3) 64% got information too late
Denmark	Knudsen 2004		U: 22.3% of those planning pregnancy	1) Young age, low education and smoking were identified as factors that determined non-compliance
Ireland	Oleary 2001		A: 67% U: 18%	3) Folic acid was not 'visible' enough
	Mc-Donnell 1999		U: 16 %	1) Less affluent women tended to use their general practitioner more as a source of advice 3) Planned pregnancy advice and relative affluence were predictive of use.
	Ward 2004		A: 21% -66% U: 24%	3) Lack of pregnancy planning
Netherlands	Bakker 2003		A: 41% of non-western women had heard of the recommendation to use folic acid before pregnancy, compared to 79% of the western women U: not significantly different between non-western and western women (56% versus 69%)	1) Awareness lower in non western women, but usage similar 3) Awareness was higher in women who were older, of western descent had a higher level of education, or had a planned pregnancy
	de Jong-van den Berg 1998		A: 28% - 78% U: 4.4%	

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
	de Walle 2002		A: 63% U: 36%	1) Higher educated women knew more about folic acid and used it significantly more often
New Zealand	Allen 2000		U: 35.7%	
	Schader 1999		A: 63% U: 17%, planned pregnancy-35%, unplanned -2.8%	2) Main sources of advice were general practitioners (48%) or media advertising, either in the form of a magazine, or health pamphlet or television promotion (20%).
Norway	Braekke 2003		U: 17%	
	Daltveit 2004	A: 46% U: 47%		
	Vollset 2000	A: 32.9% U: 2.4%- U: by women who had been pregnant within the last year, 10.3%		1) Strongest determinants of knowledge were closeness to a pregnancy and educational level
Poland	Szumska 1999	A:15% U:13%		2) Commonly cited sources of information - general practitioner (43.0%) and magazines (41.7%).
Spain	Cano-Serral 2006			1) In social classes with manual occupations women were less likely to have taken folic acid supplements
	Coll 2004		A:85.7% U: 6.9%	3) Awareness of the need to take folic acid together with having had preconceptional counselling and knowledge of NTDs were the strongest associations with use
	Garcia Carballo 2003		U: 95% used supplements 'during their pregnancy'	3) More correct use if prescribed by a family doctor
UK	Blake 2003		U: Women planning pregnancy. overall -55% 32% of those aged 16-24 59% of those aged 25-34 60% of those aged 35+	1) Use decreased with area deprivation levels, lower household income, and for lone parents
	Glasgow PEC 1998		U: 21%	1) Failure to use folic acid was significantly associated with unplanned pregnancy, increased age and no previous pregnancies, and lack of awareness of the potential benefits

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
	FAA Round-table 2004	U: 28 (when planning pregnancy)		2) Women were four times more likely to get advice on taking folic acid from a GP than a midwife and nine times more likely than family/friends
	Haslam 2003			3) Women planning to breastfeed were more likely s to have increased their folic acid intake
	Howell 2001		U: White – 29% Bangladeshi – 7%	1) White women were 5.7 times more likely to have taken folic acid supplements before conception than Bangladeshi women, after controlling for the variables, age, school leaving age, social class, parity, planned pregnancy and 'heard of folic acid'.
	ICM 2004	A: 69%		3) 1 in 6 women think that eating a healthy diet alone during pregnancy is enough
	Johnson 2000		A: 66%	1) Knowledge higher in those who had a job, who had planned their pregnancy, didn't smoke and in higher social classes 3) Supplements were most frequently bought from a chemist (50%) or supermarket (22%) or obtained on prescription from a GP (22%). The most common sources of information on nutrition in pregnancy were The BOUNTY book on having a baby, 'Mum-to be' magazines and 'St George's Guide to Nutrition in Pregnancy'
	Langley-Evans 2002		U: 43%	1) Less likely to use - Women under the age of 21 years, smokers and women from lower social classes
	Mathews 1998		U:31.5%	1) Young age, smoking and low educational attainment were statistically significant predictors of failure to use folic acid both before and during pregnancy.
	Neill 1999		U: 43%	3) 38% did not recall being given any advice about the benefits of periconceptual folic acid
	Relton 2005		U:48%	1) Younger women and more socially deprived women were less likely to use folic acid supplements before 4 weeks of gestation
	Rogers 1998		U:9%	
	Sen 2001		A:76%	1) Less knowledgeable – lower income, lone parents, lower educational levels, smokers and women who did not plan a pregnancy

