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Vitamin D: A Systematic Review of Effectiveness and Cost-Effectiveness of Activities to Increase Awareness, Uptake and Provision of Vitamin D Supplements in at Risk Groups

ANNE MORGAN, Associate
DANIELLE VARLEY, Research Assistant
MICK ARBER, Information Specialist
MARIA CIKALO, Associate
VICTORIA BURLEY, Associate
ANITA FITZGERALD, Associate
JULIE GLANVILLE, Associate Director

SEPTEMBER 2013

THE UNIVERSITY of York

INVESTORS IN PEOPLE

Review Team

Team member / expertise	Project role
Mr Mick Arber, Information Specialist	Search strategy development; literature searches; contributed to report writing.
Dr Victoria Burley, Senior Lecturer in Nutritional Epidemiology	Information management; provided subject area expertise to the review.
Dr Maria Cikalo, Researcher	Data extraction; quality assessment; provided comments on the review draft.
Ms Anita Fitzgerald, Systematic reviewer	Record selection.
Ms Julie Glanville, Information Specialist	Overall management responsibility for the project.
Ms Anne Morgan, Researcher	Lead reviewer for the record selection, quality assessment, data extraction and writing the evidence review.
Ms Danielle Varley, Research Assistant	Project support; literature searching and reviewing; database management; data analysis; contributed to report writing.

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1. BACKGROUND

Vitamin D is essential for bone and skeletal growth and thus a deficiency in vitamin D can lead to bone deformities (such as rickets) among children and bone pain (such as osteomalacia) among children and adults. Those at risk of vitamin D deficiency include infants and children under five years of age, pregnant and breastfeeding women, older people, people with dark skin and those who have limited exposure to the sun. Although UK health departments and the National Institute for Health and Care Excellence (NICE) have issued evidence-based guidance regarding supplements for groups at risk of vitamin D deficiency, implementation of these recommendations and guidance is limited. Furthermore, uptake of free vitamin supplements among low income families in the UK (pregnant mothers and children under four years) eligible for the Healthy Start scheme is low.

2. OBJECTIVES

This review was undertaken to support the development of NICE guidance which will help implement existing evidence-based recommendations on the prevention of vitamin D deficiency, the latter being based on the best available evidence of effectiveness, including cost-effectiveness. Specifically, the evidence review investigated the following questions:

1. How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?
2. What are the implications for professional training and practice?
3. How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme)?
4. What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?
5. What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

3. METHODS

Search strategies were developed in accordance with NICE guidance and through discussion with the NICE team. In addition to the database searches, citation searches were carried out and the reference lists of reviews and included papers were assessed. From the literature search results publications were selected based on pre-specified criteria derived from the final NICE Public Health Guidance scope for this topic. All selected papers were assessed for quality, and relevant data were extracted based on protocols for the development of NICE Public Health Guidance. Evidence statements were constructed taking

into account the quality and consistency of the findings and the applicability of the evidence for each of the research questions.

4. FINDINGS

Twenty six studies met the inclusion criteria for the review and underwent quality appraisal. All of the included studies were conducted in the UK and were published after 2000. Two were before-and-after studies that assessed public health campaigns to increase the uptake of vitamin D supplements; sixteen were surveys of knowledge and awareness of the importance of vitamin D among health care professionals, providers and members of at-risk groups; four were qualitative research studies that examined barriers to uptake of vitamin D supplements; two were cost analysis studies of universal vitamin D supplementation in at-risk groups; one was a mixed-methods study that investigated universal supplementation of vitamin D in at-risk groups; and one study was an updated review of before-and-after studies.

Overall the quality of the studies was poor. One study was assessed as very good quality (++ rating), three were assessed as good quality (+ rating), and the remainder were assessed as poor quality (- rating). Studies that were judged to be of poor quality had significant reporting omissions that meant it was not possible to have confidence in their reliability. Often this was because the studies were not conducted as research projects. However, the usefulness of all of the studies included in the review was considered to be adequate.

Question 1: How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?

Two studies were included for this research question: one of good quality and one of poor quality. Both were before-and-after studies set in Birmingham and Cardiff inner city areas. They evaluated programmes of universal vitamin D supplementation with Healthy Start vitamins. Healthy Start is a public awareness campaign about the importance of vitamin D and Healthy Start vitamins and also educates health staff through continuing professional development.

Both studies explicitly focused on two at-risk groups a) pregnant and breastfeeding women and b) infants and children under five years, and the Birmingham study included a large proportion of women and children from at-risk ethnic minority groups. For this research question no studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Evidence statement 1.1

There is moderate evidence from one [+] before-and-after study[1] and weak evidence [-] from another before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins, alongside a public awareness campaign about the importance of vitamin D and Healthy Start vitamins, may increase awareness and implementation of existing guidance on vitamin D among health professionals and others working with at-risk populations of pregnant/breast-feeding women and mothers of young children. One study found that the number of symptomatic cases of vitamin D deficiency in children under five years decreased by 59% in a four-year period.[1] Another study showed that 20% of children aged under four years, received at least one bottle of Healthy Start vitamins compared to less than 1% before the programme started.[2] Both studies indicated that public awareness and health professionals' awareness of the importance of vitamin D and Healthy Start vitamins increased each year that the programme was in operation.[1,2]

[1] Moy *et al.,* 2012
[2] Nicholls and Stocker, 2012

Question 2: What are the implications for professional training and practice?

Three studies were included for this research question, two of which were included in question one. The third study was a large survey of providers and staff in North West England and was part of a performance audit of the Healthy Start scheme. All three studies explicitly focused on two at-risk groups: a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Evidence statement 1.2

There is moderate evidence from one [+] before-and-after study[1] and weak evidence from another [-] before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins increases awareness and implementation of existing guidance on vitamin D among health professionals and others working with at-risk populations of pregnant/breast-feeding women and mothers of young children. A key element of both these programmes has been an emphasis on staff training, where the provision of the free vitamin D supplements has been supported by continuing professional development of health staff including GPs, health visitors, community and hospital midwives, pharmacists, paediatricians and obstetricians about the importance of vitamin D.

[1] Moy *et al*., 2012
[2] Nicholls and Stocker, 2012

Evidence statement 1.3

There is weak evidence from one [-] survey of 13 trusts in North West England that health visitors and midwives are more likely to discuss vitamin D with women in those Trusts that have training policies in place, although exact numbers are not reported. However, only 6 of the 13 organisations surveyed offered training relating to vitamin D supplementation in prenatal and postnatal women to health visitors and midwives.[1]

[1] Jagatia *et al,.* 2011

Question 3: How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme)?

Five studies met the inclusion criteria for this research question, two of which were included in question one. The third study was a cost analysis of free universal vitamin D supplementation for pregnant women, women whose child was aged under 12 months, and children aged under four years. The fourth study was a conference abstract describing a mixed methods approach to evaluate provision of universal Healthy Start vitamins. The fifth study was a UK cost analysis of vitamin D supplementation targeted at Asian children aged under 2 years in the NHS Trust area. All five studies explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Evidence statement 1.4

There is moderate evidence from one [+] before-and-after study[1] and weak evidence from another [-] before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins, alongside a public awareness campaign about the importance of vitamin D and Healthy Start vitamins, increases awareness and uptake of existing guidance on vitamin D among pregnant/breast-feeding women and mothers of young children. One study showed a year on year increase in the proportion of pregnant and lactating women and young children receiving vitamin D supplements over a period of 4 years. Uptake rates of Healthy Start vitamins in 2010/11 were 22% and 14%, and in 2012/13 were 23% and 20% for women and children, respectively.[3] In another study 20% of children aged under 4 years received at least one bottle of Healthy Start vitamins at the end of the second year of the programme compared to 1% before the programme began.[2] Both studies demonstrated yearly increases in public awareness of the importance of vitamin D and Healthy Start vitamins since the programmes began.[1, 2]

[1] Moy *et al*., 2012
[2] Nicholls and Stocker, 2012
[3] McGee and Shaw, 2013 (Update of vitamin uptake numbers from earlier study by Moy et al., 2012)

Evidence statement 1.5

There is weak evidence from one [-] cost study[1] that the costs of providing free universal vitamin D supplementation for pregnant women, women whose child is less than 12 months old, and children under four years old are less than the costs of treating all cases of vitamin D deficiency in children in Birmingham (Heart of Birmingham (HoB), Birmingham East and North (BEN), and Birmingham South PCTs). The costs of providing Healthy Start vitamins to 100% of the target group in the three PCT areas were estimated to be £659,952 per year. Assuming 10% uptake for both women and children in BEN and South PCTs plus 25% uptake in HoB PCT (HoB has been providing free universal Healthy Start vitamins for four years), the costs for the year 2011-12 were estimated to be £102,984. Assuming 25% take up for both women and children in all three PCTs in subsequent years the total costs were estimated to be £164,988. The costs of treating 33 cases of vitamin D deficiency in 2009-2010 were estimated to be £165,000 (£5,000 x 33 cases). The study was not a formal economic evaluation and included only the costs of vitamin supplements plus delivery charges when estimating the costs of the intervention.

[1] McGee 2010

Evidence statement 1.6

There is weak evidence from one [-] mixed methods study[1] that a programme of universal vitamin D supplementation using Healthy Start vitamins increases uptake among mothers and children. National data showed that uptake of the vitamins was higher in areas with universal schemes (3.97% for children and 7.72% for women) than in areas with targeted schemes (1.46% for children and 2.56% for women). Data were supported by in-depth interviews with service users and providers.

[1] Moonan *et al*., 2012

Evidence statement 1.7

There is weak evidence [-] from one[1] cost study that the average cost of primary prevention compares favourably with the cost of treating vitamin D deficiency in children of Asian origin. The estimated cost was £2,507 to treat one case of vitamin D deficiency. The cost of providing vitamin D supplementation to the total Asian population was estimated to be £10,300 per year or £25,750 per year according to the COMA and DH guidelines, respectively. Providing supplementation to the entire population of 500 children of Asian origin was estimated to avoid 4.27 cases of vitamin D deficiency, therefore saving £10,706 per year. The study was not a formal economic evaluation and included only the costs of vitamin supplements when estimating the costs of supplementation.

[1]Zipitis *et al*., 2006

Question four: What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?

Twenty studies met the inclusion criteria for research question four. Fifteen studies assessed awareness and knowledge of the importance of vitamin D, vitamin D guidelines and/or Healthy Start vitamins in people in at-risk groups but mostly in those working with at-risk groups. Five studies addressed other factors that help or hinder implementation of vitamin D guidance, including access to vitamins and information about vitamin D, parental motivation, lack of promotion of vitamins, and lack of vitamin D guidance in maternity units. Nineteen studies explicitly focused on at-risk groups: a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over. One study explicitly focused on d) people who have low or no exposure to the sun, and e) people who have dark skin.

Evidence statement 1.8

There is weak evidence from 16 studies (six [-] surveys of at-risk groups [1, 2, 3, 4, 5, 6], seven [-] surveys of health care professionals or providers [7, 8, 9, 10, 11, 12, 13], and three [-] surveys of both at-risk groups and health care professionals [14, 15, 16]) that generally there is a lack of knowledge about the importance of vitamin D in bone health and the consequences of vitamin D deficiency, a lack of awareness of Healthy Start schemes, and lack of awareness of NICE guidelines and Department of Health guidelines about vitamin D supplements for at-risk groups. Most studies report that less than 50% of health care professionals advise pregnant and breast feeding women about taking vitamin D supplements or giving them to their children.

Fifteen studies explicitly focused on two at-risk groups a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies focused on women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over. One study explicitly focused on d) people who have low or no exposure to the sun, and e) people who have dark skin.[1]

[1] Alemu and Varnam, 2012
[2] Austin *et al.,* 2012
[3] Chandaria *et al.,* 2011
[4] Leven *et al.,* 2012
[5] Lucas-Herald *et al.,* 2012
[6] Sharma *et al.,* 2011
[7] Cleghorn, 2006
[8] Garton, 2008
[9] Jagatia *et al.,* 2011
[10] Jain *et al.,* 2011
[11] Ling *et al*., 2011
[12] Lockyer *et al*., 2011
[13] Sharma *et al.*, 2009
[14] Feeding for life Foundation, 2012
[15] Roberts, 2012
[16] Zipitis *et al.,* 2011

Evidence statement 1.9

There is strong evidence [++] from one[1] qualitative study, weak evidence [-] from one[2] qualitative study and weak evidence [-] from one[3] survey that there are key reasons for poor uptake of Healthy Start vitamin supplements. Parents find it difficult to access Healthy Start vitamins, health professionals do not promote the scheme, families that are eligible for Healthy Start are unaware of the scheme, and mothers are not motivated to take the vitamins or to give them to their children. Things that may help to increase the uptake of Healthy Start vitamins are universal supplementation, central ordering of vitamins and increasing the number of distribution centres.

[1] Jessiman *et al.,* 2013
[2] Stocker and Nicholls, 2012
[3] NHS England, 2013

Evidence statement 1.10

There is moderate evidence [+] from one[1] qualitative study of members of the Somali community in Bristol and health care professionals working with them, that an identified important health need is access to evidence-based information about vitamin D deficiency, especially for women.

[1] Ingram and Potter, 2009.

Question 5: What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

Two studies were included for this research question. One was an update of the progress of the vitamin D public health campaign in Birmingham, described in findings for research question one. The second study was identified from the Healthy Start website and presents eleven case studies from Healthy Start organisations in the UK.

Both studies explicitly focused on at-risk groups a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Evidence statement 1.11

There is moderate evidence [+] from one[1] before and after study that vitamin D supplements can be distributed locally in such a way as to ensure their availability for the following at-risk groups: a) pregnant and breastfeeding women, and b) infants and young children aged under 5 years. In Birmingham, the vitamin D public health campaign and scheme are overseen by a steering group that has worked to identify obstacles and practical issues to ensure vitamin D supplements are available. The scheme has established one ordering and distribution point for vitamins and increased the number of issuing sites throughout the city. Pharmacies and children's centres contribute significantly to issuing vitamin D supplements (issuing 20% and 29.7% of total vitamins respectively).[2]

[1] Moy *et al*., 2012

[2] McGee and Shaw 2013 (an update of the public health campaign reported by Moy et al 2012)

Evidence statement 1.12

There is weak evidence [-] from one[1] survey of eleven Healthy Start schemes (chosen as examples of good practice for the Healthy Start website) that a large range of vitamin issuing sites are used to ensure availability for the following at-risk groups: a) pregnant and breastfeeding women, and b) infants and young children aged under 5 years. These include: children's centres; child health clinics; antenatal clinics; health centres/GP surgeries; and community pharmacies. The supply of vitamins was ensured mainly by using one central point to order vitamins and to monitor vitamin use at the issuing points.

[1] NHS England, 2013

5. CONCLUSIONS

There is some evidence suggesting that there are modifiable factors among groups at high risk of vitamin D deficiency that could be addressed through interventions that aim to encourage uptake of vitamin D supplements. Appropriate interventions as identified in this review (for example public health campaigns) may help to improve awareness and knowledge of the importance of vitamin D among pregnant and breastfeeding women and those who work with them. However, given the poor quality of the studies overall, it is not clear how confident we could be that implementing any of the interventions would be successful.

Furthermore, no evidence was identified for interventions aimed at increasing uptake of vitamin D supplements for people aged 65 years, people who have low or no exposure to the sun, or people who have dark skin. Therefore, it is uncertain if interventions that may be effective in women and young children would be as effective, for example, in the elderly or in those who have little exposure to the sun or who have dark skin.

The public health campaigns that were conducted in Birmingham and Cardiff aimed to increase awareness of vitamin D deficiency through advertising, promotion of the scheme by trained health professionals and providing free vitamins to those in the at-risk group. All three elements were important for the success of the programme. Different elements may work differently for each of the at-risk groups. Any development of intervention materials (such as promotional leaflets) would need to take into consideration how information can be tailored to the different at-risk groups.

There is some evidence, in the form of a relatively large number (n=16) of poor quality studies, to suggest that there is a general lack of awareness about the importance of vitamin D and of Healthy Start schemes, among pregnant and breastfeeding women and among health professionals who work with those groups. In addition, there is evidence from one good quality study and two poor quality studies that improving training for health professionals may impact on knowledge and awareness of vitamin D and Healthy Start among eligible families. Efforts could be made to address knowledge and information gaps among healthcare professionals, and an approach that could be considered is the introduction of vitamin D guidance and staff training policies where none currently exist.

Most of the studies about awareness and knowledge of vitamin D explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) children under five years, as well as the health care professionals who work with them. Often there are opportunities for routine contact between health professionals and women with young children in the antenatal period, in the postnatal period and when families attend children's centres. For other at-risk groups (people aged over 65 years, people with low or no exposure to the sun, and people with dark skin) there may be limited opportunities for contact with health care professionals. People who are vitamin D deficient do not necessarily feel unwell and may not attend health care settings on a regular basis.

There is strong evidence from one study that suggests that access to vitamin supplements needs to be straightforward in terms of administration (for the provider and consumer) and uncomplicated with regard to acquiring the supplements if awareness and uptake is to increase. Because most of the evidence identified focused on women and young children consideration may need to be given to the types of facilities that are frequented by members of the different at-risk groups, in both health care and non-health care settings.

Glossary

BEN	Birmingham East and North Primary Care Trust
CPH	Centre for Public Health
DH	Department of Health
GP	General Practitioner
HoB	Heart of Birmingham Primary Care Trust
HRQoL	Health-related quality of Life
LA	local authority
NEG	Nutritional Epidemiology Group
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
PCT	Primary Care Trust
PHAC	Public Health Advisory Committee
SACN	Scientific Advisory Committee on Nutrition
YHEC	York Health Economics Consortium

Acknowledgements

We would like to thank Oluwaseyi Vincent (YHEC) and Charlotte Hill (YHEC) for their contribution to this review.

Section 1: Introduction

1.1 BACKGROUND

Vitamin D is an essential nutrient needed to help maintain calcium and phosphate levels in the body and also for health bone and skeletal growth. Although the main source of vitamin D is from exposure to sunlight, it is also found in a small number of foods, such as: eggs, powdered milk, oily fish and fortified fat spreads and breakfast cereals (National Health Service, 2012).

By eating a healthy and balanced diet, and also by having some sun exposure, the majority of people should not have a vitamin D deficiency. However, there are groups of the population that may be at risk of vitamin D deficiency, including: pregnant and breastfeeding women, children under the age of five years and adults aged over 65 years, people who are not exposed to much sun (such as those who cover up their skin when they are outdoors or those who are confined indoors for a considerable amount of time) and people who have dark skin including people of African, African-Caribbean and South Asian origin (National Health Service, 2013).

Vitamin D is essential for bone and skeletal growth and thus a deficiency in vitamin D can lead to bone deformities (such as rickets) among children and bone pain (such as osteomalacia) among children and adults (Scientific Advisory Committee on Nutrition, 2007). Primary care expenditure on treatments for vitamin D deficiency increased from £28 million in 2004 to £76 million in 2011 (National Institute for Health and Care Excellence, 2013).

UK recommendations for vitamin D intake have been published by the Committee on Medical Aspects of Food Policy (Department of Health, 1991). Although UK health departments (Chief Medical Officers, 2012) and the National Institute for Health and Care Excellence (NICE) have issued evidence-based guidance regarding supplements for groups at risk of vitamin D deficiency (National Institute for Health and Clinical Excellence, 2010, National Institute for Health and Clinical Excellence, 2008), implementation of these recommendations and guidance has been limited (National Institute for Health and Care Excellence, 2013).

Although there are initiatives such as the provision of Healthy Start vitamins, a low uptake of these vitamin supplements among the population who qualify for the Healthy Start Scheme has been reported (Feeding for Life Foundation, 2012). Vitamin supplements are available in many places including children's centres, health centres, and GP surgeries (National Health Service, no date). Supplements are also available for purchase for those who are not eligible for Healthy Start, and currently cost 91p for women and £1.80 for children for an eight week supply.

NICE has been asked by the Department of Health (DH) to develop guidance to help safely implement existing evidence-based recommendations on the prevention of vitamin D deficiency. The guidance will focus on at-risk groups including infants and children aged under five years, pregnant and breastfeeding women, older people, people with dark skin and those who have limited exposure to the sun.

The guidance will provide recommendations for good practice, based on the best available evidence of effectiveness, including cost-effectiveness. It is aimed at commissioners, managers and other professionals with public health as part of their remit working within the National Health Service (NHS), local authorities and the wider public, private, voluntary and community sectors. The guidance is also aimed at the suppliers and providers of vitamin D supplements. In addition, it may be of interest to people at risk of vitamin D deficiency, their families and carers and other members of the public.

1.2 OBJECTIVES

The objectives of this review were to provide evidence for the effectiveness and cost-effectiveness of interventions to increase awareness and uptake of vitamin D and the barriers and facilitators to the implementation of existing guidance on the prevention of vitamin D deficiency for healthcare professionals and at-risk groups. Further objectives included identifying studies that addressed the implications for professional training and described ways to ensure good provision of vitamin D supplements for at-risk groups.

1.3 RESEARCH QUESTIONS

The evidence review investigated the following questions:

1. How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?
2. What are the implications for professional training and practice?
3. How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme)?
4. What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?
5. What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

At-risk groups included: pregnant and breastfeeding women; infants and children under 5 years of age; people aged 65 years and over; people who have low or no exposure to the sun (such as those who cover their skin while outdoors or those who are confined indoors for

a considerable period of time); and people who have dark skin (such as people of African, African-Caribbean and South Asian origin).

1.4 OPERATIONAL DEFINITIONS

For the purposes of this review 'at risk' groups should be understood to include:

a) All pregnant and breastfeeding women;
b) Infants and children under 5 years of age;
c) People aged 65 years and over;
d) People who have low or no exposure to the sun (such as those who cover their skin while outdoors or those who are confined indoors for a considerable period of time);
e) People who have dark skin (such as people of African, African-Caribbean and South Asian origin).

1.5 IDENTIFICATION OF POSSIBLE EQUALITY AND EQUITY ISSUES

This evidence review focuses on 'at-risk' groups (listed in Section 1.4) and hence there has been an inevitable focus on reviewing studies that have investigated one or more of these population groups. However, the search strategy has not been limited to any specific population groups, so that the retrieval of studies for assessment of relevance was broader than the population focus of the review.

Section 2: Methodology

This evidence review was conducted according to the NICE public health review guidance (National Institute for Health and Care Excellence, 2012). The review was guided by a NICE scope document (National Institute for Health and Care Excellence, 2013) which specified the identification, selection, data extraction and assessment of the search results to address the five research questions. The protocol was developed in close collaboration with the NICE Centre for Public Health (CPH).

2.1 SELECTION CRITERIA

2.1.1 Population

Studies reporting populations that were deemed to be at risk of vitamin D deficiency were included in the evidence review. These included: pregnant and breastfeeding women; infants and children under 5 years of age; people aged 65 years and over; people who have low or no exposure to the sun (such as those who cover their skin while outdoors or those who are confined indoors for a considerable period of time); and people who have dark skin (such as people of African, African-Caribbean and South Asian origin).

Studies that reported people being treated for vitamin D deficiency or those with diseases or conditions which may be associated with an increased risk of vitamin D deficiency were excluded from the review.

2.1.2 Interventions

For a study to be eligible for inclusion, it needed to include one or more interventions that aimed to:

- Increase awareness or uptake of vitamin D supplements among at-risk groups in a range of settings, in line with existing evidence-based guidance for England;
- Increase provision of vitamin D supplements in a range of settings, in line with existing guidance for England;
- Increase uptake of Healthy Start vitamins in a range of settings among eligible groups in England;
- Explore the effect of training health professionals to use the guidance; provide information on barriers to implementation of existing guidance on vitamin D among commissioners, providers, practitioners and at-risk groups;
- Explore the extent of vitamin D supplements availability and marketing for different at-risk groups through, for example, Healthy Start, prescriptions and over-the-counter sales.

Studies that reported the following interventions were not eligible for review:

- Management of vitamin D deficiency;
- Management of conditions that may increase the risk of vitamin D deficiency;
- Fortification of food and drinks with vitamin D;
- Recommendations of specific intake of vitamin D for different population groups;
- Introduction of legislation relating to vitamin D supplements.

2.1.3 Comparators

Eligible comparators included:

- Other active or passive methods of increasing awareness of vitamin D deficiency and deficiency reduction options;
- No activity to increase awareness;
- No comparator.