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
	Sillender 2000a		A: 81% U: 27%	Unplanned pregnancy was a significant bar to uptake. Number of pregnancies had no effect. Older women were more likely to take postconceptional folate, but awareness and preconceptional use were the same as younger women.
	Sillender 2000b		U:27%	2) Advice increased from all sources following the HEA campaign, only nurses reached statistical significance. GPs were significantly more likely to prescribe folic acid preconceptionally 3) The most common reason given for non-use, was unplanned pregnancy followed by non-awareness of folate, and awareness without being convinced of efficacy. Cost was a less important factor
	Wald 2005		U: 1999-37%; 2000 - 37%; 2001 - 35%; 2002- 31%; 2003 - 32%; 2004 - 27%	
USA	Ahluwalia 2001		A: 73% in 1998	1) Less aware - Women who obtained a high school education or less; who were black, Hispanic, or from other racial/ethnic groups; who entered prenatal care after the first trimester; and whose pregnancies were unintended
	Alozie Arole 2003		A: Planned pregnancy- 1999 71.4%	1) Less aware - women with no high school education, black women with unplanned pregnancies
	Car-michael 2006		U: 53%	1) Less use in women who are nonwhite, speak Spanish, have low education, younger than 25 years old, nulliparous, smoke, have no previous miscarriage and no fertility treatments, begin prenatal care and become aware of their pregnancy after the first trimester, have nonplanned pregnancies, and eat less breakfast cereal.
	CDC 1999	A:1999 -68% U: 32%, and 29% of those being not pregnant		1) those most likely to use -women aged 25-45 years , college graduates and those with high incomes 3) women who reported obtaining information about folic acid from magazine or newspaper articles - 31%. Those learning about folic acid from radio or television and health-care providers increased 23% and 19%, respectively

Country	First author-date	Sample (A= Awareness/Knowledge; U= Use of supplements)		Comments 1) relevant to low income, young, or minority ethnic women 2) Sources of information 3) Other attitude information
		Women of child bearing age	Pregnant women/new mothers	
	CDC 2001 Michigan	A: 30% U: (multivit. folic acid) 42.4%		1) Less likely to use -women aged 18--24 years, women who had a low level of education, women who ate less than five fruits and vegetables a day, and obese women
	CDC 2004 &5	U: (vitamin containing folic acid) 2004 -40% 2005 -33%		
	de Jong-van den Berg 2005	A: 50% U: 40%		1) Maternal education was a strong independent predictor of both awareness and use as were ethnicity, whether the pregnancy was wanted, family income, and whether a health care provider was consulted before planning
	Goldberg 2006			1) Predictors of lack of use included a higher prepregnancy body mass index, younger maternal age, non-white race/ethnicity, lower education level, and unplanned pregnancy
	Hilton 2002	U: 33.3% -daily multivitamins		
	Kloeblen 1999a and b		U: <20%	3) Correlations were found between participants' intention to permanently follow a high folate diet and perceived susceptibility, severity, benefits, barriers, self-efficacy and cues to action constructs. The perceived benefits were consistently the most predictive.
	Rosenberg 2003		U:33.2%	1)Adolescent mothers were less likely to take periconceptional folic acid (9.2%) and more likely to report unintended pregnancy (62.0%) than older women
	Cleves 2004	U: 22.7%		1) Age, race, educational level, folic acid awareness, marital status, pregnancy intent, and other preventive health behaviours were the most important predictors of compliance
	Perlow 2001 Arizona		A: 7.9%	1) Spanish-speaking patients were significantly less likely to be consuming a vitamin supplement preconceptionally when compared with English-speaking patients

4.3.2.8 Qualitative research

Only one qualitative study was identified, and this was carried out in the UK, in the closing year of the national campaign (Health Education Authority 1999). The purpose was to undertake research in vulnerable groups (i.e. young women, women in low-income groups, and those with poor educational backgrounds) in order to inform further work in raising awareness of the benefits of folic acid both preconception and in early pregnancy. The sample included women on a low income from African and Caribbean background: and women on low income from a south Asian background. Health professionals were also involved and included one group of General Practitioners, one group of health professionals including a community midwife, pharmacists and family planning professionals. The research was carried out using focus groups and in depth interviews.