2.1.4 Outcomes

Studies that reported the following outcomes were included in the evidence review:

- Changes in levels of awareness of vitamin D guidance among the at-risk groups;
- Changes in levels of awareness of vitamin D guidance among health professionals, commissioners and providers;
- Changes in adherence to vitamin D guidance among at-risk groups (including any differences between socioeconomic groups);
- Changes in adherence to vitamin D guidance among health professionals, commissioners and providers; reported barriers and facilitators to implementing vitamin D guidance among at-risk groups, health professionals, commissioners and providers;
- Change in Vitamin D consumption, uptake or sales in at-risk groups through various access routes including Healthy Start, prescriptions and over-the-counter sales;
- Indicators of supplement availability; estimates of length and quality of life;
- Health and non-health related costs and/or benefits.

2.1.5 Study Types

Any study design including, for example observational studies or local programme evaluations, that met the inclusion criteria set out in Sections 2.1.1 to 2.1.4 were eligible to be included in the review. Only studies published from 2000 that were conducted in the United Kingdom and reported in English were eligible for inclusion.

2.2 METHODS OF STUDY IDENTIFICATION

2.2.1 Search strategy development

The literature search strategy was developed in accordance with the guidance provided in Section 4 of the NICE Methods for the development of NICE public health guidance (National Institute for Health and Care Excellence, 2012). Several iterations of the MEDLINE search strategy were undertaken before agreement with the CPH team was reached on the final strategy which would be used (and translated as appropriate) across the resources to be searched. Trade-offs in the balance between search sensitivity and precision were discussed with the CPH team at each stage of strategy development.

Preliminary search strategies for initial discussion were based on the following conceptual structure:

> (vitamin D) AND (guidance OR prescriptions OR over-the-counter sales).

The named initiative of interest (Healthy Start) was also searched as a stand-alone concept. The search was presented as two strategies (one to address the systematic review questions 1 to 4, one to address question 5) for clarity and to facilitate ease of discussion. It was agreed that the two strategies would be combined into one single strategy in the final search to reduce duplication of effort and records.

Following initial discussions it was agreed that the vitamin D concept should be enhanced by including terms on multivitamins. Discussions then focused on the numbers of records being retrieved by the preliminary strategy (which were reasonably high) and on whether the concept of 'guidance implementation / awareness / uptake' would be adequately captured by searching on guidance terms alone. As a result of these discussions two additional approaches were developed and considered. Firstly, as the review was specifically UK focussed, the impact of introducing a third concept to the strategy, targeting UK studies, was considered. A strategy was developed which combined the preliminary strategy with UK-related search terms across a number of record fields and a limited test was carried out. After discussion, however, the CPH team decided that the increased risk of missed studies was too high and that a UK-specific concept should not be included as a third concept in the strategy. The second additional approach was developed to address the difficulties in robustly capturing the concept of 'guidance implementation / awareness / uptake'. To enhance the strategy's ability to achieve this, implementation, awareness and uptake-related terms were added, developing the overall conceptual structure as follows:

> (vitamin D OR multivitamins) AND (guidance OR prescriptions OR over-the-counter sales OR implementation / awareness / uptake).

It was understood that this approach would increase search results significantly, but with the decision not to introduce a UK concept to the search, it was now accepted by the research and CPH teams that result numbers for the project would be too high to process within available resources. In addition to generic terms, the proposed implementation / awareness / uptake terms in the strategy included terms on specific interventions known to be used to promote guideline implementation in healthcare. After discussion the CPH team decided

that the majority of these specific implementation intervention terms should not be searched as they judged that this literature would already be captured adequately by the guidance terms in the strategy. Some additional search terms were suggested which were considered more useful, and these were incorporated into the strategy. The CPH team also suggested additional terms to enhance the part of the search which aimed to identify studies evaluating local provision of vitamin D supplements to at-risk groups (which specifically including the Healthy Start initiative, prescriptions and over-the-counter sales). Although these additional terms might lack discriminating ability (e.g. deliver$, provision$, provide$, distribute$), it was decided that their inclusion was necessary to pick up poorly described studies. It was agreed that searches would be limited to results published from 2000 onwards, and that although the strategy would not be limited to records where a UK context was indicated, studies which were indexed with non-UK geographical terms (and which were not also indexed with UK terms) could be removed at search stage.

As the final agreed search strategy indicated that potential search totals would be high (14,000+ after de-duplication), some pragmatic decisions were discussed and agreed during the search implementation phase in order to ensure that the project aims would be achieved within the required timeframe:

- Embase subject headings would be searched as major descriptors;
- Letters, conference records and MEDLINE records were excluded from the Embase search.

The strategy used to search MEDLINE via Ovid is provided in Appendix B. This strategy was adapted to be run in the search resources identified. Full details of all adaptions (including date of search) are given in Appendix B.

2.2.2 Resources searched

The following resources (Table 2.1) were searched to identify relevant studies for the review.

The Science Citation databases was included in the protocol but excluded from the original list of resources to be searched since search results were already numerous and the Science Citation databases are not core NICE resources.

In one further change from the protocol it was decided that the Sociological Abstracts would not be searched since access to this database had recently ceased. It was agreed that other social science resources already searched would provide adequate coverage of the social care literature.

Table 2.1: Resources searched

Resource	Interface / URL
AMED (Allied and Complementary Medicine)	OvidSP
ASSIA (Applied Social Science Index and Abstracts)	Proquest
British Nursing Index	Proquest
CINAHL (Cumulative Index of Nursing and Allied Health Literature)	EBSCOhost
ClinicalTrials.gov	http://www.clinicaltrials.gov
Cochrane Central Register of Controlled Trials (CENTRAL)	Cochrane Library/Wiley Interscience
Cochrane Database of Systematic Reviews (CDSR)	Cochrane Library/Wiley Interscience
Database of Abstracts of Reviews of Effectiveness (DARE)	Cochrane Library/Wiley Interscience
DoPHER (EPPI Centre database)	http://eppi.ioe.ac.uk/webdatabases/SearchIntro.aspx
Embase	OvidSP
Google	http://www.google.co.uk/
Health Management Information Consortium (HMIC)	OvidSP
International Clinical Trials Registry Platform (ICTRP)	http://www.who.int/ictrp/en/
MEDLINE and MEDLINE in Process	OvidSP
metaRegister of Controlled Trials (mRCT)	http://www.controlled-trials.com/mrct/
PAIS International (Public Affairs Information Service)	Proquest
PsycINFO	OvidSP
OAIster	http://oaister.worldcat.org/
OpenGrey	http://www.opengrey.eu/
POPLINE	http://www.popline.org/
Social Care Online	http://www.scie-socialcareonline.org.uk/
Social Policy and Practice	OvidSP
Social Sciences Citation Index (SSCI), Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH)	Web of Science
TRoPHI (EPPI Centre database)	http://eppi.ioe.ac.uk/webdatabases/Intro.aspx?ID=5
UK Clinical Research Network Portfolio Database	http://public.ukcrn.org.uk/search/
WHOLIS	http://dosei.who.int/

2.2.3 Other study identification methods

In addition to searching the resources listed in Table 2.1 for relevant records, the reference lists of reviews and included papers were assessed, and citation searches were conducted. No additional references were identified from the assessment of reference lists. The citation search comprised:

- A search for papers that cited papers identified for inclusion in the review, using Web of Science and Google Scholar;
- A search for additional studies by authors of papers identified for inclusion in the review in MEDLINE and MEDLINE in Process (via OvidSP);
- A search for webpages of lead authors of papers identified for inclusion in the review, to identify their publications lists.

Citation searches were carried out on the 24-25 June 2013. The strategy used to search MEDLINE via Ovid for additional studies by authors of papers identified for inclusion (including date of search) is provided in Appendix B. The search for web pages of lead authors was carried out using the Google search engine on the 26 June 2013; institution name terms and author name terms were used in a pragmatic fashion to locate web pages which listed research publications for lead authors of included studies. Pages were located for five authors.

Further information was obtained by the call for evidence issued by NICE with a closing date of 30 April 2013. The information provided by NICE to the project team included website pages, leaflets, reports and unpublished data. The project team were provided with a list of 51 pieces of evidence to assess for relevance to the evidence review.

The majority of search results were downloaded to EndNote bibliographic management software and de-duplicated using several algorithms. Results available in a format which did not facilitate downloading into EndNote were saved in an appropriate form (e.g. as a Word document, Excel spreadsheet, or OneNote file).

2.3 STUDY SELECTION

The search results were assessed and categorised according to the inclusion and exclusion criteria set out in Section 2.1. The numbers of records included and excluded at each stage of the study selection process were recorded and are presented in Section 3.1.

Two reviewers independently selected records by firstly screening the title and/or the abstract of the record. The full text documents of the studies thought to be relevant to the review were obtained. Studies that were excluded at the full paper screening stage have been tabulated along with their reason for exclusion, in Appendix F. For studies that did not provide enough information to determine their eligibility to the review, study authors were contacted for further information. To ensure a high degree of inter-rater reliability, the reviewers worked through a sample of studies meeting the inclusion criteria and discussed any relevance issues before screening the rest of the retrieved studies.

2.4 QUALITY APPRAISAL, DATA EXTRACTION AND DATA SYNTHESIS

Each study was quality assessed using the appropriate quantitative or qualitative appraisal checklists from the NICE process and methods guide (National Institute for Health and Care Excellence, 2012). For the cross-sectional studies/survey reports we used a checklist developed by Cardiff University (Cardiff University, no date). Two reviewers independently assessed the quality of the individual studies. Disagreements were resolved through consensus and if necessary a third reviewer was consulted. The studies were given one of the following quality ratings:

- '++' (All or most of the checklist criteria have been fulfilled and the conclusions are unlikely to alter where the criteria has not been fulfilled);

- '+' (Some of the criteria have been fulfilled and the conclusions are unlikely to alter for the criteria that have not been fulfilled or not adequately described);
- '-' (Few or no criteria have been fulfilled and the conclusions are likely to alter).

Studies that received a '++' quality rating were referred to as 'very good' quality, those receiving a '+' rating were referred to as 'good' and those that received a '-' rating were referred to as 'poor'.

One reviewer extracted the data from each of the included studies using a standardised template, and a second researcher checked the extraction. Any discrepancies were resolved through discussion or by consulting a third researcher. The data extraction tables can be found in Appendix E. Four types of data extraction template were used based on the study type. For before and after studies, qualitative studies, and economic evaluations, the three templates presented in the NICE process and methods guide (National Institute for Health and Care Excellence, 2012) were used. We modified the qualitative study data extraction template to enable data extraction from cross-sectional studies/survey reports.

Data synthesis incorporated narrative summaries and/or evidence tables for all studies and provided concise detail on: populations, intervention, settings and outcomes. Results were presented in the most appropriate format for each research question to reflect the number of studies identified, the quality of the studies, and the different types of studies included.

Evidence statements were constructed which took into account the quality and consistency of the findings and the applicability of the evidence for each of the research questions. For the purpose of generating evidence statements, evidence was graded as strong (mostly [++] quality rated studies, moderate (mostly [+] quality rated studies) and weak (mostly [-] quality rated studies).

EndNote reference management software was used for the record selection and coding of studies. Word 2007 tables were used for the data extraction.

Section 3: Results

3.1 SEARCH RESULTS

A total of 21,373 records were identified: 20,686 records from the database searches and 687 records from other sources. Table G.1 (Appendix G) shows the number of results identified for each resource by the literature searches, the total number of results identified by the literature searches and the number of results assessed after EndNote de-duplication. No additional articles were identified from screening reference lists of potential articles. After de-duplication, 12,955 records were assessed for relevance based only on the title and abstract. Of these, 78 records were identified as being potentially relevant to the review and were assessed in more detail for eligibility. A total of 26 publications from the 78 records identified were included in the review.[1]

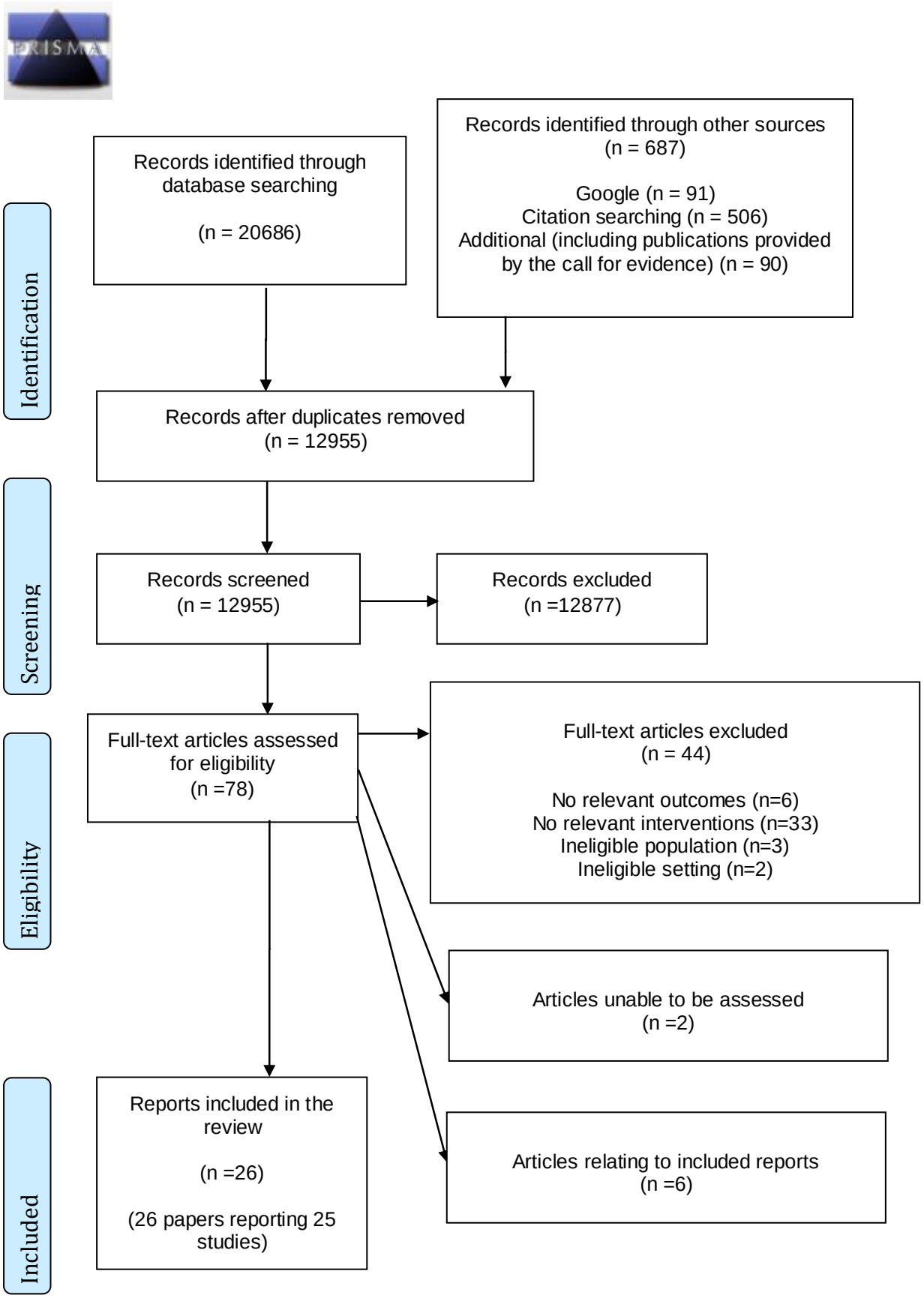
Two publications were unable to be fully assessed or included in this review because they were submitted after the cut-off date for accepting evidence (28 June 2013). The first publication was a 2-part evaluation of a vitamin D awareness campaign in Bradford and Airedale (Amjid, 2008). Part 1 was an end of project report that outlined key achievements of the vitamin D publicity campaign. It described process outcomes such as the distribution of publicity material to those at-risk, and a summary of training provided for health care professionals. Part 2 was an assessment of understanding of vitamin D in those at greater risk of vitamin D deficiency. The second publication was an assessment of the potential effects of Vitamin D supplementation for women and children in Greater Manchester (Manchester City Council, 2013). It proposed that vitamin supplementation be offered to pregnant and breastfeeding women and young children throughout Greater Manchester. The report also estimated the cost of providing free vitamin D to these at-risk groups. Neither report presented any objective health outcomes such as reduction in cases of vitamin D deficiency or uptake rates of vitamin supplements.

Six records were excluded because they were secondary publications to the primary studies already included in the review. They are presented in Appendix H.

Figure 3.1 shows the total number of studies excluded at each stage of the reviewing process.

[1] Whilst this report refers to 'studies', it should be noted that 'studies' refers to a range of publications, including local process evaluation reports, internal documents, draft documents and website material.

Figure 3.1: PRISMA Flow Chart



3.2 OVERVIEW OF STUDY SELECTION RESULTS

Twenty six studies met the inclusion criteria for the review and underwent quality appraisal. All of the included studies were conducted in the UK and were published after 2000. They are presented in Table 3.1. Twenty four studies explicitly focused on at-risk groups a) pregnant and breastfeeding women, and/or b) infants and young children aged under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies explicitly focused on c) older people aged 65 and over. One study explicitly focused on d) people who have low (or no) exposure to the sun, or e) people with dark skin.

Where studies were directly relevant to more than one question the second listing of that study was presented in italics. However, some studies were indirectly relevant to more than one question. For example, a large number of studies that assessed vitamin D knowledge in health care professionals (Question 4) were also indirectly relevant to the question about implications for staff training (Question 2). However, to minimise repetition within the report, studies were included in the research question which was judged to be the most appropriate.

Table 3.1: Studies that met the inclusion criteria for the research questions

Study citation. Setting	Study design	Publication type
Q1. How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk groups?		
Moy *et al.,* 2012. Birmingham	Before-and-after without controls	Full peer reviewed study
Nicholls and Stocker 2012. Cardiff	Before-and-after without controls	Project evaluation report
Q2. What are the implications for professional training and practice?		
Moy et al., 2012. Birmingham	*Before-and-after without controls*	*Full peer reviewed study*
Nicholls and Stocker, 2012. Cardiff	*Before-and-after without controls*	*Project evaluation report*
Jagatia *et al*., 2011, North West England	Service audit and staff survey.	Full report.
Q3. How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme?		
Moy et al., 2012. Birmingham	*Before-and-after without controls*	*Full peer reviewed study*
Nicholls and Stocker, 2012. Cardiff	*Before-and-after without controls*	*Project evaluation report*
McGee 2010. Birmingham	Costing study	Report on the case for universal supplementation
Zipitis *et al*., 2006. Burnley	Costing study	Full peer reviewed study
Moonan *et al.,* 2012. England	Mixed methods	Abstract

Study citation. Setting	Study design	Publication type
Q4. What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?		
Alemu and Varnam, 2012, North West England.	Patient survey	Full peer reviewed study
Austin *et al*., 2012, Newham, London.	Survey of pregnant women	Full report
Chandaria *et al*., 2011, Not reported	Survey and qualitative study with mostly mothers.	Abstract
Cleghorn, 2006 London	Survey of HCPs	Full peer reviewed paper
Feeding for life Foundation, 2012, England	Survey of HCPs/ parents.	Survey results summary
Garton, 2008, Not reported	Qualitative study with HCPs	Full peer reviewed study
Ingram and Potter, 2009, Bristol	Qualitative study in the Somali community	Full peer reviewed study
Jagatia et al., 2011, North West England	*Service audit and staff survey.*	*Full report.*
Jain *et al*., 2011, London.	Survey of HCPs	Abstract
Jessiman *et al*., 2013, England.	Qualitative study with HS coordinators, HCPs/ parents.	Full peer reviewed paper
Lockyer *et al*., 2011, Heywood, Middleton, Rochdale.	Survey of HCPs	Full peer reviewed paper
Leven *et al*., 2012, Glasgow	Survey of parents	Abstract
Ling *et al*, 2011, London	Survey of HCPs	Abstract
Lucas-Herald *et al*, 2012, Glasgow	Survey of parents	Letter
NHS England, 2010 to 2013, England	Survey of 11 Healthy Start schemes	Healthy Start website material.
Stocker and Nicholls, 2012 Cardiff	Qualitative study of parents/ HCPs	Summary of survey responses .
Roberts, 2012, East London	Survey of parents/ HCPs	Incomplete evaluation report.
Sharma *et al.,* 2009, London	Survey of HCPs	Full peer reviewed paper
Sharma *et al*., 2011, London	Survey of parents/ HCPs	Abstract
Zipitis *et al*., 2011, Manchester	Survey of parents/HCPs	Letter
Q5. What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?		
McGee, 2013. Birmingham	Before-and-after study without controls.	Review of programme originally reported by Moy et al., 2012.
NHS England 2010 to 2013, England	*Survey of 11 Healthy Start schemes*	*Healthy Start website material.*

Note: studies listed in italics have already been included in an earlier question. Abbreviations: HS=Healthy Start; HCP= health care professional.

3.3 FINDINGS FOR RESEARCH QUESTION ONE

How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?

Two studies met the inclusion criteria for research question one (Moy et al., 2012, Nicholls and Stocker, 2012). They were both before-and-after studies, one study [+] was conducted in Birmingham (Moy et al., 2012) and one study [-] was conducted in Cardiff (Nicholls and Stocker, 2012). Evidence from each study is summarised in Table 3.2. Full data extraction tables are presented in Appendix E.

Both studies explicitly focused on at-risk groups a) pregnant and breastfeeding women and b) infants and children under five years, and one of these studies included a high proportion of women and children from at-risk ethnic minority groups (Moy et al., 2012). For this research question no studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Moy *et al.,* evaluated the effectiveness of a public health programme in reducing cases of symptomatic vitamin D deficiency in children aged under five years resident in inner city Birmingham, where 75% of the population are from at-risk ethnic minority groups. The public health programme was targeted at two at-risk groups in particular, pregnant/breastfeeding women and infants/young children aged under 5 years. The programme involved universal rather than targeted vitamin D supplementation, and used Healthy Start vitamin drops for children and vitamin D tablets for women. Supplements were provided free of charge to all mothers and children at Health Centres, Children's Centres and at some general practices and pharmacies across the Primary Care Trust. Supplementation for infants started from 2 weeks of age, when health visitors provided families of newborns with their first bottle of children's drops, at the time of the first new baby home visit. Information about Healthy Start vitamins and the importance of vitamin D was provided to the public through Asian media networks, posters and flyers in health centres, surgeries and pharmacies, logo-branded materials ('My Little Ray of Sunshine') such as shopping bags, supermarket trolley keys, baby sunhats and T-shirts, and through Asian shops. Another key part of the programme was continuing professional education of health staff including GPs, health visitors, community and hospital midwives, pharmacists, paediatricians and obstetricians (Moy et al., 2012).

The incidence of vitamin D deficiency was measured in 2005 just before the programme began and four years later, in 2010. In addition, the study reported on the uptake of Healthy Start vitamins and on public awareness of the importance of vitamin D. The number of cases of symptomatic vitamin D deficiency in those children aged under five years fell by 59% (case incidence rate falling from 120/100 000 to 49/100 000), despite the supplement uptake rate rising only to 17%. Public awareness surveys in 2007 (n=100), 2008 (n=108) and 2011 (n=76) showed that 61%, 73% and 89% of respondents had heard of vitamin D: 21%, 41% and 79% knew that vitamin D was essential for bone health; and 20%, 56% and

85% knew that sunlight was the main source of vitamin D. The study did not report effects estimates or calculate the statistical significance for the increases in awareness over time.

This was a before-and-after study without controls. This study design can introduce bias into the results. The authors discussed the risk of confounding: for example, increasing public awareness of vitamin D and/or over the counter purchases by informed parents. The study provided detailed descriptions of the intervention with regard to coordination, provision and supply of vitamins, raising public awareness and staff training, all of which would be sufficient for replication elsewhere. The study was assessed as being of good quality [+].

Cardiff and Vale University Board presented annual performance results for the second year of the Cardiff Vitamins Project (Nicholls and Stocker, 2012) which, like Birmingham, was a programme promoting universal vitamin D supplementation in at-risk women and young children. This was a pilot project funded by the Welsh Government, and began on 1 April 2010. The project aimed to increase the uptake of Healthy Start vitamins and ensure equitable access amongst pregnant women, new mothers and children age under four years of age in Cardiff. The programme issued Healthy Start vitamins free of charge. In addition, the programme aimed to raise awareness of the importance of Healthy Start vitamins amongst health professionals and the public. Staff training/awareness of Healthy Start vitamins and the importance of vitamin D was mainly focussed on health visitors and community workers. Healthy Start promotional activities were carried out with families in a community setting. Nine clinics/health centres in Cardiff plus one midwifery unit were set up as Healthy Start vitamin issue points for families, health visitors and midwives.

This was a performance evaluation that was not conducted as a research project. It simply reported, in brief, on the progress of a public health campaign. The report was four pages long and summarised in bullet point format the project's successes and how the scheme could be improved. Due to the brief nature of the report it received a poor quality rating [-] on the quality assessment checklist (see Appendix D). It should be noted however, that this does not imply that the project itself was of poor quality.

The report stated that 20% of children under four years of age received at least one bottle of Healthy Start vitamins. 35% of Flying Start[2] children received at least one bottle of Healthy Start vitamins. 100% of GP practices received a promotional pack at the start of the project. 68% of Health Visitors received training on Healthy Start vitamins and 100% of student health visitors received training on Healthy Start vitamins. All of the health visitors interviewed in focus groups were aware of the Healthy Start vitamin project and 84% of target parents had heard of Healthy Start vitamins. The validity and appropriateness of the outcome measures were not discussed, and few details were provided about how the intervention was delivered.

[2] Flying Start is a service for children living in the most deprived areas. Among other things they have enhanced health visitor services.

Table 3.2: Evidence table for research question one

Study details: author, aim of study, design.	Population and setting	Intervention and controls	Outcomes	Results	Limitations
Moy et al. 2012 Effectiveness of a public programme in reducing vitamin D deficiency in children. Before-and-after study without controls **Quality score:** + **External validity score:** ++	Programme targeted at all pregnant and lactating women and those with children < 5 years of age. Birmingham. 75% of population are from at-risk ethnic minority groups.	Universal vitamin D supplementation began in 2005. First vitamins given when baby was 2 weeks old. Vitamins issued throughout the PCT area. Programme also includes comprehensive staff training and public awareness campaign.	Change in the incidence rate of vitamin D deficiency; change in public knowledge of vitamin D; and uptake of vitamin D supplements. All outcomes measured at 4 years after the programme began.	Vitamin D deficiency in children < 5 years = 120/100,000 in 2005 vs. 49/100,000 in 2009/2010. Uptake rates of HS vitamins in 2010/11 were 14% and 20%, and in 2012/13 were 20% and 23%, for children and women, respectively. Surveys of the public in 2007 (n=100), 2008 (n=108) and 2011(n=76) showed 21%, 41% and 79% knew that vitamin D was essential for bone health.	Absence of controls introduces risk of bias. Risk of confounding: e.g. increasing public awareness of vitamin D and/or over the counter purchases by informed parents.
Nicholls and Stocker, 2012 To pilot a process for distribution of HS vitamins that increases uptake amongst pregnant women, new mothers and children under 4 years in Cardiff. Before-and-after evaluation without controls. **Quality score: -** **External validity score: -**	Pregnant women and mothers of young children up to the age of 4 in Cardiff.	HS vitamins were issued free of charge for all pregnant women, new mothers and children under 4 years of age living in Cardiff. Programme began in 2010. Programme also includes comprehensive staff training and public awareness campaign.	Uptake of vitamins by children under 4 years and women. Staff training delivered. Public awareness of HS vitamins. Performance was measured each year for 2 years.	20% (4104) children in Cardiff, aged under 4 years, have received at least one bottle of HS vitamins. 35% (928) FS* children in Cardiff have received at least one bottle of Healthy Start vitamins. 84% parents interviewed at community play sessions had heard of healthy start vitamins.	Absence of controls introduces risk of bias. This was an annual performance report. The report does not present details of the intervention, evaluation design or methods. Nor does it report details of how outcomes were measured.

*Flying Start is a service for children living in the most deprived areas. Among other things they have enhanced health visitor services.

3.3.1 Evidence statement for research question one

How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?

Evidence statement one

There is moderate evidence from one [+] before-and-after study[1] and weak evidence [-] from another before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins, alongside a public awareness campaign about the importance of vitamin D and Healthy Start vitamins, may increase awareness and implementation of existing guidance on vitamin D among health professionals and others working with at-risk populations of pregnant/breast-feeding women and mothers of young children. One study found that the number of symptomatic cases of vitamin D deficiency in children under five years decreased by 59% in a four-year period.[1] Another study showed that 20% of children aged under four years, received at least one bottle of Healthy Start vitamins compared to less than 1% before the programme started.[2] Both studies indicated that public awareness and health professionals' awareness of the importance of vitamin D and Healthy Start vitamins increased each year that the programme was in operation.[1,2]

[1] Moy *et al.,* 2012
[2] Nicholls and Stocker, 2012

3.4 FINDINGS FOR RESEARCH QUESTION TWO

What are the implications for professional training and practice?

Three studies met the inclusion criteria for this question (Jagatia et al., 2011, Moy et al., 2012, Nicholls and Stocker, 2012). They included a before-and-after study [+] conducted in Birmingham (Moy et al., 2012), a before-and-after study [-] carried out in Cardiff (Nicholls and Stocker, 2012) and a survey [-] carried out in North West England (Jagatia et al., 2011). Two of the studies were also included in Question 1 and have been described in Section 3.3 and their data has been summarised in Table 3.2 (Moy et al., 2012, Nicholls and Stocker, 2012). Full data extraction tables are in Appendix E.

All three studies explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Moy *et al.,* evaluated the effectiveness of a public health programme in inner city Birmingham and found that the number of cases of symptomatic vitamin D deficiency in children under five years of age were reduced by 59% over a four year period. A key part of the intervention was continuing professional education of health staff including GPs, health visitors, community and hospital midwives, pharmacists, paediatricians and obstetricians around the importance of vitamin D (Moy et al., 2012). No further details of the training were reported.

Cardiff and Vale University Board presented results for the Cardiff Vitamins Project which, like Birmingham, was a public health programme that used universal vitamin D supplementation in at-risk women and young children. At the end of the second year, 20% of children aged under 4 years received at least one bottle of Healthy Start vitamins compared to less than 1% before the programme began. A key part of the programme was staff training amongst health visitors and community workers. The report stated that in the last 12 months 68% of health visitors received training on Healthy Start vitamins and 100% of student health visitors received training on Healthy Start vitamins (Nicholls and Stocker, 2012). No further details of the training were reported.

Stockport NHS Foundation Trust conducted a provider service audit and staff survey, regarding vitamin D and the Healthy Start programme in 2010, in self-selected hospitals and Primary Care Trusts in the North West of England. The audit aimed to measure and improve Vitamin D promotion and prescribing to pre- and postnatal women. One of the key aims was to gain an insight into the training needs of healthcare professionals. An audit of health visitors' (n=385) and midwives' (n=268) case notes found that discussing vitamin D with women at pre- and postnatal appointments occurred more frequently in Trusts that provided vitamin D training compared to those with no training policy (exact numbers not reported). The provider service audit found that among the 13 organisations surveyed, six offered training relating to vitamin D supplementation in pre- and postnatal women to health visitors and midwives. For the staff survey all health visitors (n=450) and midwives (n=1350) were sent a questionnaire; response rates were 44% for health visitors and 14% for midwives. The survey found that 24% of health visitor responders and 11% of midwife responders reported having received vitamin D training (Jagatia et al., 2011). This publication was an audit report and was not conducted as a research project. The authors acknowledged that the response rates to the staff survey were especially low among midwives and that the results may not be representative of individual trusts. For these reasons the report received a poor quality rating on the quality assessment checklist.

3.4.1 Evidence statement for research question two

What are the implications for professional training and practice?

Evidence statement two

There is moderate evidence from one [+] before-and-after study[1] and weak evidence from another [-] before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins increases awareness and implementation of existing guidance on vitamin D among health professionals and others working with at-risk populations of pregnant/breast-feeding women and mothers of young children. A key element of both these programmes has been an emphasis on staff training, where the provision of the free vitamin D supplements has been supported by continuing professional development of health staff including GPs, health visitors, community and hospital midwives, pharmacists, paediatricians and obstetricians about the importance of vitamin D.

[1] Moy *et al*., 2012
[2] Nicholls and Stocker, 2012

Evidence statement three

There is weak evidence from one [-] survey of 13 trusts in North West England that health visitors and midwives are more likely to discuss vitamin D with women in those Trusts that have training policies in place, although exact numbers are not reported. However, only 6 of the 13 organisations surveyed offered training relating to vitamin D supplementation in prenatal and postnatal women to health visitors and midwives.[1]

[1] Jagatia *et al,.* 2011

3.5 FINDINGS FOR RESEARCH QUESTION THREE

How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme?

Five studies met the inclusion criteria for this research question. . One was a before-and-after study [+] conducted in Birmingham (Moy et al, 2012), one was a before-and-after study [-] carried out in Cardiff (Nicholls and Stocker, 2012), one was a mixed methods [-] study (Moonan et al., 2012), and two were costing studies [-] (McGee, 2010, Zipitis et al., 2006). Two of these studies met the inclusion criteria for research question one and have been described in Section 3.4 (Moy et al., 2012, Nicholls and Stocker, 2012). Full data extraction tables for all studies are presented in Appendix E.

All five studies explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups (Moonan et al., 2012, Moy et al., 2012, Nicholls and Stocker, 2012, Zipitis et al., 2006). No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

Moy *et al.,* [+] evaluated the effectiveness of a public health programme of universal vitamin D supplementation in inner city Birmingham and found that, over a four-year period, there was a year on year increase in the proportion of pregnant women and young children receiving Healthy Start vitamins (Moy et al., 2012). In an update to the progress of the programme an updated review reported that the uptake rates of healthy start vitamins for the heart of Birmingham area in 2010/11 were 14% and 20%, and in 2012/13 were 20% and 23%, for children and women, respectively (McGee and Shaw, 2013). Public awareness surveys conducted in 2007, 2008 and 2011 showed increases in awareness of vitamin D (61%, 73% and 89% of respondents, respectively), of the importance of vitamin D for bone health (21%, 41% and 79%, respectively) and awareness that sunlight is the main source of vitamin D (20%, 56% and 85%, respectively) (Moy et al., 2012).

In 2010, five years after the public health programme of universal vitamin D supplementation (Moy et al., 2012) began in inner city Birmingham, McGee published a study [-] making the case for a roll out of the programme from one inner city PCT (HoB) to two additional Birmingham PCTs (BEN) and South Birmingham PCT). The aim was to make the scheme available to the target group (women who were pregnant or whose child was under 12

months old and children under four years old) city wide. The report included estimates of the cost of providing free universal supplementation to the target groups in the three PCTs and compared them to the estimated costs of treating vitamin D deficiency in children in the same three PCTs. The costs of the intervention comprised the purchase cost of vitamins minus the cost of vitamins supplied to those eligible for Healthy Start, as well as charges for delivery to distribution points (McGee, 2010).

The total cost of providing free universal vitamin D supplementation to 100% of the target groups in the three PCTs was estimated at £659,952. The author considered this to be a huge over estimate of what a universal policy might cost as, after 4 years and much awareness-raising in HoB, only 18% of women and 11% of eligible children were receiving the vitamins. Assuming 10% uptake for both women and children in South and BEN PCTs, plus 25% uptake in HoB for the year 2011-12 the total cost was estimated to be £102,984. Assuming 25% take up for both women and children citywide in subsequent years the total cost was estimated to be £164,988. The study estimated the cost of treating one case of nutritional rickets to be £5,000 and therefore the cost of treating the 33 identified cases of rickets or hypocalcaemic fits in Birmingham in 2009- 2010 was estimated to be £165,000. It should be noted that this was not a formal economic evaluation. The approach taken in this study implicitly ignored any additional health benefits of vitamin D supplements other than preventing new cases of vitamin D deficiency in children. It did not include all relevant costs associated with the intervention and it did not cite the source of the estimated cost of treating vitamin D deficiency. Finally, the target groups were slightly different to the at-risk groups targeted in the HoB programme (McGee 2010).

Cardiff and Vale University Board [-] presented an evaluation report for a public health programme that provided universal vitamin D supplementation to women and young children. At the end of the second year, 20% of children under the age of four had received at least one bottle of Healthy Start vitamins compared with less than 1% before the start of the programme. In addition, 35% of Flying Start children (those living in deprived areas with enhanced health visitor services) had received at least one bottle of Healthy Start vitamins. 84% of parents interviewed at community play sessions had heard of Healthy Start vitamins (Nicholls and Stocker, 2012).

Although not a formal economic evaluation, Zipitis *et al.,* [-] addressed the cost-effectiveness of vitamin D supplementation in a UK setting with a large Asian community. The authors estimated that it would cost £2,507 to treat one case of vitamin D deficiency. The cost of providing vitamin D supplementation to the total Asian population was estimated to be £10,300 per year or £25,750 per year according to the Committee on Medical Aspects of food and Nutritional Policy (COMA) and DH guidelines, respectively. Providing supplementation to the entire population of 500 children of Asian origin was estimated to avoid 4.27 cases of vitamin D deficiency, therefore saving £10,706 per year. Therefore, the incremental costs of supplementation versus no supplementation were a saving of £406 or increased costs of £15,044 according to the COMA and DH guidelines, respectively. For the Trust's Asian population where the incidence of vitamin D deficiency is 1 in 117, the costs are £2410 (COMA guidelines) and £6025 (DH guidelines). The study did not include any costs other than the costs of the vitamin supplements when estimating the total cost of primary prevention. The true prevalence of vitamin D deficiency in the local childhood population was not determined in this study. It was a retrospective study, and the authors

acknowledged that the low socioeconomic status of the population studied may render generalisation of the results and recommendations problematic (Zipitis et al., 2006).

Moonan *et al.,* [-] presented a summary of a mixed methods study to evaluate the effectiveness of providing universal Healthy Start vitamins to mothers and children independently of their income, and compared it to a targeted approach for eligible families only. In areas using the targeted approach, the uptake of vitamin D of children's drops and women's tablets was 1.46% and 2.56%, respectively. In the area that adopted a universal approach, the uptake of children's drops and women's tablets was 3.97% and 7.72% respectively. The study presented limited descriptions of methods and results because it was published in abstract form (Moonan et al., 2012).

3.5.1 Evidence statement for research question three

How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme)?

Evidence statement four

There is moderate evidence from one [+] before-and-after study[1] and weak evidence from another [-] before-and-after study[2] that a programme of universal vitamin D supplementation using Healthy Start vitamins, alongside a public awareness campaign about the importance of vitamin D and Healthy Start vitamins, increases awareness and uptake of existing guidance on vitamin D among pregnant/breast-feeding women and mothers of young children. One study showed a year on year increase in the proportion of pregnant and lactating women and young children receiving vitamin D supplements over a period of 4 years. Uptake rates of Healthy Start vitamins in 2010/11 were 22% and 14%, and in 2012/13 were 23% and 20% for women and children, respectively.[3] In another study 20% of children aged under 4 years received at least one bottle of Healthy Start vitamins at the end of the second year of the programme compared to 1% before the programme began.[2] Both studies demonstrated yearly increases in public awareness of the importance of vitamin D and Healthy Start vitamins since the programmes began.[1, 2]

[1] Moy *et al*., 2012
[2] Nicholls and Stocker, 2012
[3] McGee and Shaw, 2013 (Update of vitamin uptake numbers from earlier study by Moy et al., 2012

Evidence statement five

There is weak evidence from one [-] cost study[1] that the costs of providing free universal vitamin D supplementation for pregnant women, women whose child is less than 12 months old, and children under four years old are less than the costs of treating all cases of vitamin D deficiency in children in Birmingham (Heart of Birmingham (HoB), Birmingham East and North (BEN), and Birmingham South PCTs). The costs of providing Healthy Start vitamins to 100% of the target group in the three PCT areas were estimated to be £659,952 per year. Assuming 10% uptake for both women and children in BEN and South PCTs plus 25% uptake in HoB PCT (HoB has been providing free universal Healthy Start vitamins for four years), the costs for the year 2011-12 were estimated to be £102,984. Assuming 25% take up for both women and children in all three PCTs in subsequent years the total costs were estimated to be £164,988. The costs of treating 33 cases of vitamin D deficiency in 2009-2010 were estimated to be £165,000 (£5,000 x 33 cases). The study was not a formal economic evaluation and included only the costs of vitamin supplements plus delivery charges when estimating the costs of the intervention.

[1] McGee 2010

Evidence statement six

There is weak evidence from one [-] mixed methods study[1] that a programme of universal vitamin D supplementation using Healthy Start vitamins increases uptake among mothers and children. National data showed that uptake of the vitamins was higher in areas with universal schemes (3.97% for children and 7.72% for women) than in areas with targeted schemes (1.46% for children and 2.56% for women). Data were supported by in-depth interviews with service users and providers.

[1] Moonan *et al*., 2012

Evidence statement seven

There is weak evidence [-] from one[1] cost study that the average cost of primary prevention compares favourably with the cost of treating vitamin D deficiency in children of Asian origin. The estimated cost was £2,500 to treat one hospital-ascertained childhood case of vitamin D deficiency compared to £2,400 to supplement all Asian children from birth to two years of age within the NHS trust area. Costs for supplementing all Asian children from birth to five years were estimated to be £6025. The study was not a formal economic evaluation and included only the costs of vitamin supplements when estimating the costs of supplementation.

[1]Zipitis *et al*., 2006

3.6 FINDINGS FOR RESEARCH QUESTION FOUR

What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?

3.6.1 Overview of studies

Twenty studies met the inclusion criteria for research question four. The majority of studies were concerned with measuring awareness and knowledge of the importance of vitamin D and/or the Healthy Start scheme among members of at-risk groups and health care professionals, and were generally undertaken to help promote the implementation of vitamin D guidance by those working with at-risk group and people in at-risk groups. Summary characteristics of the studies are presented in Table 3.3 and full data extraction tables are presented in Appendix E.

Eighteen of the twenty studies explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years or over. Two studies explicitly focused on d) people who have low or no exposure to the sun, and e) people who have dark skin (Alemu and Varnam, 2012, Ingram and Potter, 2009).

- Fifteen studies [-] were surveys that assessed awareness and knowledge of the importance of vitamin D, vitamin D guidelines and/or Healthy Start vitamins in people in at-risk groups and in those working with at-risk groups (Alemu and Varnam, 2012, Austin et al., 2012, Chandaria et al., 2011, Cleghorn, 2006, Feeding for Life Foundation, 2012, Garton, 2008, Jagatia et al., 2011, Jain et al., 2011, Leven et al., 2012, Ling et al., 2011, Lockyer et al., 2011, Lucas-Herald et al., 2012, Roberts, 2012, Sharma et al., 2011, Zipitis et al., 2011). Two studies (both in abstract form) had both a survey element and a qualitative element. To minimize repetition they are both included in the list of survey studies (Chandaria et al., 2011, Ling et al., 2011);
- Five studies addressed other factors that help or hinder implementation of vitamin D guidance: one qualitative study [++] addressed reasons why the uptake of Healthy Start vitamins among eligible families is low (Jessiman et al., 2013, Stocker and Nicholls, 2012); one was a qualitative study [-] of parents and health professionals to explore barriers to uptake of Healthy Start (Stocker and Nicholls, 2012); one was a survey [-] of good practice in eleven Healthy Start schemes (NHS England, 2013); one was a survey [-] of antenatal units in London (Sharma et al., 2009); and one qualitative study [+] addressed the health needs of the Somali community, including access to information about the importance of vitamin D for women (Ingram and Potter, 2009).

Table 3.3: Summary of included studies for research question four

Study [quality score]	Participants, target at-risk group (setting)	Data collection methods
Alemu and Varnam, 2012 [-]	GP patients, d+e (North West England)	Survey using questionnaire
Austin *et al*., 2012 [-]	Pregnant women, a (Newham, London)	Telephone survey using questionnaire
Chandaria *et al*., 2011 [-] Abstract	Members of local community, mostly mothers a+b+c+d+e (Not reported)	Survey and qualitative data from focus group
Cleghorn, 2006 [-]	Health visitors, a+b (London)	Survey using postal questionnaire
Feeding for life Foundation, 2012 [-]	Health care professionals + parents, a+b (England)	Survey using online questionnaire
Garton, 2008 [-]	Health visitors and nurses, a+b (Not reported)	Survey within focus group
Ingram and Potter, 2009 [+]	Members of Somali community and health care professionals, d+e (Bristol)	Qualitative data from focus groups
Jagatia *et al.,* 2011 [-]	Provider services + health visitors and midwives, a+b (North West England)	Survey using questionnaire
Jain *et al.,* 2011 [-] Abstract	Health care professionals, a+b (London)	Survey using questionnaire
Jessiman *et al.,* 2013 [++]	Healthy Start coordinators, health professionals and parents (England)	Qualitative data from in-depth interviews
Leven *et al.,* 2012 [-] Abstract	Mothers, mainly African and Pakistani, a+b (Glasgow)	Survey using interviews
Ling *et al.,* 2011 [-] Abstract	Midwives, a (London)	Survey using online questionnaire + interviews
Lockyer *et al.,* 2011 [-]	Health visitors and midwives, a+b (Heywood, Middleton and Rochdale)	Survey using questionnaire
Lucas-Herald *et al.,* 2012 [-] Abstract	Mothers, a+b (Glasgow)	Survey using questionnaire
NHS England, 2013 [-]	Healthy Start coordinators, a+b (England)	Survey using questionnaire
Stocker and Nicholls, 2012 [-]	Health visitors and parents, a+b (Cardiff)	Telephone and face to face interviews with parents. Focus groups with health visitors.
Roberts, 2012 [-]	Mothers and health care professionals, a+b (East London)	Survey using interviews. Qualitative data using interviews.
Sharma *et al.,* 2009 [-]	Midwife coordinators, a (London)	Survey using telephone interview
Sharma *et al.,* 2011 [-] Abstract	Parents and paediatric hospital staff, a+b, (London)	Survey using questionnaire
Zipitis *et al.,* 2011 [-] Letter	Mothers and health care professionals, a (Manchester)	Survey using questionnaires

3.6.2 Quality assessment

One study was assessed as being of very good [++] quality (Jessiman et al., 2013), one was assessed as being of good [+] quality (Ingram and Potter, 2009), and the remainder were assessed as being of poor [-] quality. The full results of quality assessment are presented in Appendix D. Issues that affected the validity of the included studies included inadequate reporting of research methods, in particular with regard to details of the survey tools, sampling methods and survey response rates. Many of the evaluations were not conducted as research projects and consequently did not score well on the quality assessment tools used in this review, which are specifically designed for research studies. Furthermore, many of the studies were in summary form, including abstracts, information from websites, and local performance evaluation reports.

3.6.3 Awareness and knowledge of vitamin D and Healthy Start vitamins

Of the fifteen studies that assessed awareness and knowledge of the importance of vitamin D and/or Healthy Start, six were surveys of people in at-risk groups, seven were surveys of health care professionals or providers, and two were surveys of both health care professionals, providers and people in at-risk groups. Summary results from the surveys are presented in Table 3.4.

Surveys of at-risk groups (n=6)

Alemu and Varnam [-] surveyed 363 patients in at-risk groups d) people who have low (or no) exposure to the sun or e) people with dark skin regardless of age or gender. They found that 72% were aware of vitamin D. However, they used closed questions (yes/no answers) that may have resulted in bias, and the sample, from the local health centre waiting room, may not be representative of the local community (Alemu and Varnam, 2012). Chandaria *et al.,* reported on a study [-] in which mothers were invited to participate in an interactive discussion and teaching session with local paediatricians about vitamin D. They found that among 47 members of the local community (mostly mothers and 70% of South Asian origin) 50% were aware of vitamin D prior to entering the group. The study presented limited descriptions of methods and results because it was published in abstract form (Chandaria et al., 2011). Leven *et al.,* [-] surveyed 50 mothers, mainly of African and Pakistani origin and found that 28 (56%) mothers recalled discussing vitamin supplementation antenatally and 16 (32%) recalled being given a Healthy Start leaflet. The study presented limited descriptions of methods and results because it was published in abstract form (Leven et al., 2012). Austin *et al.,* [-] found that of the 70 pregnant women they surveyed 91% were aware of the local universal free Healthy Start vitamins, although it appears that all the women were already in receipt of vitamins before they were interviewed, which may explain the high awareness levels. There was insufficient description of the study methods to be confident about the reliability of the study results (Austin et al., 2012). Lucas-Herald *et al.,* [-] found that none of the 37 women they surveyed took vitamin D during pregnancy and only four of the 14 eligible children took vitamin D supplements. The study presented limited descriptions of methods and results because it was published in the form of a letter (Lucas-Herald et al., 2012). Sharma *et al.,* [-] surveyed 116 parents in a paediatric outpatient department as well as paediatric health care staff who were also parents, and found that 84% of parents and 79% of staff were unaware of recommendations for vitamin D supplementation in children.

The study presented limited descriptions of methods and results because it was an abstract (Sharma et al., 2011).