The main findings were that:-

- The target group did not seem to plan their pregnancies. Having babies was accepted as a natural part of being a woman. Awareness of Folic acid was low amongst the target audience, largely due to their lack of thought about preconception issues, but awareness increased significantly amongst those who had given birth
- Typical reactions to unintended pregnancies were characterised by shock. This was particularly common amongst teenagers. Those who had already had children expressed concern about the practicalities of having another baby and, and this was particularly true of unsupported mothers. African Caribbean women showed determination to have children with or without support and Asian women were much more likely to plan their children with the help of their extended families.
- Mothers and friends were credible sources of advice and tended to supersede professional advice particularly in the early stages of pregnancy. The key time for taking folic acid - before conception - was a time when most of the women were wholly uninterested in advice.
- The target audience requires clarity on key parts of the folic acid message particularly the importance of taking it preconception.
- In terms of approaches it is key that the folic acid message actively seeks out these vulnerable groups. They will not proactively seek out information and they are not comfortable with detailed written resources. Direct communication approaches would be appropriate for raising awareness e.g. verbally, posters, videos, and television. Short written resources could be used to develop the message e.g. leaflets or postcards. Communications should emphasise folic acid as a vitamin for all women, which will both improve the health of a baby and reduce the risk of birth defects. Communications should be available in South Asian languages.
- Health professionals felt that low levels of awareness and understanding made it hard for them to explain the benefits of folic acid to this group. There was a lack of available opportunities to make contact. However, they felt that folic acid was emerging more in consultations, and many were adopting ad hoc approaches acknowledging that folic acid should be mentioned at every available opportunity during a consultation with the women of child-bearing age. Furthermore GPs claimed to be prescribing folic acid and felt that women generally took a supplement if provided with a prescription. Health professionals felt that it was important to raise awareness of folic acid preconception by using diverse

community based routes e.g. schools, community centres, family planning centres, pharmacists and television. Well-presented communication was thought to be vital e.g. in pregnancy packs, on Asian television channels. For health professionals themselves an actionable document was suggested, including case studies and tips.

4.3.2.9 Case studies

Representatives from eighteen European countries provided information relevant to folic acid in a report from Eurocat (2005). The report contains detailed information for each country, including a summary of the status (official/unofficial) of supplementation policy, and whether there is a health education campaign and the dates of this.

By January 2005, eleven of the eighteen countries contributing to the report had introduced an official policy advising women to take periconceptional folic acid supplementation. The first governments to formulate such a policy were in the Netherlands (1992), UK (1992) and Ireland (1993). Of the other 7 countries: Portugal recommended that health workers should educate women about the benefits of folic acid; Malta and Finland recommend raising folate status by dietary means only; and four countries (Austria, Belgium, Croatia, Germany) has no official government policy at the time of writing, although professional groups within them advise supplementation. Half the countries have launched some type of health education campaign so that the information about the protective effect of folic acid can reach women directly rather than just through health professionals. In all countries, only a minority of women were found to have taken folic acid supplements during the entire advised periconceptional period. The highest uptake was recorded in Netherlands, UK, Ireland and Norway with 30-46% periconceptional uptake. Extremely low uptakes of less than 5% were found in France, Spain, Germany and Italy. It should be noted that the countries in which the highest uptake rates were found were those with official health education initiatives. The low uptake of periconceptional folic acid supplements may be because a large proportion of women do not plan their pregnancies. The report presents information on the estimated number of planned pregnancies in different countries, and this ranges from 10-20% in Poland, to 75% in Croatia.

4.3.2.10 Use of theoretical models

There were only 5 papers which explicitly mentioned the use of any theoretical model in developing an intervention or an evaluation.

Quinn 2005 addressed the application of the social ecological model, and this systematic review is summarised in Section 4.3.2.1.

In the evaluation of the Dutch folic acid campaign (van der pal de Bruin 2003) a framework was used which was similar to the central constructs of the theory of reasoned action. The data from the 1995 survey were used to test the hypothetical model of determinants. The behavioural model that resulted from the logistic regression analysis included attitude, subjective norm and perceived safety, while awareness knowledge appeared to affect folic acid use through subjective norm and perceived safety. The criterion variable of the conceptual model was folic acid use during some period around conception. The model was confirmed by analysing the

data from the 1996 survey and appeared to be consistent among women with different levels of education.

Quillin 2000 (described in Section 4.3.2.4) assessed whether the Health Belief Model (HBM) and Foetal Health Locus of Control Scale variables are associated with vitamin consumption practices and can be changed. This was a small study, with a sample of 71 students. As mentioned previously the researchers found very little association between either of the models and multivitamin consumption, and in particular, locus of control variables were very weak. The authors concluded that these findings could be important since many current campaigns to increase folic acid consumption focus on education about the preventive effects of daily maternal folic acid use. The data from the study do not predict the success of such campaigns since subjects' motivation to take multivitamins containing folic acid was not related to their beliefs in their abilities to influence the outcome of pregnancy.