Surveys of health care professionals or providers (n=7)

Cleghorn *et al.,* [-] surveyed 143 health visitors and found that 81% and 57% reported they would recommend vitamin D for breastfed infants, and children under five years of age, respectively. There was a lack of detail about study methods, in particular about the survey tool and therefore, it was not possible to be confident about the reliability of the results (Cleghorn, 2006). Garton *et al.,* [-] held a discussion group for 22 health visitors and nurses during which questions were asked about their knowledge and awareness of vitamin D for bone health and about guidelines for vitamin D supplementation of pregnant or breastfeeding women and young children. Most health visitors were aware of the link between vitamin D and good bone health and most were aware of Healthy Start schemes (numbers not reported). Most of the respondents reported difficulties in accessing regular supplies of vitamin D supplements for mothers and babies. Reporting of study methods was of very poor quality and it was not possible to be confident about the reliability of the results (Garton, 2008). Jagatia *et al.,* [-] surveyed 450 health visitors and 1350 midwives as part of an audit of provider services in North West England. They found that one-third of all respondents were aware of the recommended daily allowance of vitamin D for pre and postnatal women but less than one-third knew the correct percentage of vitamin D supply obtained from the sun. More health visitors (47%) than midwives (22%) reported discussing vitamin D with women (Jagatia et al., 2011).

Lack of knowledge was the most reported reason (approx. 35%) for not discussing vitamin D with women. When asked about discussing Healthy Start with women 37% of midwives, compared to 76% of health visitors reported promoting Healthy Start. The survey tool included a variety of multiple choice and open questions designed to elicit honest responses but response rates were low (44% for health visitors and 14% for midwives) and the study did not discuss how bias might be introduced as a result (Jagatia et al., 2011). Jain *et al.,* [-] found that, of the 116 health care professionals they surveyed (77 respondents=66% response rate), 96% of health visitors and 53% of midwives were aware that vitamin D deficiency could cause rickets.

Pregnant women were routinely advised about supplementation by 8/34 (24%) of midwives and 2/21 (10%) of GPs (data not reported for midwives). They also reported that 0% of GPs, 65% of midwives and 96% of health visitors were aware of Healthy Start. This study was reported in abstract form and no details about the survey tool were reported (Jain et al., 2011). *Ling et al.,* [-] surveyed 200 midwives (n=53 responded) and found that 39% of the respondents correctly identified the recommended daily amount of vitamin D supplements for pregnant women, the majority were aware of groups at-risk of vitamin D deficiency, and 12/53 (23%) routinely advised women to take vitamin D supplements. Interviews with a sample of the midwives (n=40) indicated that the main reason for not offering advice to women was because they did not believe it was a high profile topic (25/40), and 26/40 thought that the best way to increase numbers of midwives giving advice was to improve staff training. The response rate was low (27%) and no details of the survey tool were reported (Ling et al., 2011). Lockyer *et al.,* [-] surveyed 96 health visitors and midwives and found that overall 78% identified vitamin D as being necessary for bone health and/or

calcium absorption. There was wide variation in knowledge about which groups are at risk of vitamin D deficiency. Health visiting teams recommended vitamin D supplements to breast feeding women (39/59=66%), to breast fed infants (46/59=78%) and to children aged 1 to 5 years (38/59=65%). The study reported that 6/14 (43%) midwives recommended vitamin D supplements to pregnant women and 5/14 (36%) recommended them to breast fed children. Overall 38/73 (52%) respondents were aware of current guidelines on vitamin D supplementation. In comparison 5/14 (36%) midwives and 41/59 (69%) health visiting teams reported recommending the Healthy Start branded vitamins. No details of the survey tool were reported (Lockyer et al., 2011). Roberts surveyed mothers (n=19) and health care professionals (numbers not reported) in Hackney London, about their awareness of vitamin D and the Healthy Start scheme. Very few mothers knew about the scheme and pharmacists reported that very few mothers returned for vitamin supplements. Yet health care professionals were very aware of the scheme (numbers not reported) and thought it was working well. This was a draft local evaluation report and reporting of study methods was very limited (Roberts, 2012).

Surveys of providers, health care professionals and at-risk groups (n=2)

The Feeding for Life Foundation [-] commissioned an online survey of 227 health care professionals (health visitors, midwives and GPs) and 1001 parents throughout England. They reported that 53% of health care professionals and 74% of parents were not sure or were unaware of UK supplementation recommendations. Of the health care professionals surveyed, 58% did not discuss vitamin supplements with all parents, and 24% did not discuss vitamin supplementation or Healthy Start with parents. The study reported that 53% of health care professionals were unaware of current recommendations on vitamin D supplementation, 26% knew the correct recommendations and 85% were not clear on specific recommendations for children under five. No details of the study methods or response rates were reported (Feeding for Life Foundation, 2012). Zipitis *et al.,* reported on a survey of 50 new mothers and 52 midwives. 72% of mothers had at least one factor putting them in the high risk category, but only 16% had been informed about vitamin D supplements. Among midwives, 42% were aware of NICE guidelines and 29% were aware of the Department of Health guideline for babies. Of the midwives who were aware of the guidelines, 22/52 (42%) gave advice on vitamin D supplementation to expectant women. Sixty-five percent of the midwives interviewed were aware of which groups were considered to be high-risk. The study presented limited descriptions of methods and results because it was published in the form of a letter (Zipitis et al., 2011).

Table 3.4: Results from awareness and knowledge surveys

Study [quality score]	Participants, target at-risk group, setting	Sample size (response rate)	Key results
Alemu and Varnam, 2012 [-]	GP patients, d+e, North West England	n=363 (81%)	• 160 (72%) had heard about vitamin D • 74 (46%) were aware of symptoms of vitamin D deficiency • 10 (6%) were taking vitamin D supplements
Austin *et al*., 2012 [-]	Pregnant women, a, Newham, London	n=70 (Not reported)	• 64 (91%) were aware of Newham's universal Healthy Start vitamins in pregnancy
Chandaria *et al.,* 2011 [-]	Members of local community, a+b+c+d+e, Not reported	n=47 (100%)	• 23 (50%) participants were aware of vitamin D • 19 (40%) were aware of its sources • 8 (17%) knew about the consequences of insufficiency
Cleghorn, 2006 [-]	Health visitors, a+b London	n=143 (69%)	• 79 (81%) would recommend vitamin D for the breastfed infant • 56 (57%) would recommend vitamin D until 5 years of age
Feeding for life Foundation, 2012 [-]	Health care professionals (HCP) + parents, a+b, England	n=1001 parents n=227 HCPs (Not reported)	• 53% health care professionals and 74% parents were not sure or unaware of UK supplementation recommendations • 58% health care professionals did not discuss vitamin supplements with all parents
Garton, 2008 [-]	Health visitors and nurses, a+b (Not reported)	n=22 (100%)	• There was a high degree of awareness of the importance of vitamin D for good bone health. No data presented
Jagatia *et al.,* 2011 [-]	Provider services + health visitors (HV) and midwives (MW), a+b, North West England	n=450 HVs (44%) n=1350 MWs (14%)	• About one-third of all respondents were aware of the recommended daily allowance of vitamin D for pre and postnatal women • 73 (37%) midwives promoted Healthy Start compared to 150 (76%) health visitors • 47% of health visitors and 22% of midwives discussed vitamin D with women.
Jain *et al.,* 2011 [-]	Health care professionals, a+b, London	n=116 (Not reported)	• 96% health visitors and 53% of midwives were aware that vitamin D deficiency could cause rickets • 0% of GPs, 65% of midwives and 96% of health visitors were aware of Healthy Start. • 24% (8/34) midwives and 10% (2/21) of GPs routinely advised pregnant women about supplementation
Leven *et al.,* 2012 [-]	Mothers, mainly African and Pakistani, a+b +d+e, Glasgow	n=50 (Not reported)	• 28 (56%) mothers recalled discussing vitamin supplementation antenatally and 16 (32%) recalled the Healthy Start leaflet
Ling *et al.,*	Midwives, a, London	n=200 (27%)	• 21/53 (39%) correctly identified the recommended daily amount of vitamin D

Study [quality score]	Participants, target at-risk group, setting	Sample size (response rate)	Key results
2011 [-]			supplements and n=17 (31%) the duration of supplementation • 12/53 (23%) routinely advised women to take vitamin D supplements
Lockyer *et al.,* 2011 [-]	Health visitors and midwives, a+b, Heywood, Middleton and Rochdale	n=96 (76%)	• 56 (77%) of the sample identified rickets as a condition due to vitamin D deficiency, 24 (33%) cited poor bone health and 16 (22%) cited osteoporosis. • 66% (39/59) health visiting teams recommended vitamin D supplements to breast feeding women, 78% (46/59) to breast feed infants (46/59=78%) and 65% (38/59) to children aged 1 to 5 years • 43% (6/14) midwives recommended vitamin D supplements to pregnant women and 36% (5/14) recommended breast feeding children
Lucas-Herald *et al.,* 2012 [-]	Mothers, a+b, Glasgow	n=37 (92%)	• None of the mothers took vitamin D during pregnancy even though all were eligible • 4 of the 14 eligible children took vitamin supplements; only one of these took Healthy Start vitamins
Roberts, 2012 [-]	Parents and health professionals, a+b, East London	N=19 (100%)	• 12 mothers were unaware that vitamins could be obtained for free or could identify why they were needed
Sharma *et al.,* 2011 [-]	Parents and paediatric hospital staff who were also parents, a+b, London	n=116 (Not reported)	• 45 (39%) respondents were unaware of risk factors for vitamin D deficiency • 84% of parents and 79% of healthcare staff were unaware of recommendations for vitamin D supplementation in children • 91% of parents and 88% of healthcare staff were unaware of recommendations for vitamin D supplementation for mothers during pregnancy and lactation
Zipitis *et al.,* 2011 [-]	Mothers and health care professionals, a, Manchester	n=50 new mothers and n=52 midwives (100%)	• 36 (72%) mothers had at least one factor putting them in the high risk category, but only 16% had been informed about vitamin D supplements. • 19 (38%) mothers had been taking vitamin D supplements, of which 16 had obtained them over the counter • 22 (42%) midwives were aware of NICE guidelines and 15 (29%) were aware of the Department of Health guideline for babies • Of the midwives who were aware of the guidelines, 22/52 (42%) were giving advice about vitamin D supplementation to pregnant women

Notes: Where there are no values reported for response rates and number of responses to individual questions, values for 'n' and '%' in the results column have been estimated in order that results are presented consistently throughout the table.

3.6.4 Other things that help or hinder implementation of vitamin D guidance

In a qualitative study [++] Jessiman *et al.,* used in-depth interviews with 15 Healthy Start coordinators, 50 frontline health and children's professionals and 107 parents, from 13 primary care trusts in England. Vitamin take-up was low across all research sites, reported as below 10% of eligible beneficiaries for free vitamins. Reasons identified by both parents and professionals included (1) poor accessibility of vitamins, (2) low promotion of the scheme by health professionals, (3) a lack of awareness among eligible families, and (4) low motivation among mothers to take vitamins for themselves during pregnancy or for children under four years of age. They concluded that low uptake rates can be explained by poor accessibility of vitamins and lack of awareness and motivation to take vitamin supplements among eligible families. Universal provision (at least for pregnant women) and better training for health professionals were identified as potential solutions worthy of further research and evaluation (Jessiman et al., 2013).

In a qualitative study Stocker and Nicholls [-] conducted interviews with parents and health care professionals as part of the evaluation of the Cardiff Vitamin Project. Parents and professionals reported difficulty in accessing vitamins (location of distribution points and administrative problems with vouchers) while many parents did not believe they were necessary. This study was not conducted as a research project and reporting of study methods and results are very limited (Stocker and Nicholls, 2012). The Healthy Start website [-] included survey results from eleven schemes that the NHS considered were examples of good practice in England. The schemes listed things that worked well in promoting Healthy Start vitamins to women. These included providing vitamins universally at the antenatal booking appointment; regular communication with key stakeholders to raise awareness of the scheme; development of operational procedures for the midwives and health visitors; and outreach work within the community. No study methods were reported and it was not clear what criteria were used in defining good practice (NHS England, 2013).

In a study of the prevalence of vitamin D deficiency in children the author conducted a telephone survey [-] of National Health Service antenatal units in London (n=24) and found that none had departmental guidelines on vitamin D. The survey was not the primary outcome of the study and it reported only limited details of the survey methods (Sharma et al., 2009).

Ingram and Potter [+] conducted qualitative research amongst the Somali residents of Bristol to identify specific health needs. Vitamin D was identified as one important health need for women in particular as they 'are covered up and use veils and so get little sunshine'. The authors translated the themes they identified into action through health awareness multi-agency days, by involving extended school providers, school nurses and other health workers in order to address and improve communication on vitamin D deficiency for the Somali community. No further details of the action days were reported and no evaluations were performed (Ingram and Potter, 2009).

3.6.5 Evidence statement for research question four

What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?

Evidence statement eight

There is weak evidence from 16 studies (six [-] surveys of at-risk groups [1, 2, 3, 4, 5, 6], seven [-] surveys of health care professionals or providers [7, 8, 9, 10, 11, 12, 13], and three [-] surveys of both at-risk groups and health care professionals [14, 15, 16]) that generally there is a lack of knowledge about the importance of vitamin D in bone health and the consequences of vitamin D deficiency, a lack of awareness of Healthy Start schemes, and lack of awareness of NICE guidelines and Department of Health guidelines about vitamin D supplements for at-risk groups. Most studies report that less than 50% of health care professionals advise pregnant and breast feeding women about taking vitamin D supplements or giving them to their children.

Fifteen studies explicitly focused on two at-risk groups a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies focused on women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over. One study explicitly focused on d) people who have low or no exposure to the sun, and e) people who have dark skin.[1]

[1] Alemu and Varnam, 2012
[2] Austin *et al.,* 2012
[3] Chandaria *et al.,* 2011
[4] Leven *et al.,* 2012
[5] Lucas-Herald *et al.,* 2012
[6] Sharma *et al.,* 2011
[7] Cleghorn, 2006
[8] Garton, 2008
[9] Jagatia *et al.,* 2011
[10] Jain *et al.,* 2011
[11] Ling *et al*., 2011
[12] Lockyer *et al*., 2011
[13] Sharma *et al.*, 2009
[14] Feeding for life Foundation, 2012
[15] Roberts, 2012
[16] Zipitis *et al.,* 2011

Evidence statement nine

There is strong evidence (++) from one[1] qualitative study, weak evidence [-] from one[2] qualitative study and weak evidence [-] from one[3] survey that there are key reasons for poor uptake of Healthy Start vitamin supplements. Parents find it difficult to access Healthy Start vitamins, health professionals do not promote the scheme, families that are eligible for Healthy Start are unaware of the scheme, and mothers are not motivated to take the vitamins or to give them to their children. Things that may help to increase the uptake of Healthy Start vitamins are universal supplementation, central ordering of vitamins and increasing the number of distribution centres.

[1] Jessiman *et al.,* 2013
[2] Stocker and Nicholls, 2012
[3] NHS England, 2013

Evidence statement ten

There is moderate evidence [+] from one[1] qualitative study of members of the Somali community in Bristol and health care professionals working with them, that an identified important health need is access to evidence-based information about vitamin D deficiency, especially for women.

[1] Ingram and Potter, 2009.

3.7 FINDINGS FOR RESEARCH QUESTION FIVE

What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

Two studies met the inclusion criteria for this research question. One [+] was a review paper (McGee and Shaw, 2013) that presented an update of the progress of the vitamin D public health campaign in Birmingham, as described above in findings for research question one (Section 3.3). The second study [-] was identified from the Healthy Start website and presents eleven case studies from Healthy Start organisations in the UK (NHS England, 2013).

Both studies explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and both studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, d) people who have low or no exposure to the sun, or e) people who have dark skin.

McGee and Shaw reviewed the 4-year public health campaign in inner city Birmingham, originally evaluated and reported by Moy *et al.,* 2012. The campaign and scheme were overseen by a steering group comprised of dieticians, public health nutritionists, paediatricians and public health nurses, who met regularly to identify obstacles and practical issues to ensure vitamin D supplements were available. The steering group successfully made its case to roll out the scheme to the entire city, and health centre receptions, children's centres and community pharmacies were established across the city as issuing

sites in order to ensure that there would be a distribution point within easy walking distance of most families. Since April 2012, the number of pharmacies registered to issue vitamins has increased from 12 to 39. However, due to recent re-organization of services and spending cuts, children's centres have lost staff and opening hours may be limited (McGee and Shaw, 2013).

To help overcome problems with the supply of Healthy Start vitamins through the NHS supply chain, a decision was made early on in the scheme to set up one central ordering and distribution point rather than ordering directly from NHS supplies. Each issuing site e-mails their order to the Birmingham NHS's receipt and distribution centre, which dispatches vitamins to all sites across the city and records orders. Issuing sites are required to submit monthly records to a central administration point for monitoring and evaluation purposes (McGee and Shaw, 2013).

The Healthy Start website presents 11 case studies written by health boards/trusts in the UK, which demonstrate what they have achieved in terms of where the vitamins are being distributed, who is responsible, what training has been provided locally, what challenges have been faced/overcome and key tips for other boards and trusts who are setting up vitamin distribution. Four main issues were identified: vitamin availability (11 case studies); distribution embedded into local delivery (6 case studies); organization of Healthy Start supply (10 case studies); and evaluation/monitoring of distribution (8 case studies) (NHS England, 2013).

All 11 case studies reported vitamins being made available at multiple sites including, but not exclusively, children's centres, health centres, health visitor centres, children and family centres, antenatal clinics, pharmacies and GP surgeries. The most popular were children's centres, which served as distribution sites in nine Trusts. Vitamins could be given in exchange for coupons/vouchers in four Trusts, and were also available to purchase in four Trusts. Two Trusts located services in the local community, in locations that families would naturally visit; two ensured that arrangements for Healthy Start vitamin distribution was written into both the maternity and health visiting service specification; and one used the hospital antenatal booking centre as the main distribution site since it was used by all pregnant women in the borough.

The supply of vitamins was mainly organized through a single centralized ordering centre and/or a dedicated coordinator/support worker responsible for ordering and distributing vitamins and collecting/collating data (seven Trusts). In two Trusts, children's centres and community pharmacies ordered vitamins through an intermediary, who ordered through the supply chain or a commercial distributor. In one Trust, children's centres sent a monthly return of vitamins distributed to the PCT, which despatches sufficient vitamins to ensure a small stock level is maintained. Seven of the eleven Trusts reported that they evaluated or monitored vitamin distribution levels, of which four did so on a monthly basis (NHS England, 2013).

The case studies were identified from the Healthy Start website. No details were reported about the study methods or response rates. This resulted in the study receiving a poor quality rating on the quality assessment checklist (see Appendix D).

3.7.1 Evidence statement for review question five

What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

Evidence statement eleven

There is moderate evidence [+] from one[1] before and after study that vitamin D supplements can be distributed locally in such a way as to ensure their availability for the following at-risk groups: a) pregnant and breastfeeding women, and b) infants and young children aged under 5 years. In Birmingham, the vitamin D public health campaign and scheme are overseen by a steering group that has worked to identify obstacles and practical issues to ensure vitamin D supplements are available. The scheme has established one ordering and distribution point for vitamins and increased the number of issuing sites throughout the city. Pharmacies and children's centres contribute significantly to issuing vitamin D supplements (issuing 20% and 29.7% of total vitamins respectively).[2]

[1] Moy *et al*., 2012
[2] McGee and Shaw 2013 (an update of the public health campaign reported by Moy et al 2012)

Evidence statement twelve

There is weak evidence [-] from one[1] survey of eleven Healthy Start schemes (chosen as examples of good practice for the Healthy Start website) that a large range of vitamin issuing sites are used to ensure availability for the following at-risk groups: a) pregnant and breastfeeding women, and b) infants and young children aged under 5 years. These include: children's centres; child health clinics; antenatal clinics; health centres/GP surgeries; and community pharmacies. The supply of vitamins was ensured mainly by using one central point to order vitamins and to monitor vitamin use at the issuing points.

[1] NHS England, 2013

Section 4: Discussion and conclusion

The purpose of the review was to provide evidence of the effectiveness and cost-effectiveness of interventions to increase awareness and uptake of vitamin D amongst at-risk groups and those working with at-risk groups. In addition, the review aimed to identify barriers and facilitators to the implementation of existing guidance on prevention of vitamin D deficiency for healthcare professionals and at-risk groups. A third objective was to identify ways to ensure that vitamin D supplements were made available for different at-risk groups.

4.1 OVERVIEW OF STUDIES

A total of 26 UK based studies published since 2000 were identified for inclusion in this review. Overall the quality of the studies was assessed as poor [-], with only one study assessed as very good quality [++], and two assessed as good quality [+]. Nine of the included studies were peer-reviewed journal articles. The remainder included local and national evaluation reports, study abstracts, survey reports, and website materials. The lack of reported study methods meant that most studies received a poor quality rating. In addition, many of the studies were not conducted as research projects and consequently did not score well on the quality assessment tools that are specifically designed for assessing research studies.

Of the 26 studies identified, 24 explicitly focused on at-risk groups, a) pregnant and breastfeeding women and b) infants and children under five years, and certain of these studies included women and children from at-risk ethnic minority groups. No studies were identified that explicitly focused on c) people aged 65 years and over, and two studies explicitly focused on d) people who have low or no exposure to the sun, or e) people who have dark skin.

Twenty of the studies were included in research question four which identified barriers and facilitators to the implementation of guidance on prevention of vitamin D deficiency. Two studies were relevant to a number of the research objectives and were consequently included in research questions one, two, three and five.

4.1.1 Research question one

How effective and cost-effective are interventions to increase awareness and implementation of existing guidance on vitamin D among health professionals or others working with at-risk populations?

This review identified only two studies that reported on interventions that increased awareness and implementation of existing guidance on vitamin D. The evidence that was found focused on two at-risk groups, pregnant or breastfeeding women and young children. No evidence was identified for other at-risk groups (people aged 65 years and over, people who have low or no exposure to the sun, and people who have dark skin).

The evidence suggests that well conducted public health campaigns may increase awareness and implementation of existing guidance on vitamin D amongst health care professionals and others working with pregnant or breastfeeding women and young children. Two public health programmes in Birmingham [+] and Cardiff [-] were found to be successful. In Birmingham a programme of universal rather than targeted Healthy Start vitamin D supplementation for pregnant and lactating women and young children led to a decrease in cases of symptomatic vitamin D deficiency in a high-risk population. In Cardiff, which also promoted universal vitamin D supplementation, the public health programme evaluation at two years, reported an increase in the proportion of children aged under 4 years who received at least one bottle of Healthy Start vitamins.

4.1.2 Research question two

What are the implications for professional training and practice?

The review identified evidence from both public health campaigns that professional training was a key part of increasing awareness of guidelines on vitamin D amongst those working with at-risk groups. For example, the Birmingham study reported that the public health programme was supported by the continuing professional education of health staff including GPs, health visitors, community and hospital midwives, pharmacists, paediatricians and obstetricians, while frontline staff who were authorised to issue vitamins were required to undergo appropriate training. In Cardiff, the evaluation report at two years reported the proportions of health visitors and community workers who have so far received training on nutrition incorporating Healthy Start vitamin education.

Results from a survey of health providers in North West England found evidence that the incidence of health visitors and midwives discussing vitamin D with women at prenatal and postnatal appointments is higher in Trusts that provide vitamin D training compared to those with no training policy. However, just under half of those Trusts surveyed offered staff training relating to vitamin D supplementation.

4.1.3 Research question three

How effective and cost-effective are interventions to increase awareness and uptake of existing guidance on vitamin D among at-risk groups (with special consideration given to those eligible for the UK's Healthy Start scheme?

There is evidence from public health campaigns in Birmingham and Cardiff that the uptake of vitamins for women and children increased each year compared to the period before the campaigns began. Factors that may have affected the increase in uptake include advertising in localities where at-risk groups visit, and promotion of the scheme by health professionals. Schemes that provide universal supplementation to women and children may also help increase the uptake of vitamins by making them more accessible: for example, midwives and health visitors can hand vitamins directly to women, thereby endorsing their use. The evidence suggests that a targeted scheme of vitamin D supplementation for Asian children may be more cost-effective than no supplementation, although there may be practical difficulties in implementing such a project as well as unforeseen cost implications.

4.1.4 Research question four

What helps or hinders the implementation of existing guidance on vitamin D by commissioners, providers, practitioners, those working with at-risk groups and people in at-risk groups?

The review identified a relatively large body of literature (n=20 studies) that reported barriers to implementing existing guidance on vitamin D. The studies mainly focused on at-risk groups, a) pregnant and breastfeeding women, and b) children under five years and certain of these studies included women and children from at-risk ethnic minority groups. No studies explicitly focused on c) people aged 65 years and over, while only two studies explicitly focused on d) people who have low or no exposure to the sun, and e) people who have dark skin.

Mostly the authors surveyed commissioners, providers, and those who work with at-risk groups. Although most of the studies were assessed as being of poor quality the results consistently reported a general lack of knowledge and awareness regarding different aspects of vitamin D. There was a lack of awareness about the importance of vitamin D for bone health, and a lack of knowledge about the risks of vitamin D deficiency as well as who was at risk. Deficits of awareness and knowledge were high amongst both those at-risk and health professionals. Often, midwives and health visitors were not aware of NICE guidelines or Department of Health recommendations for vitamin D supplements for at-risk groups. Most studies report that less than 50% of health care professionals advise pregnant and breast feeding women about taking vitamin D supplements or giving them to their children. There was evidence that a minority of maternity units had vitamin D policies in place.

Evidence from qualitative research [++] showed that reasons identified by both parents and professionals for poor uptake of Healthy Start vitamins included (1) poor accessibility of vitamins, (2) low promotion of the scheme by health professionals, (3) a lack of awareness among eligible families, and (4) low motivation among mothers to take vitamins for themselves during pregnancy or for children under four years of age. Universal provision (at least for pregnant women) and better training for health professionals were identified as potential solutions.

4.1.5 Research question five

What local provision is made to ensure vitamin D supplements are available for different at-risk groups (including Healthy Start, prescriptions and over-the-counter sales)?

The review identified numerous practical examples of how to improve provision of vitamins for at-risk groups, specifically for women and young children. These examples were reported by the public health programmes in Birmingham and Cardiff and among Healthy Start organisations who shared their positive experiences on the Healthy Start website for the benefit of other Healthy Start schemes. The majority of organisations reported that having one central ordering point for Healthy Start vitamins simplified the process, while increasing the number of issuing sites made vitamins more accessible to women. Other things that

may help to increase the uptake of Healthy Start vitamins were providing universal vitamin supplements so that women received their first supplements at their antenatal booking appointment; regular communication with key stakeholders to raise awareness of the scheme; development of operational procedures for the midwives and health visitors; and outreach work within the community.

4.2 CONSIDERATION OF HEALTH INEQUALITIES

Universal interventions that provide vitamin D supplementation to all members of an at-risk group regardless of income may exacerbate relative health differences. This is because the well-off tend to make more use of (and derive greater benefit from) available services. This tendency has implications for public health interventions such as the provision of universal vitamin D supplementation.

In considering the effectiveness of activities to increase awareness, uptake and provision of vitamin D supplements in these groups, a number of possible scenarios concerning impact on health inequities are possible. These may include:

- Awareness, uptake, and provision of vitamin D supplements may improve across the whole population, whether targeted or not, and this may result in improved vitamin D status across the whole population to a similar extent in all groups, meaning that those with initially worse status would still be so post-intervention. However, health inequities would still be evident;
- Interventions to promote awareness, uptake, and provision of vitamin D supplements may be more effective in the pre-defined at-risk population groups (Healthy Start recipients, the elderly, the housebound, individuals who cover their skin etc.) rather than in the whole population, and there would therefore be a reduction in health inequities;
- Alternatively, effectiveness may be greater in lower risk groups (for example when universal rather than targeted supplementation is promoted) and this may be disadvantageous (theoretical risk of vitamin D over-dosing), whilst exacerbating heath inequities. It should be noted however, that there is little evidence that long-term supplementation between 10-25 µg per day would be harmful (Yong, 2010).

This review provides some evidence that interventions to promote awareness, uptake and provision of vitamin D supplements were effective in two at-risk groups (pregnant and breast feeding women and children aged under five years) and in this way may lead to a reduction in health inequities. However, in the UK, there is a lack of evidence about interventions aimed at other at-risk groups. Consequently, health inequalities will continue to exist: in particular for the elderly, people with dark skin and those who have little or no exposure to the sun, such as the housebound and those in prison.

4.3 CONCLUSIONS

There is some evidence suggesting that there are modifiable factors among groups at high risk of vitamin D deficiency that could be addressed through interventions that aim to encourage uptake of vitamin D supplements. Appropriate interventions as identified in this review (for example public health campaigns) may help to improve awareness and knowledge of the importance of vitamin D among pregnant and breastfeeding women and those who work with them. However, given the poor quality of the studies overall, it is not clear how confident we could be that implementing any of the interventions would be successful.

Furthermore, no evidence was identified for interventions aimed at increasing uptake of vitamin D supplements for people aged 65 years, people who have low or no exposure to the sun, or people who have dark skin. Therefore, it is uncertain if interventions that may be effective in women and young children would be as effective, for example, in the elderly or in those who have little exposure to the sun or who have dark skin.

The public health campaigns that were conducted in Birmingham and Cardiff aimed to increase awareness of vitamin D deficiency through advertising, promotion of the scheme by trained health professionals and providing free vitamins to those in the at-risk group. All three elements were important for the success of the programme. Different elements may work differently for each of the at-risk groups. Any development of intervention materials (such as promotional leaflets) would need to take into consideration how information can be tailored to the different at-risk groups.

There is some evidence, in the form of a relatively large number (n=16) of poor quality studies, to suggest that there is a general lack of awareness about the importance of vitamin D and of Healthy Start schemes, among pregnant and breastfeeding women and among health professionals who work with those groups. In addition, there is evidence from one good quality study and two poor quality studies that improving training for health professionals may impact on knowledge and awareness of vitamin D and Healthy Start among eligible families. Efforts could be made to address knowledge and information gaps among healthcare professionals, and an approach that could be considered is the introduction of vitamin D guidance and staff training policies where none currently exist.

Most of the studies about awareness and knowledge of vitamin D explicitly focused on at-risk groups a) pregnant and breastfeeding women and b) children under five years, as well as the health care professionals who work with them. Often there are opportunities for routine contact between health professionals and women with young children in the antenatal period, in the postnatal period and when families attend children's centres. For other at-risk groups (people aged over 65 years, people with low or no exposure to the sun, and people with dark skin) there may be limited opportunities for contact with health care professionals. People who are vitamin D deficient do not necessarily feel unwell and may not attend health care settings on a regular basis.

There is strong evidence from one study that suggests that access to vitamin supplements needs to be straightforward in terms of administration (for the provider and consumer) and

uncomplicated with regard to acquiring the supplements if awareness and uptake is to increase. Because most of the evidence identified focused on women and young children consideration may need to be given to the types of facilities that are frequented by members of the different at-risk groups, in both health care and non-health care settings.

4.4 LIMITATIONS OF, AND GAPS IN, THE EVIDENCE

Overall, relatively few studies were identified that helped answer the research questions. There is the possibility that relevant literature was missed during the searches conducted for this review. However, an extensive search was conducted for the review that incorporated searching of a range of electronic sources, web-based searches and reference checking. Furthermore, the criteria for study selection were very inclusive so as to take account of the results of early scoping searches that identified very few studies for this review topic. Despite this, only two studies were identified that assessed interventions aimed at increasing awareness and uptake of vitamin D guidance. However, as a range of literature sources were searched, it is unlikely that key studies were missed and the review therefore concludes that there is a lack of research in the UK regarding interventions for improving implementation of vitamin D guidance among at-risk groups. The literature searches identified some studies that were excluded because they were set in North America but otherwise would have met the inclusion criteria for this review. Examples of interventions from North American studies were:

- Vitamin D education for healthcare providers (the outcome was vitamin D knowledge);
- Educational intervention vs. no educational intervention by pharmacists in geriatric outpatients (the outcome was vitamin D concentrations and self-reported daily vitamin D intake);
- Improving vitamin D uptake by using case notes in a residential home to identify those at-risk of vitamin D deficiency (the outcome was the prescription rate before and after the intervention) (Yanamadala et al., 2012, Vande Griend et al., 2008, Sundeen, 2011).

Furthermore there is anecdotal evidence of the existence of public health campaigns in different parts of the UK that are aiming to increase the awareness of vitamin D and increase the uptake of vitamin D supplements among those at risk. However, these interventions have not been formally evaluated to date and often have not been designed as research projects. Therefore, no objective measures of their impact on public health are publicly available.

Overall the quality of the studies in this review was poor. Studies that were judged to be of poor quality had significant reporting omissions that meant it was not possible to have confidence in their reliability. Often this was because the studies were not conducted as research projects. However, the usefulness of all of the studies included in the review was considered to be adequate. They were all UK based and applicable to the research questions.

Twenty-four of the 26 studies identified for this review addressed the issue of vitamin D deficiency in two at-risk groups: a) pregnant and breastfeeding women and/or b) infants and children under 5 years. Certain of these studies included women and children who were from at-risk ethnic minority groups. This review primarily aimed to determine the effects of interventions targeted at disadvantaged populations, since these are the populations that the Department of Health has identified as being at greater risk of vitamin D deficiency through elevated vitamin D requirements (pregnancy), poor dietary intake (low income, in receipt of state benefits), or inadequate sunlight exposure with or without diminished vitamin D synthesis (dark skin, housebound, the elderly, and skin concealment by clothing) (Department of Health, 1991). This review did not identify any studies that focused on interventions to increase uptake of vitamin D supplements in the elderly. Furthermore only one study explicitly included people who have low exposure to the sun and people with dark skin.

Although most of the studies identified in this review focused on pregnant and breastfeeding women and young children, even for these groups there are insufficient numbers of good quality studies to help answer all the research questions. For example, for research question one, the review identified two studies (one good quality and one poor quality) that reported on public health campaigns aimed at increasing uptake of Healthy Start vitamins among women and young children. The settings for these campaigns were inner city Birmingham and Cardiff. Results from these settings may not necessarily be applicable to the same at-risk groups in other settings, such as in rural areas.

Research is lacking on interventions to increase awareness and knowledge about the importance of vitamin D among members of at-risk groups other than pregnant women and mothers of young children. In particular, there is a need for studies to explore ways to improve knowledge and access to vitamin D in the elderly.

Further research is required into the effectiveness and cost-effectiveness of universal vitamin supplementation schemes versus a targeted approach. Two cost studies were identified in this review. They both compared the costs of universal supplementation for selected at-risk groups with the costs of treating vitamin D deficiency. However, these were not formal economic evaluations. The evidence from both studies was weak because they omitted to include all relevant costs associated with universal supplementation, such as administration and staff time and training costs.

References

Alemu, E. & Varnam, R. 2012. Awareness of vitamin D deficiency among at-risk patients. *BMC Research Notes*, 5, 17.

Amjid, T. 2008. *Bradford and Airedale NHS "project has developed resources and training to address an increase in children with vitamin D deficiency,* Bradford, NHS Yorkshire and the Humber. Available: http://www.institute.nhs.uk/index.php?option=com_mtree&task=viewlink&link_id=3877&Itemid=1876

Austin, F., Jewell, R. & Dunn, S. 2012. *Healthy Start and Vitamin D Evaluation Report,* London, Barts Health NHS Trust.

Cardiff University. no date. *Questions to assist with the critical appraisal of an observational study eg cohort, casecontrol, cross-sectional. (Type IV evidence)* [Online]. Available: http://www.cardiff.ac.uk/insrv/libraries/sure/sysnet/pdf/CA%20questions-observational.pdf [Accessed 20 Aug 2013].

Chandaria, K., Mohd Daud, K., Syed, F. & Blair, M. 2011. What are the views of local people about vitamin d and its health effects: a community focus group study. *Arch Dis Child* 96, A11.

Chief Medical Officers 2012. *Vitamin D – advice on supplements for at risk groups [letter],* London, Department of Health.

Cleghorn, S. 2006. Do health visitors advise mothers about vitamin supplementation for their infants in line with government recommendations to help prevent rickets? *Journal of Human Nutrition & Dietetics*, 19 (3), 203-8.

Department of Health 1991. *Dietary Reference Values (DRVs) for Food Energy and Nutrients for the UK. Report of the Panel on DRVs of the Committee on Medical Aspects of Food Policy,* London, The Stationery Office.

Feeding for Life Foundation 2012. *Mind the Gap: Are the current vitamin recommendations meeting the needs of the under-5's in the UK?,* London, Feeding for Life Foundation.

Garton, L. 2008. Children's bone health, calcium and vitamin D--how much do nurses and health visitors know? *Journal of Family Health Care*, 18 (5), 175-7.

Ingram, J. & Potter, B. 2009. The health needs of the Somali community in Bristol. *Community Practitioner*, 82 (1), 26-29.

Jagatia, S., Lee, D., Haynes, C., Knuckey, S. & Cook, G. 2011. *Measuring and Improving Vitamin D Promotion and Prescribing to Prenatal and Postnatal Women within the North West. Stockport NHS Foundation Trust,* Stockport, Stockport NHS Foundation Trust. Available: http://www.gmpublichealthpracticeunit.nhs.uk/wp-content/uploads/2011/06/Final-Vitamin-D-Report.pdf

Jain, V., Raychaudhuri, R. & Barry, W. 2011. A survey of healthcare professionals' awareness of vitamin d supplementation in Pregnancy, infancy and childhood-midwives, GPs and health visitors have their say. *Arch Dis Child*, 96 (Suppl 1), A16-18.

Jessiman, T., Cameron, A., Wiggins, M. & Lucas, P. J. 2013. A qualitative study of uptake of free vitamins in England. *Arch Dis Child*, 98 (8), 587-591.

Leven, L., Longbottom, K. & Jackson, A. 2012. Efficacy of vitamin D deficiency prevention strategies in Glasgow's maternity services. *Archives of Disease in Childhood*, 97 (3), 299.

Ling, R., Coren, M. & Goldring, S. 2011. Barriers to effective vitamin D supplementation during ante-natal care. *Arch Dis Child*, 96 (Suppl1), A22.

Lockyer, V., Porcellato, L. & Gee, I. 2011. Vitamin D deficiency and supplementation: are we failing to prevent the preventable? *Community Practitioner*, 84 (3), 23-6.

Lucas-Herald, A., Grosset, K., Robertson, M. & Ahmed, S. 2012. The GP'S role in improving the uptake of healthy start vitamins. *British Journal of General Practice*, 62 (601), 407.

Manchester City Council 2013. *Health and Well-being Update Part 2: supplementary,* Manchester, Manchester City Council. Available: http://tinyurl.com/qbzysue

Mcgee, E. 2010. *Prevention of rickets and vitamin D deficiency in Birmingham: The case for universal supplementation,* Birmingham, National Health Service.

Mcgee, E. & Shaw, D. 2013. Vitamin D supplementation: Putting recommendations into practice. *Journal of Health Visiting*, 1 (3), 2-7.

Moonan, M., Hanratty, B. & Whitehead, M. 2012. Which is more effective, a universal or targeted approach, to implementing the National Healthy Start Programme? A mixed methods study. *Journal of Epidemiology and Community Health*, 66, A44-A45.

Moy, R. J., Mcgee, E., Debelle, G. D., Mather, I. & Shaw, N. J. 2012. Successful public health action to reduce the incidence of symptomatic vitamin D deficiency. *Archives of Disease in Childhood*, 97 (11), 952-4.

National Health Service. 2012. *Vitamins and minerals – Vitamin D* [Online]. London: NHS Choices. Available: http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-D.aspx [Accessed 19 Aug 2013].

National Health Service. 2013. *Sunlight and vitamin D* [Online]. Available: http://www.nhs.uk/Livewell/Summerhealth/Pages/vitamin-D-sunlight.aspx [Accessed 7 August 2013].

National Health Service. no date. *Health Start vitamins* [Online]. National Health Service. Available: http://www.healthystart.nhs.uk/healthy-start-vouchers/healthy-start-vitamins/ [Accessed June 20 2013].

National Institute for Health and Care Excellence 2012. *Methods for the development of NICE public health guidance (third edition),* London, National Institute for Health and Care Excellence.

National Institute for Health and Care Excellence 2013. *Vitamin D: implementation of existing guidance to prevent deficiency,* London, National Institute for Health and Care Excellence.

National Institute for Health and Clinical Excellence 2008. *PH11 Maternal and Child Nutrition,* London, National Institute for Health and Clinical Excellence.

National Institute for Health and Clinical Excellence 2010. *CG62 Antenatal Care,* London, National Institute for Health and Clinical Excellence.

NHS England. 2013. *Healthy Start – Learn more about Healthy Start* [Online]. Available: http://www.healthystart.nhs.uk/for-health-professionals/learn-more-about-healthy-start/ [Accessed 19 July 2013].

Nicholls, H. & Stocker, S. 2012. *Cardiff Healthy Start Vitamin Project, Cardiff Additional qualitative evaluation April – Sept 2012,* Cardiff, NHS Wales.

Roberts, H. 2012. *Process evaluation of a new scheme offering free vitamins to families in Hackney and the City,* London, Public Health ELC.

Scientific Advisory Committee on Nutrition 2007. *Update on vitamin D. Position statement by the Scientific Advisory Committee on Nutrition,* London, The Stationary Office.

Sharma, S., Khan, N., Khadri, A., Julies, P., Gnanasambandam, S., Saroey, S., Jacobs, B., Beski, S., Coren, M. & Alexander, S. 2009. Vitamin D in pregnancy-time for action: a paediatric audit. *BJOG: An International Journal of Obstetrics & Gynaecology*, 116 (12), 1678-82.

Sharma, V., Williams, B., Goddard, A. & Coren, M. 2011. Vitamin D and parental knowledge. *Arch Dis Child*, 96 (Suppl 1), A62.

Stocker, S. & Nicholls, H. 2012. *Cardiff Vitamin Project: Performance Evaluation Report 1st October 2011-30st September 2012,* Cardiff, NHS Wales.

Sundeen, J. E. 2011. The impact of vitamin D education on healthcare providers. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 72 (2-B), 802.

Vande Griend, J. P., Linnebur, S. A., Ruscin, J. M., Vondracek, S. F., Wolfe, P. & Mcdermott, M. T. 2008. Vitamin D intervention by pharmacists in geriatric outpatients. *Journal of the American Pharmacists Association: JAPhA*, 48 (4), 501-7.

Yanamadala, M., Heflin, M. T., White, H. K. & Buhr, G. T. 2012. Ensuring vitamin D supplementation in nursing home patients-A quality improvement project. *Journal of Nutrition in Gerontology and Geriatrics*, 31 (2), 158-171.

Yong, E. 2010. *Vitamin D Expert Review. . http://www.nice.org.uk/nicemedia/live/11871/49665/49665.pdf* London, Cancer Research UK.

Zipitis, C. S., Elazabi, A. & Samanta, S. 2011. Vitamin D deficiency and guideline awareness. *Archives of Disease in Childhood Fetal & Neonatal Edition*, 96 (4), F310.

Zipitis, C. S., Markides, G. A. & Swann, I. L. 2006. Vitamin D deficiency: prevention or treatment? *Archives of Disease in Childhood*, 91 (12), 1011-4.

APPENDIX A

PRISMA Checklist

PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title page
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Exec Summary (p i-x)
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	p1-2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	p2-3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	p4-5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	p6-9
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix B
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	p9
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	p9-10
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	N/A

Section/topic	#	Checklist item	Reported on page #
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	N/A
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	p11-14
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	p15-35
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Appendix D
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	N/A
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarise the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	p36-38

Section/topic	#	Checklist item	Reported on page #
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	p39-37
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	p38-42
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	This project has been funded by NICE

APPENDIX B

Search Strategies

B.1: Source: MEDLINE In-Process & Other Non-Indexed Citations and MEDLINE

Interface / URL: OvidSP

Database coverage dates: 1946 to present

Search date: 02/05/13

Retrieved records: 7335

Search strategy:

1 exp Vitamin D/40333

2 exp Vitamin D Deficiency/ 18546

3 (vitamin$1 adj5 D$1).ti,ab. 41794

4 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).ti,ab,rn. 8257

5 (1406-16-2 or 67-97-0).rn. 24495

6 (multivitamin$1 or multimicronutrient$1 or multimineral$1).ti,ab. 2647

7 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).ti,ab. 192

8 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).ti,ab. 479

9 or/1-8 67451

10 exp Guidelines as Topic/ 104684

11 Nutrition Policy/ 5687

12 exp guideline/ 23599

13 Clinical Protocols/ 18684

14 critical pathways/ 4234

15 consensus/ 4264

16 exp consensus development conferences as topic/ 2085

17 Health Planning Guidelines/ 3732

18 (guideline$1 or guidance$ or recommended or recommendation$1 or advised or advice or standard$1 or statement$1 or consensus or policy or policies or protocol$1 or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference daily intake$1 or dietary reference value$1 or reference nutrient intake$1 or estimated average requirement$1 or strategy or strategies).ti,ab. 1923767

19 (implement$ or aware$ or uptake or up-take or takeup or take-up or adhere$1 or adherence or concordance or accordance or adopt$ or comply or complies or compliance or disseminat$ or spread or spreading or barrier$1 or facilitat$).ti,ab. 1428038

20 Guideline Adherence/ 18214

21 Health Plan Implementation/ 3491

22 exp Patient Compliance/ 49619

23 exp Program Evaluation/ 52317

24 Patient Medication Knowledge/ 17

25 Health Knowledge, Attitudes, Practice/ 66122

26 exp Prescriptions/ 23769

27 exp Prescription Drugs/ 2362

28 exp Nonprescription Drugs/ 4811

29 Pharmacies/ 3692

30 exp Vitamin D/sd [Supply & Distribution] 6

31 (prescription$ or prescrib$ or nonprescription$ or nonprescrib$ or over-the-counter$ or OTC$ or behind-the-counter$ or BTC$ or pharmacy or pharmacies or chemist or chemists

or shop or shops or sale or sales or sold or sell or sells or selling or retail$ or buy$ or bought or purchas$ or deliver$ or provision$ or provide$ or distribut$ or pharmacist$).ti,ab.
2576344
32 or/10-31 4995187
33 9 and 32 16199
34 exp Vitamin D/st [Standards] 53
35 (healthy start$ or healthystart$).ti,ab. 171
36 or/33-35 16386
37 limit 36 to (english language and yr="2000 -Current") 10245
38 animals/ not humans/ 3715426
39 (exp africa/ or exp americas/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp australia/ or andorra/ or austria/ or balkan peninsula/ or belgium/ or exp europe, eastern/ or finland/ or exp france/ or exp germany/ or gibraltar/ or greece/ or iceland/ or ireland/ or exp italy/ or liechtenstein/ or luxembourg/ or exp mediterranean region/ or monaco/ or netherlands/ or portugal/ or san marino/ or exp scandinavia/ or spain/ or switzerland/ or exp transcaucasia/ or vatican city/ or exp oceania/) not exp great britain/
2650655
40 37 not (38 or 39) 7335

B.2: Source: Embase

Interface / URL: OvidSP
Database coverage dates: 1974 to 2013 May 07
Search date: 08/05/13
Retrieved records: 6217
Search strategy:

1 exp *vitamin D/ 44454
2 *vitamin D deficiency/ 6176
3 (vitamin$1 adj5 D$1).ti,ab. 56691
4 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).ti,ab,rn. 22213
5 (1406-16-2 or 67-97-0 or 50-14-6 or 50809-47-7 or 8042-78-2).rn. 18414
6 *multivitamin/ 1021
7 (multivitamin$1 or multimicronutrient$1 or multimineral$1).ti,ab. 3411
8 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).ti,ab. 274
9 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).ti,ab. 567
10 or/1-9 80650
11 exp *practice guideline/ 40854
12 *health care policy/ 50934
13 *consensus/ 1671
14 *consensus development/ 837
15 *health care planning/ 30731
16 (guideline$1 or guidance$ or recommended or recommendation$1 or advised or advice or standard$1 or statement$1 or consensus or policy or policies or protocol$1 or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs

or reference daily intake$1 or dietary reference value$1 or reference nutrient intake$1 or estimated average requirement$1 or strategy or strategies).ti,ab. 2474975
17 (implement$ or aware$ or uptake or up-take or takeup or take-up or adhere$1 or adherence or concordance or accordance or adopt$ or comply or complies or compliance or disseminat$ or spread or spreading or barrier$1 or facilitat$).ti,ab. 1754288
18 *patient compliance/ 17581
19 *health care quality/ 58391
20 *patient education/ 23549
21 *attitude to health/ 37309
22 *prescription/ 24393
23 *prescription drug/ 999
24 *non prescription drug/ 3335
25 *pharmacy/ 28626
26 (prescription$ or prescrib$ or nonprescription$ or nonprescrib$ or over-the-counter$ or OTC$ or behind-the-counter$ or BTC$ or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail$ or buy$ or bought or purchas$ or deliver$ or provision$ or provide$ or distribut$ or pharmacist$).ti,ab. 3134242
27 or/11-26 6158684
28 10 and 27 21137
29 (healthy start$ or healthystart$).ti,ab. 198
30 or/28-29 21323
31 limit 30 to (english language and yr="2000 -Current") 14191
32 (animal experiment/ or animal model/ or animal tissue/) not human/ 1942709
33 nonhuman/ not human/ 3260693
34 (exp "arctic and antarctic"/ or exp oceanic regions/ or exp western hemisphere/ or exp africa/ or exp asia/ or exp "australia and new zealand"/ or exp Eastern Europe/ or austria/ or belgium/ or benelux/ or france/ or exp germany/ or ireland/ or liechtenstein/ or luxembourg/ or monaco/ or netherlands/ or exp scandinavia/ or exp southern europe/ or switzerland/) not United Kingdom/ 2778870
35 31 not (32 or 33 or 34) 10536
36 (conference abstract or conference paper or letter).pt. 2555195
37 medline.cr. 9743877
38 35 not (36 or 37) 6217