Kloeblen (1999a and b) came to rather different conclusions about the relevance of the Health Belief Model (HBM), when used with a convenience sample of 251 low-income pregnant women. In these studies preconception use of supplements and several indicators of subjects' knowledge about folate were correlated with Health Belief Model constructs in manners consistent with the model framework. Correlations consistent with the HBM were found between the perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and cues to action constructs, and participants' intention to permanently follow a high folate diet. In regression analyses, the perceived benefits construct was consistently the most predictive of folate intention. The authors concluded that participants were generally unfamiliar with and had many misperceptions concerning both folate and NTDs. The HBM may offer an effective foundation for development of tailored educational interventions promoting permanent consumption of a high folate diet among low-income women.

4.3.3 Key Findings

4.3.3.1 Background

Awareness, Knowledge, Uptake

A large number of studies, 55 cross-sectional and two prospective cohort monitoring surveys, provided information on folic acid awareness, knowledge and uptake among women. The two main sampling approaches which were used were either to collect information amongst women of child-bearing age, or to collective retrospective information from pregnant women or new mothers.

Although there is a great deal of data about awareness and knowledge of folate and folic acid supplements, much of it is not directly comparable. For example, some studies have just assessed familiarity with the term 'folic acid', some have asked about knowledge in relation to neural tube defects or pregnancy, whereas others have assessed whether women know about the advice on when to take supplements. So, although this data can be invaluable for individual monitoring exercises, it is of restricted use when comparing results from different studies.

Data on uptake (as recommended) is far more useful for this purpose, and some cross sectional surveys which are described here indicate that uptake (as recommended) reported by pregnant women and new mothers ranges from 7% (in Croatia) to 53% (one study from the USA). However, most countries report levels between 25-35%. Much lower levels are reported when data is collected from samples of women of child-bearing age. New Zealand reported levels as low as 3%. Case studies reported by Eurocat in 2005, indicate that similar levels are reported from France, Spain, Germany and Italy. A study from Poland reported figures of 13%. Surveys from the USA have yielded figures of between 23% and 42%. A study from Norway reported that 10% of women used folic acid supplements before or early in their last pregnancy in 1998, and this rose to 47% in 2000. This increase is not paralleled by any other reports which were identified in this review.

Influences on awareness knowledge and uptake

The work described in this section consistently indicates there are some factors that are particularly associated with lower awareness, knowledge, and rates of uptake.

One of the most important of these is the link with unintended pregnancy. The rates of unintended pregnancy vary considerably both within and between populations. In terms of variation between countries, some countries, such as Poland, report very low levels of planned pregnancy (10-20%), some such as the UK and USA are intermediate (about 50 %), and others including Croatia and the Netherlands have very high rates of planned pregnancy (75% -80%).

There is considerable confounding between the different factors which were identified consistently across the surveys, as being associated with lower awareness/knowledge/uptake. They include:-

- unintended pregnancy or lower pregnancy planning intensity score
- lower household income
- being a lone parent
- unemployed
- lower socio –economic group
- low educational attainment
- younger
- non-English speaking/ non western/ black, Hispanic, or from other racial/ethnic groups (except one study from Canada which found that use was more common among women of Jewish descent)
- less knowledgeable /lack of awareness of the potential benefits, not being convinced of efficacy
- not planning to breastfeed
- smoking
- not taking regular exercise
- eating less breakfast cereal;
- eating less than five fruits and vegetables a day, and
- having a higher body mass index

The effects of parity (first time mother or not), and cost of supplements was less clear.

Sources of information

The sources of information about folic acid supplements and the relative credibility of these reflect general findings from the health promotion literature. The most common sources of information for women tend to be mass-media advertising, magazines, newspaper articles and family and friends. However, although health professionals are usually cited less frequently, their advice is regarded as more credible. Generally, family doctors seem to be a more frequent source of advice than other health professionals, including midwives. In the UK practice nurses appear to be the group who are asked most frequently about folic acid (82%) compared with GPs (55%) and dietitians (13%) (Edwards 1999). Pharmacies were mentioned very infrequently.

4.3.3.2 Effectiveness of interventions

Community

Only one randomised controlled trial carried out in the community, was identified. This was carried out in Australia (Watson 2001, 2002) and assessed a brief intervention based on the distribution of printed resources only. It resulted in overall increases in awareness, but this was only sustained at 3 year follow-up amongst women aged 35-44. The intervention was also less effective for women in lower socio-economic groups.

Williams (2001) measured the impact of a multimedia folate education campaign, run nationally in Australia from July 1998 to June 1999, with and without the use of health claims. Using a specific health claim explaining the role of folate in preventing birth defects appeared to increase the impact of the folate education campaign, and this finding is potentially relevant to sales of supplements.

Only two community based trials were identified, which is scarcely enough to draw many conclusions. An intervention consisting of printed resources only is not effective in the longer term, and is not appropriate for low income women. Using a health claim may make it easier for women to identify relevant foods and supplements.

Approaches which target women through the health care system.

Two controlled trials and two uncontrolled trials assessed the effectiveness of approaches which targeted women through the health care system.

One controlled trial (Lawrence 2003) compared mailing multivitamins to a sample of women of child-bearing age with providing information through primary care providers. Only a small temporary increase in uptake was found, and that was in the group who were sent the vitamins in the post. Watson 2004, in the other controlled trial, tested the provision of free folic acid supplements, and in this study found there was a significant increase in consumption, although there was no data on whether this was sustained or not. A small uncontrolled trial reported by Chacko 2003, used a similar premise. However, in this study advice was initially provided by a trained health educator, and only when a young woman indicated that she was interested, was she given a given a three-month supply of multivitamin tablets. The sample was predominantly black and Hispanic, and the programme appeared to be effective in

increasing knowledge and uptake. However, given the nature of the study these findings must be treated with some caution.

de Weerd 2002 reported that including advice about folate in preconception counselling was effective in increasing uptake, if women did not already take a supplement.

The health care system seems to be well placed to provide advice on preconceptual folic acid, and it also appears to have potential to be effective although the preliminary conclusions from the limited number of trials which have been carried out, is that advice needs to be embedded in a structure (e.g. preconception counselling) and delivered in a committed and relevant way.

Health professionals

There was one randomised controlled trial which assessed the effectiveness of counselling during a routine gynaecological visit, followed by provision of folic acid tablets and a follow-up phone call. This intervention resulted in significant increases in uptake of folic acid, and was particularly effective in black and lower income groups and women not planning pregnancies.

There were also three uncontrolled trials, all of which focused on the provision of training for health professionals. One study used a CD Rom with physician assistant students, one evaluated training sessions for health professionals, and the other evaluated a state-wide education programme for health care providers. All of these interventions were effective in increasing knowledge.

Three cross sectional studies provided some information on the knowledge, attitudes and practice of selected health professionals. One of the studies was carried out on a small sample of student pharmacists in the USA, and the findings indicated that the students lacked the specific knowledge they would need to advise women in the future. Obstetrician and gynaecologists in the USA showed a good levels of awareness of the relationship between folate and neural tube defects, with a high proportion saying that they already advise nonpregnant patients about folate intake. The final cross-sectional study was of midwives in Sweden, and this indicated they played an important role, but could be more effective if supported by local routines, guidelines, and training.

4.3.3.3 Integrated campaigns

Four integrated campaigns were identified which appear to have been successful in increasing uptake of folic acid supplements to some extent. These four campaigns were those reported from South Australia, the range of national and local educational initiatives implemented in Canada, the Dutch Folic acid campaign, and the UK Folic acid campaigns. The highest figures reported were for the Netherlands where, at the end of the campaign, 49% of women reported taking folic acid during the time around conception.

However, in the reports of all four campaigns the authors recognised that although there had been increases in supplement uptake, the apparent success was qualified in some way. In Australia, there was no evidence that the effects would be sustained. In Canada, it was noted that even at the end of the study there was ‘considerable room

for improvement' (in uptake of folic acid supplements). In the UK, the authors drew attention to the short duration of the campaign, particularly when compared with sustained health initiatives around smoking and HIV. In the Netherlands, there was particular concern about reaching women in lower socio-economic groups. The mass media approach used in the campaign was generally fairly effective. There was a difference in awareness and uptake between women in higher and lower socio-economic groups before the start of the campaign. An additional regional study which targeted women in lower socio-economic groups was effective in that women with a low level of education derived the same benefit as their better educated counterparts, however the original differences persisted. In a follow-up study it was concluded that socio-economic differences remained in relation to awareness and use, and had increased in terms of relevant knowledge.

Two other campaigns were reported, from Germany and from South West Virginia, where the effects of the interventions were limited, in particular in respect of socio-economic differences and about the appropriate timing for supplement use.