B.3: Source: Social Sciences Citation Index (SSCI); Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH)

Interface / URL: Web of Science
Database coverage dates: Social Sciences Citation Index (SSCI): 1956 to present
Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH): 1990 to present
Search date: 10/05/13
Retrieved records: 698
Search strategy:

Note: all lines run in Databases=SSCI, CPCI-SSH. All lines are Timespan=All years apart from last

# 15 698 (#13 not #14) AND Language=(English)
Databases=SSCI, CPCI-SSH Timespan=2000-2013

14 111,561 TS=("rat" or "rats" or "mouse" or "mice" or "murine" or "hamster" or "hamsters" or "animal" or "animals" or "dogs" or "dog" or "pig" or "pigs" or "cats" or "bovine" or "cow" or "cows" or "sheep" or "horse" or "horses" or "equine" or "ovine" or "porcine" or "monkey" or "monkeys" or "rhesus macaque" or "rhesus macaques" or "rabbit" or "rabbits")

13 835 #11 or #12

12 121 TS=("healthy start*" or "healthystart*")

11 714 #6 and #10

10 1,395,416 #7 or #8 or #9

9 629,691 TS=("prescription*" or "prescrib*" or "nonprescription*" or "nonprescrib*" or "over-the-counter*" or "OTC*" or "behind-the-counter*" or "BTC*" or "pharmacy" or "pharmacies" or "chemist" or "chemists" or "shop" or "shops" or "sale" or "sales" or "sold" or "sell" or "sells" or "selling" or "retail*" or "buy*" or "bought" or "purchas*" or "deliver*" or "provision*" or "provide*" or "distribut*" or "pharmacist*")

8 415,717 TS=("implement*" or "aware*" or "uptake" or "up-take" or "takeup" or "take-up" or "adhere*" or "concordance" or "accordance" or "adopt*" or "comply" or "complies" or "compliance" or "disseminat*" or "spread" or "spreading" or "barrier*" or "facilitat*")

7 777,889 TS=("guideline*" or "guidance*" or "recommended" or "recommendation*" or "advised" or "advice" or "standard" or "standards" or "statement*" or "consensus" or "policy" or "policies" or "protocol*" or "pathway*" or "RDA" or "RDAs" or "RDI" or "RDIs" or "DRV" or "DRVs" or "RNI" or "RNIs" or "LRNI" or "LRNIs" or "EAR" or "EARs" or "reference daily intake*" or "dietary reference value*" or "reference nutrient intake*" or "estimated average requirement*" or "strategy" or "strategies")

6 1,782 #1 or #2 or #3 or #4 or #5

5 42 TS=("multiple" near/1 ("vitamin*" or "micronutrient*" or "mineral*"))

4 12 TS=("multi vitamin*" or "multi micronutrient*" or "multi mineral*")

3 206 TS=("multivitamin*" or "multimicronutrient*" or "multimineral*")

2 42 TS=("vitaminD*" or "cholecalciferol*" or "colecalciferol*" or "ergocalciferol*" or "calciferol*" or "alfacalcidol*")

1 1,546 TS=("vitamin*" near/5 ("D" or "D1" or "D2" or "D3" or "D4" or "D5" or "D6" or "D7" or "D8" or "D9"))

B.4: Source: Database of Abstracts of Reviews of Effectiveness (DARE)

Interface / URL: Cochrane Library/Wiley Interscience – online 2012 (DARE issue 2)
Database coverage dates: Information not found
Search date: 08/05/13
Retrieved records: 166
Search strategy:

#1 MeSH descriptor: [Vitamin D] explode all trees 1944
#2 MeSH descriptor: [Vitamin D Deficiency] explode all trees 354
#3 (vitamin* near/5 (D or D1 or D2 or D3 or D4 or D5 or D6 or D7 or D8 or D9)) 3161
#4 (vitaminD* or cholecalciferol* or colecalciferol* or ergocalciferol* or calciferol* or alfacalcidol*) 843
#5 (multivitamin* or multimicronutrient* or multimineral*) 649
#6 (multi next vitamin* or multi next micronutrient* or multi next mineral*) 94
#7 (multiple next (vitamin* or micronutrient* or mineral*)) 194
#8 #1 or #2 or #3 or #4 or #5 or #6 or #7 4549
#9 MeSH descriptor: [Guidelines as Topic] explode all trees 1795
#10 MeSH descriptor: [Nutrition Policy] this term only 140
#11 MeSH descriptor: [Guideline] explode all trees 17
#12 MeSH descriptor: [Clinical Protocols] this term only 1499
#13 MeSH descriptor: [Critical Pathways] this term only 228
#14 MeSH descriptor: [Consensus] this term only 29
#15 MeSH descriptor: [Consensus Development Conferences as Topic] explode all trees 13
#16 MeSH descriptor: [Health Planning Guidelines] this term only 30
#17 (guideline* or guidance* or recommended or recommendation* or advised or advice or standard or standards or statement* or consensus or policy or policies or protocol* or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference next daily next intake* or dietary next reference next value* or reference next nutrient next intake* or estimated next average next requirement* or strategy or strategies) 148769
#18 (implement* or aware* or uptake or up-take or takeup or take-up or adhere* or concordance or accordance or adopt* or comply or complies or compliance or disseminat* or spread or spreading or barrier* or facilitat*) 98314
#19 MeSH descriptor: [Guideline Adherence] this term only 560
#20 MeSH descriptor: [Health Plan Implementation] this term only 67
#21 MeSH descriptor: [Patient Compliance] explode all trees 7652
#22 MeSH descriptor: [Program Evaluation] explode all trees 4116
#23 MeSH descriptor: [Patient Medication Knowledge] this term only 0
#24 MeSH descriptor: [Health Knowledge, Attitudes, Practice] this term only 3077
#25 MeSH descriptor: [Prescriptions] explode all trees 559

#26 MeSH descriptor: [Prescription Drugs] explode all trees 55
#27 MeSH descriptor: [Nonprescription Drugs] explode all trees 156
#28 MeSH descriptor: [Pharmacies] this term only 62
#29 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Supply & distribution - SD] 0
#30 (prescription* or prescrib* or nonprescription* or nonprescrib* or over-the-counter* or OTC* or behind-the-counter* or BTC* or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail* or buy* or bought or purchas* or deliver* or provision* or provide* or distribut* or pharmacist*) 133186
#31 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 261405
#32 #8 and #31 1901
#33 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Standards - ST] 1
#34 (healthy next start* or healthystart*) 28
#35 #32 or #33 or #34 from 2000 to 2013 1542
#36 MeSH descriptor: [Africa] explode all trees 3740
#37 MeSH descriptor: [Americas] explode all trees 18391
#38 MeSH descriptor: [Antarctic Regions] explode all trees 9
#39 MeSH descriptor: [Arctic Regions] explode all trees 6
#40 MeSH descriptor: [Asia] explode all trees 8928
#41 MeSH descriptor: [Australia] explode all trees 1999
#42 MeSH descriptor: [Andorra] this term only 0
#43 MeSH descriptor: [Austria] this term only 266
#44 MeSH descriptor: [Balkan Peninsula] this term only 0
#45 MeSH descriptor: [Belgium] this term only 354
#46 MeSH descriptor: [Europe, Eastern] explode all trees 892
#47 MeSH descriptor: [Finland] this term only 735
#48 MeSH descriptor: [France] explode all trees 966
#49 MeSH descriptor: [Germany] explode all trees 1800
#50 MeSH descriptor: [Gibraltar] this term only 0
#51 MeSH descriptor: [Greece] this term only 191
#52 MeSH descriptor: [Iceland] this term only 42
#53 MeSH descriptor: [Ireland] this term only 146
#54 MeSH descriptor: [Italy] explode all trees 1290
#55 MeSH descriptor: [Liechtenstein] this term only 0
#56 MeSH descriptor: [Luxembourg] this term only 4
#57 MeSH descriptor: [Mediterranean Region] explode all trees 35
#58 MeSH descriptor: [Monaco] this term only 1
#59 MeSH descriptor: [Netherlands] this term only 1881
#60 MeSH descriptor: [Portugal] this term only 64
#61 MeSH descriptor: [San Marino] this term only 0
#62 MeSH descriptor: [Scandinavia] explode all trees 2775
#63 MeSH descriptor: [Spain] this term only 817
#64 MeSH descriptor: [Switzerland] this term only 396
#65 MeSH descriptor: [Transcaucasia] explode all trees 16

#66 MeSH descriptor: [Vatican City] explode all trees 0
#67 MeSH descriptor: [Oceania] explode all trees 1504
#68 #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 44304
#69 MeSH descriptor: [Great Britain] explode all trees 4781
#70 #68 not #69 43888
#71 #35 not #70 1276

DARE subset = 166

B.5: Source: Cochrane Central Register of Controlled Trials (CENTRAL)
Interface / URL: Cochrane Library/Wiley Interscience – online 2012 issue 4
Database coverage dates: Information not found
Search date: 08/05/13
Retrieved records: 711
Search strategy:

#1 MeSH descriptor: [Vitamin D] explode all trees 1944
#2 MeSH descriptor: [Vitamin D Deficiency] explode all trees 354
#3 (vitamin* near/5 (D or D1 or D2 or D3 or D4 or D5 or D6 or D7 or D8 or D9)) 3161
#4 (vitaminD* or cholecalciferol* or colecalciferol* or ergocalciferol* or calciferol* or alfacalcidol*) 843
#5 (multivitamin* or multimicronutrient* or multimineral*) 649
#6 (multi next vitamin* or multi next micronutrient* or multi next mineral*) 94
#7 (multiple next (vitamin* or micronutrient* or mineral*)) 194
#8 #1 or #2 or #3 or #4 or #5 or #6 or #7 4549
#9 MeSH descriptor: [Guidelines as Topic] explode all trees 1795
#10 MeSH descriptor: [Nutrition Policy] this term only 140
#11 MeSH descriptor: [Guideline] explode all trees 17
#12 MeSH descriptor: [Clinical Protocols] this term only 1499
#13 MeSH descriptor: [Critical Pathways] this term only 228
#14 MeSH descriptor: [Consensus] this term only 29
#15 MeSH descriptor: [Consensus Development Conferences as Topic] explode all trees 13
#16 MeSH descriptor: [Health Planning Guidelines] this term only 30
#17 (guideline* or guidance* or recommended or recommendation* or advised or advice or standard or standards or statement* or consensus or policy or policies or protocol* or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference next daily next intake* or dietary next reference next value* or reference next nutrient next intake* or estimated next average next requirement* or strategy or strategies) 148769
#18 (implement* or aware* or uptake or up-take or takeup or take-up or adhere* or concordance or accordance or adopt* or comply or complies or compliance or disseminat* or spread or spreading or barrier* or facilitat*) 98314

#19 MeSH descriptor: [Guideline Adherence] this term only 560
#20 MeSH descriptor: [Health Plan Implementation] this term only 67
#21 MeSH descriptor: [Patient Compliance] explode all trees 7652
#22 MeSH descriptor: [Program Evaluation] explode all trees 4116
#23 MeSH descriptor: [Patient Medication Knowledge] this term only 0
#24 MeSH descriptor: [Health Knowledge, Attitudes, Practice] this term only 3077
#25 MeSH descriptor: [Prescriptions] explode all trees 559
#26 MeSH descriptor: [Prescription Drugs] explode all trees 55
#27 MeSH descriptor: [Nonprescription Drugs] explode all trees 156
#28 MeSH descriptor: [Pharmacies] this term only 62
#29 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Supply & distribution - SD] 0
#30 (prescription* or prescrib* or nonprescription* or nonprescrib* or over-the-counter* or OTC* or behind-the-counter* or BTC* or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail* or buy* or bought or purchas* or deliver* or provision* or provide* or distribut* or pharmacist*) 133186
#31 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 261405
#32 #8 and #31 1901
#33 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Standards - ST] 1
#34 (healthy next start* or healthystart*) 28
#35 #32 or #33 or #34 from 2000 to 20131542
#36 MeSH descriptor: [Africa] explode all trees 3740
#37 MeSH descriptor: [Americas] explode all trees 18391
#38 MeSH descriptor: [Antarctic Regions] explode all trees 9
#39 MeSH descriptor: [Arctic Regions] explode all trees 6
#40 MeSH descriptor: [Asia] explode all trees 8928
#41 MeSH descriptor: [Australia] explode all trees 1999
#42 MeSH descriptor: [Andorra] this term only 0
#43 MeSH descriptor: [Austria] this term only 266
#44 MeSH descriptor: [Balkan Peninsula] this term only 0
#45 MeSH descriptor: [Belgium] this term only 354
#46 MeSH descriptor: [Europe, Eastern] explode all trees 892
#47 MeSH descriptor: [Finland] this term only 735
#48 MeSH descriptor: [France] explode all trees 966
#49 MeSH descriptor: [Germany] explode all trees 1800
#50 MeSH descriptor: [Gibraltar] this term only 0
#51 MeSH descriptor: [Greece] this term only 191
#52 MeSH descriptor: [Iceland] this term only 42
#53 MeSH descriptor: [Ireland] this term only 146
#54 MeSH descriptor: [Italy] explode all trees 1290
#55 MeSH descriptor: [Liechtenstein] this term only 0
#56 MeSH descriptor: [Luxembourg] this term only 4
#57 MeSH descriptor: [Mediterranean Region] explode all trees 35
#58 MeSH descriptor: [Monaco] this term only 1

#59 MeSH descriptor: [Netherlands] this term only 1881
#60 MeSH descriptor: [Portugal] this term only 64
#61 MeSH descriptor: [San Marino] this term only 0
#62 MeSH descriptor: [Scandinavia] explode all trees 2775
#63 MeSH descriptor: [Spain] this term only 817
#64 MeSH descriptor: [Switzerland] this term only 396
#65 MeSH descriptor: [Transcaucasia] explode all trees 16
#66 MeSH descriptor: [Vatican City] explode all trees 0
#67 MeSH descriptor: [Oceania] explode all trees 1504
#68 #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 44304
#69 MeSH descriptor: [Great Britain] explode all trees 4781
#70 #68 not #69 43888
#71 #35 not #70 1276

CENTRAL subset = 711

B.6: Source: Cochrane Database of Systematic Reviews (CDSR)
Interface / URL: Cochrane Library/Wiley Interscience – online 2012 issue 4
Database coverage dates: Information not found
Search date: 08/05/13
Retrieved records: 43
Search strategy:

#1 MeSH descriptor: [Vitamin D] explode all trees 1944
#2 MeSH descriptor: [Vitamin D Deficiency] explode all trees 354
#3 (vitamin* near/5 (D or D1 or D2 or D3 or D4 or D5 or D6 or D7 or D8 or D9)):ti,ab,kw 2720
#4 (vitaminD* or cholecalciferol* or colecalciferol* or ergocalciferol* or calciferol* or alfacalcidol*):ti,ab,kw 777
#5 (multivitamin* or multimicronutrient* or multimineral*):ti,ab,kw 496
#6 (multi next vitamin* or multi next micronutrient* or multi next mineral*):ti,ab,kw 62
#7 (multiple next (vitamin* or micronutrient* or mineral*)):ti,ab,kw 161
#8 #1 or #2 or #3 or #4 or #5 or #6 or #7 4035
#9 MeSH descriptor: [Guidelines as Topic] explode all trees 1795
#10 MeSH descriptor: [Nutrition Policy] this term only 140
#11 MeSH descriptor: [Guideline] explode all trees 17
#12 MeSH descriptor: [Clinical Protocols] this term only 1499
#13 MeSH descriptor: [Critical Pathways] this term only 228
#14 MeSH descriptor: [Consensus] this term only 29
#15 MeSH descriptor: [Consensus Development Conferences as Topic] explode all trees 13
#16 MeSH descriptor: [Health Planning Guidelines] this term only 30
#17 (guideline* or guidance* or recommended or recommendation* or advised or advice or standard or standards or statement* or consensus or policy or policies or protocol* or

RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference next daily next intake* or dietary next reference next value* or reference next nutrient next intake* or estimated next average next requirement* or strategy or strategies):ti,ab,kw 120033
#18 (implement* or aware* or uptake or up-take or takeup or take-up or adhere* or concordance or accordance or adopt* or comply or complies or compliance or disseminat* or spread or spreading or barrier* or facilitat*):ti,ab,kw 56093
#19 MeSH descriptor: [Guideline Adherence] this term only 560
#20 MeSH descriptor: [Health Plan Implementation] this term only 67
#21 MeSH descriptor: [Patient Compliance] explode all trees 7652
#22 MeSH descriptor: [Program Evaluation] explode all trees 4116
#23 MeSH descriptor: [Patient Medication Knowledge] this term only 0
#24 MeSH descriptor: [Health Knowledge, Attitudes, Practice] this term only 3077
#25 MeSH descriptor: [Prescriptions] explode all trees 559
#26 MeSH descriptor: [Prescription Drugs] explode all trees 55
#27 MeSH descriptor: [Nonprescription Drugs] explode all trees 156
#28 MeSH descriptor: [Pharmacies] this term only 62
#29 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Supply & distribution - SD] 0
#30 (prescription* or prescrib* or nonprescription* or nonprescrib* or over-the-counter* or OTC* or behind-the-counter* or BTC* or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail* or buy* or bought or purchas* or deliver* or provision* or provide* or distribut* or pharmacist*):ti,ab,kw 108219
#31 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 231048
#32 #8 and #31 1375
#33 MeSH descriptor: [Vitamin D] explode all trees and with qualifiers: [Standards - ST] 1
#34 (healthy next start* or healthystart*):ti,ab,kw 22
#35 #32 or #33 or #34 from 2000 to 2013 1047
#36 MeSH descriptor: [Africa] explode all trees 3740
#37 MeSH descriptor: [Americas] explode all trees 18391
#38 MeSH descriptor: [Antarctic Regions] explode all trees 9
#39 MeSH descriptor: [Arctic Regions] explode all trees 6
#40 MeSH descriptor: [Asia] explode all trees 8928
#41 MeSH descriptor: [Australia] explode all trees 1999
#42 MeSH descriptor: [Andorra] this term only 0
#43 MeSH descriptor: [Austria] this term only 266
#44 MeSH descriptor: [Balkan Peninsula] this term only 0
#45 MeSH descriptor: [Belgium] this term only 354
#46 MeSH descriptor: [Europe, Eastern] explode all trees 892
#47 MeSH descriptor: [Finland] this term only 735
#48 MeSH descriptor: [France] explode all trees 966
#49 MeSH descriptor: [Germany] explode all trees 1800
#50 MeSH descriptor: [Gibraltar] this term only 0

#51 MeSH descriptor: [Greece] this term only 191
#52 MeSH descriptor: [Iceland] this term only 42
#53 MeSH descriptor: [Ireland] this term only 146
#54 MeSH descriptor: [Italy] explode all trees 1290
#55 MeSH descriptor: [Liechtenstein] this term only 0
#56 MeSH descriptor: [Luxembourg] this term only 4
#57 MeSH descriptor: [Mediterranean Region] explode all trees 35
#58 MeSH descriptor: [Monaco] this term only 1
#59 MeSH descriptor: [Netherlands] this term only 1881
#60 MeSH descriptor: [Portugal] this term only 64
#61 MeSH descriptor: [San Marino] this term only 0
#62 MeSH descriptor: [Scandinavia] explode all trees 2775
#63 MeSH descriptor: [Spain] this term only 817
#64 MeSH descriptor: [Switzerland] this term only 396
#65 MeSH descriptor: [Transcaucasia] explode all trees 16
#66 MeSH descriptor: [Vatican City] explode all trees 0
#67 MeSH descriptor: [Oceania] explode all trees 1504
#68 #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 44304
#69 MeSH descriptor: [Great Britain] explode all trees 4781
#70 #68 not #69 43888
#71 #35 not #70 807

CDSR subset = 43

B.7: Source: PsycINFO

Interface / URL: OvidSP
Database coverage dates: 1806 to May Week 1 2013
Search date: 10/05/13
Retrieved records: 525
Search strategy:

1 (vitamin$1 adj5 D$1).ti,ab,id. 916
2 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).ti,ab,id. 41
3 (multivitamin$1 or multimicronutrient$1 or multimineral$1).ti,ab,id. 164
4 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).ti,ab,id. 19
5 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).ti,ab,id. 30
6 or/1-5 1120
7 treatment guidelines/ 3795
8 best practices/1459
9 professional standards/ 6141
10 (guideline$1 or guidance$ or recommended or recommendation$1 or advised or advice or standard$1 or statement$1 or consensus or pathway$ or policy or policies or protocol$1 or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or

LRNIs or EAR or EARs or reference daily intake$1 or dietary reference value$1 or reference nutrient intake$1 or estimated average requirement$1 or strategy or strategies).ti,ab,id. 595412

11 (implement$ or aware$ or uptake or up-take or takeup or take-up or adhere$1 or adherence or concordance or accordance or adopt$ or comply or complies or compliance or disseminat$ or spread or spreading or barrier$1 or facilitat$).ti,ab,id. 390453

12 exp compliance/ 13303

13 exp program evaluation/ 15350

14 Health Knowledge/ 4956

15 Health Attitudes/ 7783

16 prescription drugs/ 2246

17 nonprescription drugs/ 304

18 pharmacists/ 755

19 (prescription$ or prescrib$ or nonprescription$ or nonprescrib$ or over-the-counter$ or OTC$ or behind-the-counter$ or BTC$ or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail$ or buy$ or bought or purchas$ or deliver$ or provision$ or provide$ or distribut$ or pharmacist$).ti,ab,id. 637485

20 or/7-19 1281172

21 6 and 20 488

22 (healthy start$ or healthystart$).ti,ab,id. 91

23 21 or 22 579

24 limit 23 to (english language and yr="2000 -Current") 525

B.8: Source: HMIC Health Management Information Consortium

Interface / URL: OvidSP

Database coverage dates: 1979 to March 2013

Search date: 10/05/13

Retrieved records: 146

Search strategy:

1 exp vitamin d/ 144

2 exp vitamin d deficiency/ 57

3 (vitamin$1 adj5 D$1).ti,ab. 208

4 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).ti,ab. 7

5 (multivitamin$1 or multimicronutrient$1 or multimineral$1).ti,ab. 37

6 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).ti,ab. 1

7 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).ti,ab. 2

8 or/1-7 277

9 exp guidelines/ 5469

10 exp good practices/ or exp guides/ 6807

11 national institute for clinical excellence/ 385

12 National Institute for Health & Clinical Excellence/ 4

13 nutrition policy/ 42

14 clinical protocols/ 60

15 care pathways/ 831
16 Consensus development/ or Consensus conferences/ or Consensus statements/ or Consensus management/ 97
17 exp standards/ 5317
18 (guideline$1 or guidance$ or recommended or recommendation$1 or advised or advice or standard$1 or statement$1 or consensus or policy or policies or protocol$1 or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference daily intake$1 or dietary reference value$1 or reference nutrient intake$1 or estimated average requirement$1 or strategy or strategies).ti,ab. 83779
19 (implement$ or aware$ or uptake or up-take or takeup or take-up or adhere$1 or adherence or concordance or accordance or adopt$ or comply or complies or compliance or disseminat$ or spread or spreading or barrier$1 or facilitat$).ti,ab. 44156
20 exp implementation/ 4298
21 exp patient compliance/ 476
22 evaluation/ 11405
23 (program$ adj2 evaluat$).ti,ab. 466
24 Attitudes/ or Patient attitudes/3482
25 exp prescriptions/ 631
26 prescription drugs/ 413
27 exp prescribing/ 3145
28 non prescription drugs/ 171
29 exp pharmacies/ 699
30 (prescription$ or prescrib$ or nonprescription$ or nonprescrib$ or over-the-counter$ or OTC$ or behind-the-counter$ or BTC$ or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail$ or buy$ or bought or purchas$ or deliver$ or provision$ or provide$ or distribut$ or pharmacist$).ti,ab.
79508
31 or/9-30162368
32 8 and 31 122
33 (healthy start$ or healthystart$).ti,ab. 50
34 or/32-33 169
35 limit 34 to (yr="2000 -Current" and english) 146