4.3.3.4. Folic acid in the UK

The national folic acid campaign in England ran from 1996-1998 (3 years). It succeeded in raising awareness of folic acid, increasing reported use (as recommended), increasing health professionals' knowledge and reported practice, increasing the availability of fortified foods and folic acid supplements. In terms of usage, in 1997 24% of pregnant women reported taking folic acid supplements when trying for a baby, rising to an average figure of 38% in 1998. The figure for women who were not planning a pregnancy (or 'leaving things to chance') was only 9%. This first stage of the campaign was targeted at the general population, and the original intention was to proceed to targeting those women who were less likely to use folic acid supplements.

With this in mind, a qualitative study was carried out in the closing year of the campaign, and provided insights into the influences on young women, women in low-income groups, and those with poor educational backgrounds. The most relevant findings included: the fatalistic view of pregnancy; the importance of advice from mothers and friends compared with health professionals; and the difficulty in actively making contact with women in these groups.

The Health Survey for England (Blake 2003) only collected data from mothers who reported planning their pregnancy, and it is important to bear in mind that around 50% of pregnancies are unintended. Over half of these mothers in the survey (55%) reported taking supplements or changing their diet prior to pregnancy to increase folate intake. There were pronounced variations, for example, as household income increased, so did the percentage of mothers who increased their folate intake before pregnancy, from 25% in the lowest income quintile, to 46% in the second lowest quintile, 65% in the middle and second highest income quintiles, and 69% in the highest income quintile. There were also variation with age, with 32% of those aged 16-24, 59% of those aged 25-34, and 60% of those aged 35y or more taking folic acid as advised.

The only study specifically looking at variation by ethnic group in the UK was Howell 2001, who reported that uptake levels were 29% for white women and 7% for Bangladeshi women.

It is difficult to assess trends in folic acid supplement use since the 1996-8 campaign, since much of the data is not comparable. However: Wald (2005) assessed changes in preconceptional folic acid use between 1999-2004 using the results from a routine question used in antenatal screening programme for Down's syndrome and NTDs. Nearly 60,000 women were screened, with a response rate of 85%. The percentage of women who reported taking folic acid before pregnancy dropped steadily from 37% in 2000 to 27% in 2004. This indicates that the effects of the campaign have not been sustained, and the figures are dropping back towards a level that is similar to that in 1997.

4.3.3.5. Theoretical models

It is difficult to reach any conclusions based on the limited number of papers that were found, which used a model. The social ecological model works at a number of different levels, and the review by Quinn 2005 suggests that many folic acid interventions adopt it to some extent, although this may not be recognised by the instigators of the interventions.

A small study with students (Quillin 2000) did not support the use of either the Health Belief Model (HBM) or Foetal Health Locus of Control Scale. However, a somewhat larger study with low-income pregnant women found that preconception use of supplements and several indicators of subjects' knowledge about folate were correlated with Health Belief Model, and the authors advocated its use.

Perhaps the model which has produced findings with practical implications was the one used in the Dutch folic acid campaign (van der pal de Bruin 2003). This was adapted from the Theory of Reasoned Action. Using this model led the authors to conclude that in the local intervention (which targeted women with a low educational level) the subjective norm changed more in a positive direction than in the region with only the national campaign. The implications of this were that, focusing on the social environment could be “the key to success in reducing differences in folic acid use between women of different educational levels”.

5.0 Conclusions

The aim of this work was to carry out three complementary reviews, which would provide a research basis for improving the use of folic acid supplements in the UK. This section attempts to draw out the main findings, particularly for lower income and young women, from each of the three Reviews.

The health topics covered in Review 1, and to some extent Review 2, are diverse. Although in summarising the main findings, it was possible to identify which were the most effective and less effective interventions for each of the areas, it has proved rather more difficult to assess which points are likely to be transferable to the promotion of folic acid supplements. There is also the issue of transferability of interventions from other countries to the UK, since relatively few studies were carried out in the UK context.

The approach which has been adopted here, is to identify common features across each of the topic areas, in the expectation that since they are common, they are more likely to be transferable.

However, in many ways this is reducing this aspect of the work to the lowest common denominator, and may be suppressing more innovative learning from specific health topic areas.

One possibility is that the work done in this report for Reviews 1 and 2, could be the basis for further discussion, for example through a nominal group approach (a hybrid of the Delphi method and a focus group of 'experts'). This would also help to gain insights into the likely applicability of the research to work in the UK.

The main findings for all three Reviews should thus be viewed with considerable caution, since there are important issues of transferability between topics and also between countries. The other caveat which should be noted is that many of the studies only included short term follow up, so there is very limited evidence on the sustainability of effects of interventions.

Review 1: Main findings

- Interventions should include a 'package' of complementary components including different communication channels, locations, and health promotion approaches, and be sustained over a long period
- Focus on high risk groups
- Families should be involved, if possible
- Incorporate folic acid information into school based sex education
- Work with youth development programmes
- Peer-delivered interventions appear to be effective for young women, but they should have a specific focus; be part of a wider programme; have short enough intervals between training sessions to maintain enthusiasm; include adequate training for peer educators on how to conduct a class
- Provide practical support e.g. easy access to supplements
- Encourage consistent use of supplements, by recommending that they are taken at the same time each day

Review 2: Main findings

There appears to be little research based evidence on approaches to effective preconception care, although increasingly policies and guidance for preconception care have been developed in countries around the world. Much of the research has been done in the USA, with five cross sectional studies from the Netherlands, and only one study from the UK. The health and social care structures in those countries with most research and/or preconceptional policies or guidance are very different to those in the UK, which limits the applicability of much of the work that was identified. However, there is some evidence that preconception care can have a positive impact on health behaviours, including folic acid uptake. There are also indications that participation in pre-conceptual care may increase the numbers of pregnancies which are intended.

Ideally, folic acid advice would be incorporated into a structure of preconception care which reached high numbers of women of childbearing age. This would have numerous benefits for the health of mothers and infants, of which reduction in the risk of neural tube defects would only be one. However, the reality is far from this, and key barriers which would need to be addressed are:-

- Health professionals would need adequate time, appropriate training, and a higher priority assigned to preconceptional care.
- Structural changes would need to be incorporated into standard health care for more effective preconception care. This includes identifying timely contact points between women and health professionals

Review 3: Main findings and overall conclusions

The studies included in this section used a variety of outcome measures, of which the most common were 'awareness' of the importance of folic acid supplements, and 'uptake' of folic acid supplements. In writing this Review, efforts have been made to only to compare similar data. However, the terminology used in research in describing these outcomes is often ambiguous. For example, few studies distinguish between 'prompted' and 'unprompted' awareness, or describe clearly how it was assessed. Similarly, it was not always clear whether 'uptake' referred to uptake at some stage, or in pregnancy, or 'as recommended' (i.e. preconception and 12 weeks into pregnancy). Two general points emerge and these are that a) many studies only measured 'awareness' and not 'uptake' b) 'awareness' is consistently higher than 'uptake' in both interventions and cross sectional studies, although the relationship between the two outcomes is inconsistent.

Clearly, reducing the number of unintended pregnancies in the UK would contribute to increasing the number of women taking folic acid supplements. Establishing a system for preconception care through general practice might also increase uptake, if it was appropriately resourced and structured. However, these are major tasks which are unlikely to contribute to increasing the uptake of folic acid supplements in the UK, in the short term. From this review there are some findings which have the potential to contribute to a limited increase in uptake in the more immediate future, although the

earlier caveats relating to transferability and sustainability need to be firmly borne in mind:-

- The characteristics of those women who are least likely to take folic acid supplements are well established. They are younger, on lower incomes and with lower educational levels, they are more likely to be single parents, and/or belong to a minority ethnic group. Awareness of the recommendations for folic acid is lower in these groups than others. Only interventions specifically targeted these groups, were successful in increasing both awareness and uptake, although the baseline differential with women in other groups persists. If interventions do not target these vulnerable groups, awareness remains low and the differential in both awareness and uptake increases between these women and those who are less 'at risk' i.e. inequalities are exacerbated. The aspects of interventions which may increase effectiveness with vulnerable groups appear to be: that the women are 'sought out', and do not themselves have to be proactive; that taking folic acid reflects what peers, friends and family are doing or saying; and that the messages which are communicated are culturally and linguistically relevant, and emphasise the most confusing aspect of the message – that the supplements need to be taken before conception.
- Health professionals are a credible source of information and advice, and the most accessible are practice nurses and general practitioners. The health care system is well placed to provide advice on preconceptual folic acid, although the preliminary conclusions from the limited number of trials which have been carried out, is that advice needs to be embedded in a structure (e.g. preconception counselling) and delivered in a committed and relevant way. There was one randomised controlled trial which assessed the effectiveness of counselling during a routine gynaecological visit, followed by provision of folic acid tablets and a follow-up phone call. This intervention resulted in significant increases in uptake of folic acid, and was particularly effective in black and lower income groups and women not planning pregnancies. Interventions of this sort are more effective if supported by guidelines, training, and by local routines which capitalise on any contact with women of childbearing age – particularly if they are in 'at risk groups e.g. through family planning clinics.
- Integrated national and regional campaigns can be successful in increasing uptake of folic acid supplements to some extent. However, they need to include elements which specifically target women in vulnerable groups, and they need to be sustained in some form. The latter is important in order to maintain levels of awareness amongst women of childbearing age, and others including health professionals, the media, data collection organisations, and people involved with community groups and young people.
- Printed resources and the mass media used in isolation are not effective in the longer term, particularly for vulnerable groups.
- Using a specific health claim explaining the role of folate in preventing birth defects appeared to increase the effectiveness of a campaign in Australia, by