B.9: Source: Social Policy and Practice

Interface / URL: OvidSP
Database coverage dates: 1890s to present (issue searched Social Policy and Practice 201304)
Search date: 13/05/13
Retrieved records: 98
Search strategy:

1 (vitamin$1 adj5 D$1).af. 70
2 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).af. 1
3 (multivitamin$1 or multimicronutrient$1 or multimineral$1).af. 9
4 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).af. 1

5 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).af. 0
6 (healthy start$ or healthystart$).af. 52
7 or/1-6 131
8 limit 7 to yr="2000 -Current" 98

B.10: Source: AMED (Allied and Complementary Medicine)

Interface / URL: OvidSP
Database coverage dates: 1985 to May 2013
Search date: 13/05/13
Retrieved records: 94
Search strategy:

1 exp vitamin d/ 202
2 (vitamin$1 adj5 D$1).af. 358
3 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).af. 36
4 (multivitamin$1 or multimicronutrient$1 or multimineral$1).af. 57
5 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).af. 6
6 (multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).af. 6
7 or/1-6 427
8 exp guidelines/ 1221
9 clinical protocols/ 235
10 (guideline$1 or guidance$ or recommended or recommendation$1 or advised or advice or standard$1 or statement$1 or consensus or policy or policies or protocol$1 or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or reference daily intake$1 or dietary reference value$1 or reference nutrient intake$1 or estimated average requirement$1 or strategy or strategies).af. 38551
11 (implement$ or aware$ or uptake or up-take or takeup or take-up or adhere$1 or adherence or concordance or accordance or adopt$ or comply or complies or compliance or disseminat$ or spread or spreading or barrier$1 or facilitat$).af. 20918
12 patient compliance/ 560
13 program evaluation/ 1787
14 attitude to health/ 2058
15 knowledge/ 210
16 prescriptions drug/ 211
17 exp pharmaceutical services/ 33
18 (prescription$ or prescrib$ or nonprescription$ or nonprescrib$ or over-the-counter$ or OTC$ or behind-the-counter$ or BTC$ or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail$ or buy$ or bought or purchas$ or deliver$ or provision$ or provide$ or distribut$ or pharmacist$).af. 38555
19 or/8-1878040
20 7 and 19 118
21 (healthy start$ or healthystart$).af. 1
22 or/20-21 118
23 limit 22 to (english and yr="2000 -Current") 94

B.11: Source: CINAHL

Interface / URL: EBSCOhost
Database coverage dates: 1981 to date
Search date: 16/05/13
Retrieved records: 2137
Search strategy:

S32 S28 OR S29 OR S30 Limiters - English Language; Published Date from: 20000101-20131231 (2,137)
S31 S28 OR S29 OR S30 (2,335)
S30 TI ("healthy start*" or healthystart*) or AB ("healthy start*" or healthystart*) (145)
S29 (MH "Vitamin D+/ST") (10)
S28 S8 AND S27 (2,190)
S27 S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 (703,789)
S26 TI (prescription* or prescrib* or nonprescription* or nonprescrib* or "over-the-counter*" or OTC* or "behind-the-counter*" or BTC* or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail* or buy* or bought or purchas* or deliver* or provision* or provide* or distribut* or pharmacist*) or AB (prescription* or prescrib* or nonprescription* or nonprescrib* or "over-the-counter*" or OTC* or "behind-the-counter*" or BTC* or pharmacy or pharmacies or chemist or chemists or shop or shops or sale or sales or sold or sell or sells or selling or retail* or buy* or bought or purchas* or deliver* or provision* or provide* or distribut* or pharmacist*) (309,562)
S25 (MH "Vitamin D+/SD") (0)
S24 (MH "Pharmacy Service") (2,477)
S23 (MH "Pharmacy, Retail") (1,393)
S22 (MH "Drugs, Non-Prescription") (2,376)
S21 (MH "Prescriptions, Drug") (3,752)
S20 (MH "Attitude to Health") (15,856)
S19 (MH "Health Knowledge") (13,314)
S18 (MH "Program Evaluation") (16,998)
S17 (MH "Patient Compliance+") (20,733)
S16 (MH "Program Implementation") (11,137)
S15 (MH "Guideline Adherence") (2,913)
S14 TI (implement* or aware* or uptake or up-take or takeup or take-up or adhere* or concordance or accordance or adopt* or comply or complies or compliance or disseminat* or spread or spreading or barrier* or facilitat*) or AB (implement* or aware* or uptake or up-take or takeup or take-up or adhere* or concordance or accordance or adopt* or comply or complies or compliance or disseminat* or spread or spreading or barrier* or facilitat*) (196,510)
S13 TI (guideline* or guidance* or recommended or recommendation* or advised or advice or standard* or statement* or consensus or policy or policies or protocol* or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or "reference daily intake*" or "dietary reference value*" or "reference nutrient intake*" or "estimated average requirement*" or strategy or strategies) or AB (guideline* or guidance* or recommended or recommendation* or advised or advice or standard* or statement* or

consensus or policy or policies or protocol* or RDA or RDAs or RDI or RDIs or DRV or DRVs or RNI or RNIs or LRNI or LRNIs or EAR or EARs or "reference daily intake*" or "dietary reference value*" or "reference nutrient intake*" or "estimated average requirement*" or strategy or strategies) (348,968)
S12 (MH "Protocols+") (16,841)
S11 (MH "Nutrition Policy+") (1,806)
S10 (MH "Professional Compliance") (3,377)
S9 (MH "Practice Guidelines") (29,746)
S8 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 (8,335)
S7 TI ("multiple vitamin*" or "multiple micronutrient*" or "multiple mineral*") or AB ("multiple vitamin*" or "multiple micronutrient*" or "multiple mineral*") (87)
S6 TI ("multi vitamin*" or "multi micronutrient*" or "multi mineral*") or AB ("multi vitamin*" or "multi micronutrient*" or "multi mineral*") (30)
S5 TI (multivitamin* or multimicronutrient* or multimineral*) or AB (multivitamin* or multimicronutrient* or multimineral*) (675)
S4 TI (vitaminD* or cholecalciferol* or colecalciferol* or ergocalciferol* or calciferol* or alfacalcidol*) or AB (vitaminD* or cholecalciferol* or colecalciferol* or ergocalciferol* or calciferol* or alfacalcidol*) (152)
S3 TI (vitamin* N5 (D or D1 or D2 or D3 or D4 or D5 or D6 or D7 or D8 or D9)) or AB (vitamin* N5 (D or D1 or D2 or D3 or D4 or D5 or D6 or D7 or D8 or D9)) (4,613)
S2 (MH "Vitamin D Deficiency+") (2,315)
S1 (MH "Vitamin D+") (5,635)

B.12: Source: ClinicalTrials.gov

Interface / URL: http://www.clinicaltrials.gov/ct2/home
Database coverage dates: Not found. Results database was launched in September 2008.
Search date: 16/05/13
Retrieved records: 145
Search strategy:

The following 7 searches were carried out separately:

1. (vitamin OR vitamins) AND (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9) | United Kingdom = 75 results

2. vitaminD OR vitaminD1 OR vitaminD2 OR vitaminD3 OR vitaminD4 OR vitaminD5 OR vitaminD6 OR vitaminD7 OR vitaminD8 OR vitaminD9 | United Kingdom = 36 results

3. cholecalciferol OR colecalciferol OR ergocalciferol OR calciferol OR alfacalcidol | United Kingdom = 21 results

4. multivitamin OR multimicronutrient OR multimineral OR multivitamins OR multimicronutrients OR multiminerals | United Kingdom = 5 results

5. "multi vitamin" OR "multi micronutrient" OR "multi mineral" OR "multi vitamins" OR "multi micronutrients" OR "multi minerals" | United Kingdom = 3 results

6. "multiple vitamin" OR "multiple micronutrient" OR "multiple mineral" OR "multiple vitamins" OR "multiple micronutrients" OR "multiple minerals" | United Kingdom = 5 results

7. "healthy start" OR "healthy starts" OR healthystart OR healthystarts | United Kingdom = 0 results

B.13: Source: OAIster

Interface / URL: http://oaister.worldcat.org/
Database coverage dates: Information not found
Search date: 17/05/13
Retrieved records: 711
Search strategy:

The following 5 searches were carried out separately:

1. 'kw:"vitamin* D" AND (guideline* OR guidance* OR recommended OR recommendation* OR advised OR advice OR standard* OR statement* OR consensus OR policy OR policies OR protocol* OR RDA OR RDAs OR RDI OR RDIs OR DRV OR DRVs OR RNI OR RNIs OR LRNI OR LRNIs OR EAR OR EARs OR "reference daily intake*" OR "dietary reference value*" OR "reference nutrient intake*" OR "estimated average requirement*" OR strategy OR strategies OR implement* OR aware* OR uptake OR "up-take" OR takeup OR "take-up" OR adhere* OR concordance OR accordance OR adopt* OR comply OR complies OR compliance OR disseminat* OR spread OR spreading OR barrier* OR facilitat* OR prescription* OR prescrib* OR nonprescription* OR nonprescrib* OR "over-the-counter*" OR OTC* OR "behind-the-counter*" OR BTC* OR pharmacy OR pharmacies OR chemist OR chemists OR shop OR shops OR sale OR sales OR sold OR sell OR sells OR selling OR retail* OR buy* OR bought OR purchas* OR deliver* OR provision* OR provide* OR distribut* OR pharmacist*)' > '2000..2013' > 'English' limited to Libraries Worldwide = 489 results

2. 'kw:("vitamin* D1" OR "vitamin* D2" OR "vitamin* D3" OR "vitamin* D4" OR "vitamin* D5" OR "vitamin* D6" OR "vitamin* D7" OR "vitamin* D8" OR "vitamin* D9") AND (guideline* OR guidance* OR recommended OR recommendation* OR advised OR advice OR standard* OR statement* OR consensus OR policy OR policies OR protocol* OR RDA OR RDAs OR RDI OR RDIs OR DRV OR DRVs OR RNI OR RNIs OR LRNI OR LRNIs OR EAR OR EARs OR "reference daily intake*" OR "dietary reference value*" OR "reference nutrient intake*" OR "estimated average requirement*" OR strategy OR strategies OR implement* OR aware* OR uptake OR "up-take" OR takeup OR "take-up" OR adhere* OR concordance OR accordance OR adopt* OR comply OR complies OR compliance OR disseminat* OR spread OR spreading OR barrier* OR facilitat* OR prescription* OR prescrib* OR nonprescription* OR nonprescrib* OR "over-the-counter*" OR OTC* OR "behind-the-counter*" OR BTC* OR pharmacy OR pharmacies OR chemist OR chemists OR shop OR shops OR sale OR sales OR sold OR sell OR sells OR selling OR retail* OR buy* OR bought OR purchas* OR deliver* OR provision* OR provide* OR distribut* OR pharmacist*)' > '2000..2013' > 'English' limited to Libraries Worldwide = 85 results

3. 'kw:(vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol*) AND (guideline* OR guidance* OR recommended OR recommendation* OR advised OR advice OR standard* OR statement* OR consensus OR policy OR policies OR protocol* OR RDA OR RDAs OR RDI OR RDIs OR DRV OR DRVs OR RNI OR RNIs OR LRNI OR LRNIs OR EAR OR EARs OR "reference daily intake*" OR "dietary reference value*" OR "reference nutrient intake*" OR "estimated average requirement*" OR strategy OR strategies OR implement* OR aware* OR uptake OR "up-take" OR takeup OR "take-up" OR adhere* OR concordance OR accordance OR adopt* OR comply OR complies OR compliance OR disseminat* OR spread OR spreading OR barrier* OR facilitat* OR prescription* OR prescrib* OR nonprescription* OR nonprescrib* OR "over-the-counter*" OR OTC* OR "behind-the-counter*" OR BTC* OR pharmacy OR pharmacies OR chemist OR chemists OR shop OR shops OR sale OR sales OR sold OR sell OR sells OR selling OR retail* OR buy* OR bought OR purchas* OR deliver* OR provision* OR provide* OR distribut* OR pharmacist*)' > '2000..2013' > 'English' limited to Libraries Worldwide = 25 results

4. kw:(multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral*") AND (guideline* OR guidance* OR recommended OR recommendation* OR advised OR advice OR standard* OR statement* OR consensus OR policy OR policies OR protocol* OR RDA OR RDAs OR RDI OR RDIs OR DRV OR DRVs OR RNI OR RNIs OR LRNI OR LRNIs OR EAR OR EARs OR "reference daily intake*" OR "dietary reference value*" OR "reference nutrient intake*" OR "estimated average requirement*" OR strategy OR strategies OR implement* OR aware* OR uptake OR "up-take" OR takeup OR "take-up" OR adhere* OR concordance OR accordance OR adopt* OR comply OR complies OR compliance OR disseminat* OR spread OR spreading OR barrier* OR facilitat* OR prescription* OR prescrib* OR nonprescription* OR nonprescrib* OR "over-the-counter*" OR OTC* OR "behind-the-counter*" OR BTC* OR pharmacy OR pharmacies OR chemist OR chemists OR shop OR shops OR sale OR sales OR sold OR sell OR sells OR selling OR retail* OR buy* OR bought OR purchas* OR deliver* OR provision* OR provide* OR distribut* OR pharmacist*)' > '2000..2013' > = 97 results

5. 'kw:"healthy start*" OR healthystart*' > '2000..2013' > 'English'. = 15 results

B.14: Source: Database of Promoting Health Effectiveness Reviews (DoPHER)

Interface / URL: http://eppi.ioe.ac.uk/webdatabases/SearchIntro.aspx
Database coverage dates: Information not found. States “Since January 2006 DoPHER is updated quarterly to keep it as current as possible.”
Search date: 17/05/13
Retrieved records: 19
Search strategy:

1	Freetext: "vitamin* AND D"	19
2	Freetext: "vitamin* AND D1"	0
3	Freetext: "vitamin* AND D2"	0

4 Freetext: "vitamin* AND D3" 0
5 Freetext: "vitamin* AND D4" 0
6 Freetext: "vitamin* AND D5" 0
7 Freetext: "vitamin* AND D6" 0
8 Freetext: "vitamin* AND D7" 0
9 Freetext: "vitamin* AND D8" 0
10 Freetext: "vitamin* AND D9" 0
11 Freetext: "vitaminD*" OR "cholecalciferol*" OR "colecalciferol*" OR "ergocalciferol*" OR "calciferol*" OR "alfacalcidol*" 0
12 Freetext: "multivitamin*" OR "multimicronutrient*" OR "multimineral*" OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral*" 1
13 Freetext: "healthy start*" OR "healthystart*" 0
14 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 19

B.15: Source: Trials Register of Promoting Health Interventions (TRoPHI)

Interface / URL: http://eppi.ioe.ac.uk/webdatabases/Intro.aspx?ID=5
Database coverage dates: Information not found. States: “Quarterly sensitive searches since August 2004”
Search date: 17/05/13
Retrieved records: 26
Search strategy:

1 Freetext: "vitamin* AND D" 56
2 Freetext: "vitamin* AND D1" 0
3 Freetext: "vitamin* AND D2" 0
4 Freetext: "vitamin* AND D3" 0
5 Freetext: "vitamin* AND D4" 0
6 Freetext: "vitamin* AND D5" 0
7 Freetext: "vitamin* AND D6" 0
8 Freetext: "vitamin* AND D7" 0
9 Freetext: "vitamin* AND D8" 0
10 Freetext: "vitamin* AND D9" 0
11 Freetext: "vitaminD*" OR "cholecalciferol*" OR "colecalciferol*" OR "ergocalciferol*" OR "calciferol*" OR "alfacalcidol*" 3
12 Freetext: "multivitamin*" OR "multimicronutrient*" OR "multimineral*" OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral*" 11
13 Freetext: "healthy start*" OR "healthystart*" 4
14 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 71
15 In which country/countries was the study carried out?: Mali OR Belize OR Iran OR Africa OR Developing countries OR Armenia OR Australia OR Austria OR Bahrain OR Belgium OR Botswana OR Brazil OR Bulgaria OR Canada OR Chile OR China OR Columbia OR Congo OR Czechoslovakia OR Denmark OR Ecuador OR Egypt OR Estonia OR Ethiopia OR Finland OR France OR Germany OR Ghana OR Greece OR Guatemala OR Holland OR Honduras OR Hong Kong OR Hungary OR Iceland OR India OR Indonesia

OR Ireland OR Israel OR Italy OR Ivory Coast OR Jamaica OR Japan OR Kenya OR Korea OR Kuwait OR Latin America OR Latvia OR Lebanon OR Lesotho OR Luxembourg OR Malaysia OR Mallorca OR Mexico OR Micronesia OR Mozambique OR Namibia OR Nepal OR The Netherlands OR New Zealand OR Nigeria OR Norway OR Pakistan OR Papua New Guinea OR Peru OR Philippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Russia OR Rwanda OR Samoa OR San Marino OR Saudi Arabia OR Scandinavia OR Senegal OR Serbia OR Singapore OR South Africa OR Spain OR Sri Lanka OR St Lucia OR Swaziland OR Sweden OR Switzerland OR Taiwan OR Tanzania OR Thailand OR Turkey OR Uganda OR USA OR Venezuela OR Vietnam OR West Indies OR Yugoslavia OR Zaire OR Zambia OR Zimbabwe 3976
16 In which country/countries was the study carried out?: Northern Ireland OR Scotland OR UK315
17 15 NOT 16 3971
18 14 NOT 17 26

B.16: Source: PAIS International (Public Affairs Information Service)

Interface / URL: Proquest
Database coverage dates: 1972 to present
Search date: 17/05/13
Retrieved records: 38
Search strategy:

S4 ALL(vitamin* NEAR/5 (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9)) OR ALL(vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* OR multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral") OR ALL("healthy start*" OR healthystart*) 38
S3 ALL("healthy start*" OR healthystart*) 22
S2 ALL(vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* OR multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral") 4
S1 ALL(vitamin* NEAR/5 (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9)) 12

B.17: Source: WHOLIS

Interface / URL: http://dosei.who.int/
Database coverage dates: WHO publications (from headquarters and the regional and associated offices - 1948 to the present); Technical Documents - unrestricted (from headquarters and regional office programmes - 1986 to the present; Governing Body Documents From the World Health Assembly and the Executive Board - 1986 to the present and Regional Committee Report. Information not found for other document types contained in WHOLIS
Search date: 18/05/13
Retrieved records: 12

Search strategy:

The following search was conducted using the advanced search interface. Searches were limited to English language.

words or phrase "(vitamin$ ADJ5 (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9))" OR

words or phrase "(vitaminD$ OR cholecalciferol$ OR colecalciferol$ OR ergocalciferol$ OR calciferol$ OR alfacalcidol$ OR multivitamin$ OR multimicronutrient$ OR multimineral$ OR 'multi vitamin$' or 'multi micronutrient$' or 'multi mineral$')" OR

words or phrase "('multiple vitamin$' OR 'multiple micronutrient$' OR 'multiple mineral$')" OR

words or phrase "('healthy start$' OR healthystart$)" OR

subject "'vitamin D'"

B.18: Source: OpenGrey

Interface / URL: http://www.opengrey.eu/
Database coverage dates: Information not found. SIGLE (forerunner of OpenGrey was created in 1980 (http://www.opengrey.eu/about)
Search date: 18/05/13
Retrieved records: 16
Search strategy:

The following 4 searches were carried out separately:

1. (vitamin* NEAR/5 (+D OR +D1 OR +D2 OR +D3 OR +D4 OR +D5 OR +D6 OR +D7 OR +D8 OR +D9)) lang:"en" = 11 results

2. (vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol*) lang:"en" = 1 result

3. (multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral") lang:"en" = 2 results

4. ("healthy start*" OR healthystart*) lang:"en" = 2 results

B.19: Source: Social Care Online

Interface / URL: http://www.scie-socialcareonline.org.uk/
Database coverage dates: Site states: “Content originates from the National Institute for Social Work library and includes resources dating from the 1980s. Abstracted articles from key social work journals…and defining texts.., which were published in the 60s and 70s can also be found on Social Care Online.”

Search date: 19/05/13
Retrieved records: 35
Search strategy: (freetext="vitamin*" or freetext="cholecalciferol*" or freetext="colecalciferol*" or freetext="ergocalciferol*" or freetext="calciferol*" or freetext="alfacalcidol*" or freetext="multivitamin*" or freetext="multimicronutrient*" or freetext="multimineral*" or freetext="multi micronutrient*" or freetext="multi mineral*" or freetext="multiple micronutrient*" or freetext="multiple mineral*" or freetext="healthy start*" or freetext="healthystart*") and publicationdate>2000 and publicationdate<2013 = 35 results

B.20: Source: Applied Social Sciences Index and Abstracts (ASSIA)
Interface / URL: Proquest
Database coverage dates: 1987 to current
Search date: 19/05/13
Retrieved records: 311
Search strategy:

Note: significant, known timeout issues on the Proquest interface meant that the following search lines were run and results from each line downloaded separately:

1. SU.EXACT("Vitamin D") OR SU.EXACT("Vitamin D supplement") OR SU.EXACT("Vitamin D deficiency") OR TI,AB(vitamin* NEAR/5 (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9)) Additional limits - Date: From 2000 to 2013; Language: English = 210 results

2. TI,AB(vitaminD*) Additional limits - Date: From 2000 to 2013; Language: English = 1 result

3. TI,AB(cholecalciferol* OR colecalciferol*) Additional limits - Date: From 2000 to 2013; Language: English = 9 results

4. TI,AB(ergocalciferol* OR calciferol* OR alfacalcidol*) Additional limits - Date: From 2000 to 2013; Language: English = 7 results

5. TI,AB(multivitamin*) Additional limits - Date: From 2000 to 2013; Language: English = 43 results

6. TI,AB(multimicronutrient* OR multimineral*) OR TI,AB("multi vitamin*" OR "multi micronutrient*" OR "multi mineral*") OR TI,AB("multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral*") Additional limits - Date: From 2000 to 2013; Language: English = 11 results
7. TI,AB("healthy start*" OR healthystart*) Additional limits - Date: From 2000 to 2013; Language: English = 30 results

B.21: Source: British Nursing Index
Interface / URL: Proquest
Database coverage dates: 1994 - current

Search date: 20/05/13
Retrieved records: 232
Search strategy:

Note: significant, known timeout issues on the Proquest interface meant that the following search lines were run and results from each line downloaded separately:

1. TI,AB(vitamin* NEAR/5 (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9)) Additional limits - Date: From 2000 to 2013 = 186 results

2. TI,AB("vitaminD*") Additional limits - Date: From 2000 to 2013 = 0 results

3. TI,AB(cholecalciferol* OR colecalciferol*) Additional limits - Date: From 2000 to 2013 = 0 results

4. TI,AB(ergocalciferol* OR calciferol* OR alfacalcidol*) Additional limits - Date: From 2000 to 2013 = 2 results

5. RN(1406-16-2 OR 67-97-0 OR 50-14-6 OR 50809-47-7 OR 8042-78-2) Additional limits - Date: From 2000 to 2013 = 0 results

6. TI,AB(multivitamin*) Additional limits - Date: From 2000 to 2013 = 10 results

7. TI,AB(multimicronutrient* OR multimineral*) OR TI,AB("multi vitamin*" OR "multi micronutrient*" OR "multi mineral*") OR TI,AB("multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral*") Additional limits - Date: From 2000 to 2013 = 1 result

8. TI,AB("healthy start*" OR healthystart*) Additional limits - Date: From 2000 to 2013 = 33 results

B.22: Source: POPLINE

Interface / URL: http://www.popline.org/
Database coverage dates: Site states: “The majority of items are published from 1970 to the present, however, there are selected citations dating back to 1827.”
Search date: 21/05/13
Retrieved records: 317
Search strategy:

The following 6 searches were carried out separately in the Advanced Search interface. All searches were limited to Language English and Years from 2000 to 2013

1. Keyword: Vitamin D = 46 results

2. All fields: vitamin* AND (D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9) = 4 results

3. All fields: vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* = 7 results

4. All fields: (multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral") AND (guideline* OR guidance* OR recommended OR recommendation* OR advised OR advice OR standard* OR statement* OR consensus OR policy OR policies OR protocol* OR RDA OR RDAs OR RDI OR RDIs OR DRV OR DRVs OR RNI OR RNIs OR LRNI OR LRNIs OR EAR OR EARs OR "reference daily intake*" OR "dietary reference value*" OR "reference nutrient intake*" OR "estimated average requirement*" OR strategy OR strategies OR implement* OR aware* OR uptake OR "up-take" OR takeup OR "take-up" OR adhere* OR concordance OR accordance OR adopt* OR comply OR complies OR compliance OR disseminat* OR spread OR spreading OR barrier* OR facilitat*) = 107 results

5. All fields: (multivitamin* OR multimicronutrient* OR multimineral* OR "multi vitamin*" OR "multi micronutrient*" OR "multi mineral*" OR "multiple vitamin*" OR "multiple micronutrient*" OR "multiple mineral") AND (prescription* OR prescrib* OR nonprescription* OR nonprescrib* OR "over-the-counter*" OR OTC* OR "behind-the-counter*" OR BTC* OR pharmacy OR pharmacies OR chemist OR chemists OR shop OR shops OR sale OR sales OR sold OR sell OR sells OR selling OR retail* OR buy* OR bought OR purchas* OR deliver* OR provision* OR provide* OR distribut* OR pharmacist*) = 141 results

6. All fields: "healthy start*" OR healthystart* = 12 results

B.23: Source: UK Clinical Research Network Portfolio Database
Interface / URL: http://public.ukcrn.org.uk/search/
Database coverage dates: Information not found
Search date: 21/05/13
Retrieved records: 92
Search strategy:

The following 142 searches were run separately. The 'Exact' option was selected for each.