making it easier for women to ‘find’ folic acid containing foods and supplements.

However, realistically it is likely that efforts to increase supplement intake will have a limited effect. In the Netherlands at the end of the Dutch folic acid campaign 49% of pregnant women asked retrospectively about taking supplements, reported taking folic acid during the time around conception. This is data collected retrospectively from pregnant women, and this type of data is consistently higher than that collected from samples of women of childbearing age in the population. In the UK, at the end of the national campaign 38% of pregnant women, asked retrospectively, said they had taken folic acid supplements. This means that high quality and intensive national campaigns apparently reached under half of women, and that this figure is likely to be a considerable overestimate. Another way of looking at this, is that at the end of the UK campaign, the highest figure for uptake (as recommended) of folic acid was in those women who actively planned pregnancy. 65% of these women took supplements. This means that in the unlikely event that all women planned their pregnancies, the ‘ceiling’ on supplement uptake (using data collected from pregnant women) would be around 65%.

Gaps in Knowledge

The UK has been at the forefront of research to understand the role of folic acid in reducing the risk of pregnancies affected by neural tube defects, and was also one of the first countries to run national health promotion campaigns to increase the intake of folate in women of childbearing age. However, in the course of preparing this Report, several important gaps in current knowledge emerged, and these are summarised below:-

- Data on trends in folic acid supplement intake in the UK was patchy, with different sets of data available and different methodologies used.
- There is very little data from UK studies on the effectiveness of interventions to promote uptake of folic acid supplements. From the literature identified in this Report, areas which could be explored are the potential effectiveness of:-
 - consistent and systematic prescription of folic acid supplements to women in (defined) vulnerable groups who are eligible for free prescriptions, by general practitioners.
 - provision of free folic acid supplements for all women below a specified age. This might incorporate testing the use of incentives at the first visit, and could compare provision of supplements through different settings e.g. general practitioner/practice nurse, pharmacies, sent through the post.
 - interventions targeting vulnerable groups, and incorporating the characteristics identified in this Report i.e. the women are ‘sought out’, and do not themselves have to be proactive; that taking folic acid fits with social and family ‘norms’; and that the messages which are communicated are culturally and linguistically relevant, and emphasise the most confusing aspect of the message (the need to take the supplements pre-

conception). Review 1 indicated that peer delivered interventions are effective for reaching young women.

- focusing on multivitamins (with 400 micrograms folic acid) and overall benefits of these for adolescents and young women, compared with folic acid only supplements and benefits for pregnancy outcomes.
- interventions based on the version of the Theory of Reasoned Action used in the Dutch folic acid campaign, or using other theoretical models. Social marketing is currently being used as a basis for obesity prevention interventions in the UK, and its applicability to promoting uptake of folic acid supplements could be explored.
- There has been very little good quality qualitative research in the UK seeking to understand the motivators and barriers for women to take folic acid supplements. The issues which are currently not well understood in women in defined vulnerable groups who are not planning a pregnancy and in women planning pregnancy, are: -
 - why some women who are aware of folic acid supplements do not take them
 - why some women do use folic acid supplements
 - why women who began taking folic acid supplements did not continue
 - the perceived importance of avoiding a NTD affected pregnancy
 - the perceived control in avoiding a NTD affected pregnancy
 - whether cost and access to folic acid supplements are a barrier
 - what would help women initiate and continue taking folic acid supplements
 - the perceived importance of supplements compared with dietary sources and fortified foods

The in depth interviews that were carried out as part of Review 3 also yielded some innovative ideas for future work, and these are briefly summarised in Appendix 5.