1. Title / acronym: vitamin D = 46 results
2. Title / acronym: vitamin D1 = 0 results
3. Title / acronym: vitamin D2 = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)

4. Title / acronym: vitamin D3 = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)
5. Title / acronym: vitamin D4 = 0 results
6. Title / acronym: vitamin D5 = 0 results
7. Title / acronym: vitamin D6 = 0 results
8. Title / acronym: vitamin D7 = 0 results
9. Title / acronym: vitamin D8 = 0 results
10. Title / acronym: vitamin D9 = 0 results
11. Title / acronym: vitamin-D = 1 result
12. Title / acronym: vitamin-D1 = 0 results
13. Title / acronym: vitamin-D2 = 0 results
14. Title / acronym: vitamin-D3 = 0 results
15. Title / acronym: vitamin-D4 = 0 results
16. Title / acronym: vitamin-D5 = 0 results
17. Title / acronym: vitamin-D6 = 0 results
18. Title / acronym: vitamin-D7 = 0 results
19. Title / acronym: vitamin-D8 = 0 results
20. Title / acronym: vitamin-D9 = 0 results
21. Title / acronym: vitaminD = 0 results
22. Title / acronym: vitaminD1 = 0 results
23. Title / acronym: vitaminD2 = 0 results
24. Title / acronym: vitaminD3 = 0 results
25. Title / acronym: vitaminD4 = 0 results
26. Title / acronym: vitaminD5 = 0 results
27. Title / acronym: vitaminD6 = 0 results
28. Title / acronym: vitaminD7 = 0 results
29. Title / acronym: vitaminD8 = 0 results
30. Title / acronym: vitaminD9 = 0 results
31. Title / acronym: cholecalciferol = (1 result identified, not downloaded, duplicate of result already retrieved from this source)
32. Title / acronym: colecalciferol = 0 results
33. Title / acronym: ergocalciferol = (1 result identified, not downloaded, duplicate of result already retrieved from this source)
34. Title / acronym: calciferol = (1 result identified, not downloaded, duplicate of result already retrieved from this source)
35. Title / acronym: alfacalcidol = 0 results
36. Title / acronym: multivitamin = 0 results
37. Title / acronym: multivitamins = 0 results
38. Title / acronym: multimicronutrient = 0 results
39. Title / acronym: multimicronutrients = 0 results
40. Title / acronym: multimineral = 0 results
41. Title / acronym: multiminerals = 0 results
42. Title / acronym: multi vitamin = 0 results
43. Title / acronym: multi vitamins = 0 results
44. Title / acronym: multi-vitamin = 0 results
45. Title / acronym: multi-vitamins = 0 results

46. Title / acronym: multi micronutrient = 0 results
47. Title / acronym: multi micronutrients = 0 results
48. Title / acronym: multi-micronutrient = 0 results
49. Title / acronym: multi-micronutrients = 0 results
50. Title / acronym: multi mineral = 0 results
51. Title / acronym: multi minerals = 0 results
52. Title / acronym: multi-mineral = 0 results
53. Title / acronym: multi-minerals = 0 results
54. Title / acronym: multiple vitamin = 0 results
55. Title / acronym: multiple vitamins = 0 results
56. Title / acronym: multiple-vitamin = 0 results
57. Title / acronym: multiple-vitamins = 0 results
58. Title / acronym: multiple micronutrient = 0 results
59. Title / acronym: multiple micronutrients = 0 results
60. Title / acronym: multiple-micronutrient = 0 results
61. Title / acronym: multiple-micronutrients = 0 results
62. Title / acronym: multiple mineral = 0 results
63. Title / acronym: multiple minerals = 0 results
64. Title / acronym: multiple-mineral = 0 results
65. Title / acronym: multiple-minerals = 0 results
66. Title / acronym: healthy start = 2 results
67. Title / acronym: healthy starts = 0 results
68. Title / acronym: healthy-start = 0 results
69. Title / acronym: healthy-starts = 0 results
70. Title / acronym: healthystart = 0 results
71. Title / acronym: healthystarts = 0 results

1. Research Summary: vitamin D = 38 results
2. Research Summary: vitamin D1 = 0 results
3. Research Summary: vitamin D2 = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)
4. Research Summary: vitamin D3 = 5 results
5. Research Summary: vitamin D4 = 0 results
6. Research Summary: vitamin D5 = 0 results
7. Research Summary: vitamin D6 = 0 results
8. Research Summary: vitamin D7 = 0 results
9. Research Summary: vitamin D8 = 0 results
10. Research Summary: vitamin D9 = 0 results
11. Research Summary: vitamin-D = 0 results
12. Research Summary: vitamin-D1 = 0 results
13. Research Summary: vitamin-D2 = 0 results
14. Research Summary: vitamin-D3 = 0 results
15. Research Summary: vitamin-D4 = 0 results
16. Research Summary: vitamin-D5 = 0 results
17. Research Summary: vitamin-D6 = 0 results
18. Research Summary: vitamin-D7 = 0 results

19. Research Summary: vitamin-D8 = 0 results
20. Research Summary: vitamin-D9 = 0 results
21. Research Summary: vitaminD = 0 results
22. Research Summary: vitaminD1 = 0 results
23. Research Summary: vitaminD2 = 0 results
24. Research Summary: vitaminD3 = 0 results
25. Research Summary: vitaminD4 = 0 results
26. Research Summary: vitaminD5 = 0 results
27. Research Summary: vitaminD6 = 0 results
28. Research Summary: vitaminD7 = 0 results
29. Research Summary: vitaminD8 = 0 results
30. Research Summary: vitaminD9 = 0 results
31. Research Summary: cholecalciferol = 0 results (2 results identified, not downloaded, duplicates of results already retrieved from this source)
32. Research Summary: colecalciferol = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)
33. Research Summary: ergocalciferol = 0 results
34. Research Summary: calciferol = 0 results (3 results identified, not downloaded, duplicates of results already retrieved from this source)
35. Research Summary: alfacalcidol = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)
36. Research Summary: multivitamin = 0 results
37. Research Summary: multivitamins = 0 results
38. Research Summary: multimicronutrient = 0 results
39. Research Summary: multimicronutrients = 0 results
40. Research Summary: multimineral = 0 results
41. Research Summary: multiminerals = 0 results
42. Research Summary: multi vitamin = 0 results
43. Research Summary: multi vitamins = 0 results
44. Research Summary: multi-vitamin = 0 results
45. Research Summary: multi-vitamins = 0 results
46. Research Summary: multi micronutrient = 0 results
47. Research Summary: multi micronutrients = 0 results
48. Research Summary: multi-micronutrient = 0 results
49. Research Summary: multi-micronutrients = 0 results
50. Research Summary: multi mineral = 0 results
51. Research Summary: multi minerals = 0 results
52. Research Summary: multi-mineral = 0 results
53. Research Summary: multi-minerals = 0 results
54. Research Summary: multiple vitamin = 0 results
55. Research Summary: multiple vitamins = 0 results
56. Research Summary: multiple-vitamin = 0 results
57. Research Summary: multiple-vitamins = 0 results
58. Research Summary: multiple micronutrient = 0 results
59. Research Summary: multiple micronutrients = 0 results
60. Research Summary: multiple-micronutrient = 0 results

61. Research Summary: multiple-micronutrients = 0 results
62. Research Summary: multiple mineral = 0 results
63. Research Summary: multiple minerals = 0 results
64. Research Summary: multiple-mineral = 0 results
65. Research Summary: multiple-minerals = 0 results
66. Research Summary: healthy start = 0 results (1 result identified, not downloaded, duplicate of result already retrieved from this source)
67. Research Summary: healthy starts = 0 results
68. Research Summary: healthy-start = 0 results
69. Research Summary: healthy-starts = 0 results
70. Research Summary: healthystart = 0 results
71. Research Summary: healthystarts = 0 results

B.24: Source: International Clinical Trials Registry Platform (ICTRP)

Interface / URL: http://apps.who.int/trialsearch/
Database coverage dates: Information not found
Search date: 23/05/13
Retrieved records: 285
Search strategy:

The following 27 searches were run separately:

1. vitamin D* OR vitamins D* OR vitaminD* OR cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* OR multivitamin* OR multimicronutrient* OR multimineral* OR multi vitamin* OR multi micronutrient* OR multi mineral* OR multiple vitamin* OR multiple micronutrient* OR multiple mineral* OR healthy start* OR healthystart* (Title field; recruitment status:all; countries of recruitment: united kingdom) = 119 records (for 97 trials)

2. vitamin-D* OR multi-vitamin* OR multi-micronutrient* OR multi-mineral* OR multiple-vitamin* OR multiple-micronutrient* OR multiple-mineral* OR healthy-start* (Title field; recruitment status:all; countries of recruitment: united kingdom) = 4 records (for 4 trials)

3. vitamin D* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 17 records (for 13 trials)

4. vitamins D* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

5. vitaminD* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

6. cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* OR multivitamin* OR multimicronutrient* OR multimineral* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

7. multi vitamin* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

8. multi micronutrient* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

9. multi mineral* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

10. multiple vitamin* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

11. multiple micronutrient* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

12. multiple mineral*(Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

13. healthy start* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

14. healthystart* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0

15. vitamin-D* OR multi-vitamin* OR multi-micronutrient* OR multi-mineral* OR multiple-vitamin* OR multiple-micronutrient* OR multiple-mineral* OR healthy-start* (Condition field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

16. vitamin D* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) =70 records (for 59 trials)

17. vitamins D* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

18. vitaminD* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

19. cholecalciferol* OR colecalciferol* OR ergocalciferol* OR calciferol* OR alfacalcidol* OR multivitamin* OR multimicronutrient* OR multimineral* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 74 records (for 57 trials)

20. multi vitamin* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

21. multi micronutrient* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

22. multi mineral* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

23. multiple vitamin* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

24. multiple micronutrient* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

23. multiple mineral* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

25. healthy start* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

26. healthystart* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

27. vitamin-D* OR multi-vitamin* OR multi-micronutrient* OR multi-mineral* OR multiple-vitamin* OR multiple-micronutrient* OR multiple-mineral* OR healthy-start* (Intervention field; recruitment status:all; countries of recruitment: united kingdom) = 0 results

B.25: Source: metaRegister of Controlled Trials (mRCT)

Interface / URL: http://www.controlled-trials.com/mrct/
Database coverage dates: Information not found. Site states: "ISRCTN Register and ClinicalTrials.gov data are refreshed daily. Other views are refreshed on a monthly basis or at an agreed frequency."
Search date: 23/05/13
Retrieved records: 282
Search strategy:

Search conducted across all registers apart from NIH ClinicalTrials.gov Register. The following 30 searches were run separately:

1. (vitamin OR vitamins) AND (D OR D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9) = 166 results

2. vitaminD OR vitaminD1 OR vitaminD2 OR vitaminD3 OR vitaminD4 OR vitaminD5 OR vitaminD6 OR vitaminD7 OR vitaminD8 OR vitaminD9 OR cholecalciferol OR colecalciferol OR ergocalciferol OR calciferol OR alfacalcidol = 35 results

3. multivitamin OR multimicronutrient OR multimineral OR multivitamins OR multimicronutrients OR multiminerals = 28 results

4. multi vitamin OR multi micronutrient OR multi mineral OR multi vitamins OR multi micronutrients OR multi minerals = 2 results

5. multiple vitamin OR multiple micronutrient OR multiple mineral OR multiple vitamins OR multiple micronutrients OR multiple minerals = 13 results

6. healthy start OR healthy starts OR healthystart OR healthystarts = 0 results

7. vitamin-D = 0 results

8. vitamin-D1 = 0 results

9. vitamin-D2 = 0 results

10. vitamin-D3 = 0 results

11. vitamin-D4 = 0 results

12. vitamin-D5 = 0 results

13. vitamin-D6 = 0 results

14. vitamin-D7 = 0 results

15. vitamin-D8 = 0 results

16. vitamin-D9 = 0 results

17. multi-vitamin = 22 results

18. multi-micronutrient = 2 results

19. multi-mineral = 1 result

20. multi-vitamins = 12 results

21. multi-micronutrients = 1 results

22. multi-minerals = 0 results

23. multiple-vitamin = 0 results

24. multiple-micronutrient = 0 results

25. multiple-mineral = 0 results

26. multiple-vitamins = 0 results

27. multiple-micronutrients = 0 results

28. multiple-minerals = 0 results

29. healthy-start = 0 results

30. healthy-starts = 0 results

B.26: Source: Google
Interface / URL: http://www.google.co.uk/
Database coverage dates: Information not found
Search date: 24/05/13, 28/05/13; 10/06/13
Retrieved records: 91
Search strategy:

The following 7 searches were run separately. For each search, the first 100 'most relevant' returned results (ten pages) of each search were scanned for potentially relevant items. Relevance ranking was determined by the Google algorithm. Choice of items to view and selection for further consideration was based on the searchers judgement.

1. "vitamin d" site:.nhs.uk = "About 285,000 results". Search run on 24/05/13 at 16.20 pm.

2. "vitamin d" site:.gov.uk = "About 12,500 results". Search run on 24/05/13 at 17.20 pm.

3. "vitamin d" audit site:.nhs.uk = "About 312,000 results". Search run on 28/05/13 at 08.35 am.

4. "vitamin d" guideline site:.nhs.uk = "About 222,000 results". Search run on 28/05/13 at 08.55 am

5. "vitamin d" implementation site:.nhs.uk = "About 267,000" results. Search run on 28/05/13 at 09.40 am

6. "vitamin d" "patient information" site:.nhs.uk = "About 848,000" results. Search run on 28/05/13 at 09.50 am

7. "vitamin D" site:.apho.org.uk = "About 16 results". Search run on 10/06/13 at 14.40 pm. Note: From 01/04/13, the Network of Public Health Observatories is now part of Public Health England.

B.27: Source: MEDLINE In-Process & Other Non-Indexed Citations and MEDLINE
Interface / URL: OvidSP
Database coverage dates: 1946 to present
Search date: 26/06/13

Retrieved records: 292
Search strategy:

1	Ahmed S$.au.	3749
2	Alemu E$.au.	12
3	Alexander S$.au.	1352
4	Amjid T$.au.	0
5	Barry W$.au.	414
6	Beski S$.au.	11
7	Cameron A$.au.	1143
8	Cleghorn S$.au.	5
9	Cooper C$.au.	3154
10	Coren M$.au.	22
11	Cowbrough K$.au.	6
12	Cox H$.au.	649
13	Debelle G$.au.	23
14	Evans B$.au.	1365
15	Garton L$.au.	6
16	Gee I$.au.	17
17	Gillie O$.au.	24
18	Gnanasambandam S$.au.	3
19	Goddard A$.au.	272
20	Goldring S$.au.	238
21	Gomm N$.au.	0
22	Grosset K$.au.	29
23	Hanratty B$.au.	55
24	Haynes C$.au.	400
25	Hetherington M$.au.	110
26	Hodson J$.au.	106
27	Hosie P$.au.	11
28	Ingram J$.au.	547
29	Jackson A$.au.	2943
30	Jacobs B$.au.	933
31	Jagatia S$.au.	0
32	Jain V$.au.	1327
33	Jessiman T$.au.	3
34	Julies P$.au.	2
35	Khadri A$.au.	4
36	Khan N$.au.	1962
37	Lanigan J$.au.	40
38	Lee D$.au.	14156
39	Leven L$.au.	13
40	Ling R$.au.	185
41	Locyer V$.au.	1
42	Longbottom K$.au.	1
43	Lowdon J$.au.	16

44 Lucas P$.au. 640
45 Lucas-Herald A$.au. 6
46 Markides G$.au. 5
47 Masud T$.au. 108
48 Mather I$.au. 66
49 McGee E$.au. 142
50 McGrogan P$.au. 44
51 Moonan M$.au. 10
52 Morton V$.au. 42
53 Moy R$.au. 222
54 Mucavele P$.au. 2
55 Northstone K$.au. 100
56 Oliver D$.au. 894
57 Porcellato L$.au. 7
58 Potter B$.au. 888
59 Preedy D$.au. 7
60 Puffer S$.au. 14
61 Raychaudhuri R$.au. 7
62 Robertson M$.au. 1555
63 Ross E$.au. 1217
64 Sahota P$.au. 80
65 Saroey S$.au. 1
66 Selby P$.au. 626
67 Sharma S$.au. 9250
68 Sharma V$.au. 3691
69 Shaw N$.au. 596
70 Stone M$.au. 1897
71 Sutcliffe A$.au. 172
72 Swann I$.au. 48
73 Torgerson D$.au. 315
74 Varnam R$.au. 4
75 Wall A$.au. 293
76 Warren J$.au. 2275
77 Whitehead M$.au. 596
78 Wiggins M$.au. 114
79 Williams B$.au. 4082
80 Zipitis C$.au. 17
81 or/1-8064657
82 exp Vitamin D/42679
83 exp Vitamin D Deficiency/ 19258
84 (vitamin$1 adj5 D$1).ti,ab. 44237
85 (vitaminD$1 or cholecalciferol$ or colecalciferol$ or ergocalciferol$ or calciferol$ or alfacalcidol$).ti,ab,rn. 9365
86 (1406-16-2 or 67-97-0).rn. 25761
87 (multivitamin$1 or multimicronutrient$1 or multimineral$1).ti,ab. 2779
88 (multi vitamin$1 or multi micronutrient$1 or multi mineral$1).ti,ab. 205

89	(multiple adj (vitamin$1 or micronutrient$1 or mineral$1)).ti,ab.	506
90	or/82-89	70861
91	81 and 90	434
92	limit 91 to (english language and yr="2000 -Current")	292

APPENDIX C

Bibliography of Included Studies

Included references
Alemu, E. & Varnam, R. 2012. Awareness of vitamin D deficiency among at-risk patients. *BMC Research Notes*, 5, 17.
Austin, F., Jewell, R. & Dunn, S. 2012. *Healthy Start and Vitamin D Evaluation Report,* London, Barts Health NHS Trust.
Chandaria, K., Mohd Daud, K., Syed, F. & Blair, M. 2011. What are the views of local people about vitamin d and its health effects: a community focus group study. *Arch Dis Child* 96, A11.
Cleghorn, S. 2006. Do health visitors advise mothers about vitamin supplementation for their infants in line with government recommendations to help prevent rickets? *Journal of Human Nutrition & Dietetics*, 19 (3), 203-8.
Feeding for Life Foundation 2012. *Mind the Gap: Are the current vitamin recommendations meeting the needs of the under-5's in the UK?,* London, Feeding for Life Foundation.
Garton, L. 2008. Children's bone health, calcium and vitamin D--how much do nurses and health visitors know? *Journal of Family Health Care*, 18 (5), 175-7.
Ingram, J. & Potter, B. 2009. The health needs of the Somali community in Bristol. *Community Practitioner*, 82 (1), 26-29.
Jagatia, S., Lee, D., Haynes, C., Knuckey, S. & Cook, G. 2011. *Measuring and Improving Vitamin D Promotion and Prescribing to Prenatal and Postnatal Women within the North West. Stockport NHS Foundation Trust,* Stockport, Stockport NHS Foundation Trust. Available: http://www.gmpublichealthpracticeunit.nhs.uk/wp-content/uploads/2011/06/Final-Vitamin-D-Report.pdf
Jain, V., Raychaudhuri, R. & Barry, W. 2011. A survey of healthcare professionals' awareness of vitamin d supplementation in Pregnancy, infancy and childhood- midwives, GPs and health visitors have their say. *Arch Dis Child*, 96 (Suppl 1), A16-18.
Jessiman, T., Cameron, A., Wiggins, M. & Lucas, P. J. 2013. A qualitative study of uptake of free vitamins in England. *Arch Dis Child*, 98 (8), 587-591.
Leven, L., Longbottom, K. & Jackson, A. 2012. Efficacy of vitamin D deficiency prevention strategies in Glasgow's maternity services. *Archives of Disease in Childhood*, 97 (3), 299.
Ling, R., Coren, M. & Goldring, S. 2011. Barriers to effective vitamin D supplementation during ante-natal care. *Arch Dis Child*, 96 (Suppl1), A22.
Lockyer, V., Porcellato, L. & Gee, I. 2011. Vitamin D deficiency and supplementation: are we failing to prevent the preventable? *Community Practitioner*, 84 (3), 23-6.
Lucas-Herald, A., Grosset, K., Robertson, M. & Ahmed, S. 2012. The GP'S role in improving the uptake of healthy start vitamins. *British Journal of General Practice*, 62 (601), 407.
McGee, E. 2010. *Prevention of rickets and vitamin D deficiency in Birmingham: The case for universal supplementation,* Birmingham, National Health Service.
McGee, E. & Shaw, D. 2013. Vitamin D supplementation: Putting recommendations into practice. *Journal of Health Visiting*, 1 (3), 2-7.
Moonan, M., Hanratty, B. & Whitehead, M. 2012. Which is more effective, a universal or targeted approach, to implementing the National Healthy Start Programme? A mixed methods study. *Journal of Epidemiology and Community Health*, 66, A44-A45.
Moy, R. J., Mcgee, E., Debelle, G. D., Mather, I. & Shaw, N. J. 2012. Successful public health action to reduce the incidence of symptomatic vitamin D deficiency. *Archives of Disease in Childhood*, 97 (11), 952-4.
Nicholls, H. & Stocker, S. 2012. *Cardiff Healthy Start Vitamin Project, Cardiff Additional qualitative evaluation April – Sept 2012,* Cardiff, NHS Wales.
NHS England. 2013. *Healthy Start – Learn more about Healthy Start* [Online]. Available: http://www.healthystart.nhs.uk/for-health-professionals/learn-more-about-healthy-start/ [Accessed 19 July 2013].
Roberts, H. 2012. *Process evaluation of a new scheme offering free vitamins to families in Hackney and the City,* London, Public Health ELC.
Sharma, S., Khan, N., Khadri, A., Julies, P., Gnanasambandam, S., Saroey, S., Jacobs, B., Beski, S., Coren, M. & Alexander, S. 2009. Vitamin D in pregnancy-time for action: a paediatric audit. *BJOG: An International Journal of Obstetrics & Gynaecology*, 116 (12), 1678-82.
Sharma, V., Williams, B., Goddard, A. & Coren, M. 2011. Vitamin D and parental knowledge. *Arch Dis Child*, 96 (Suppl 1), A62.
Stocker, S. & Nicholls, H. 2012. *Cardiff Vitamin Project: Performance Evaluation Report 1st October 2011-30st September 2012,* Cardiff, NHS Wales.
Zipitis, C. S., Elazabi, A. & Samanta, S. 2011. Vitamin D deficiency and guideline awareness.

Included references
Archives of Disease in Childhood Fetal & Neonatal Edition, 96 (4), F310.
Zipitis, C. S., Elazabi, A. & Samanta, S. 2011. Vitamin D deficiency and guideline awareness. *Archives of Disease in Childhood Fetal & Neonatal Edition*, 96 (4), F310.

APPENDIX D

Quality Assessment for Included Studies

D.1: Quality assessment table: qualitative studies

Reference	Theoretical approach		Study design	Data collection	Trustworthiness			Analysis						Ethics	Overall rating
	Qualitative approach	Study purpose			Role of researcher	Context	Reliable methods	Rigorous data analysis	Rich data	Reliable analysis	Convincing findings	Relevant findings	Conclusions	Clear & coherent reporting	
Chandaria 2006	Appropriate	Unclear	Unsure	Unsure/ inadequately reported	Not described	Unclear	Not sure	Not sure/ not reported	Poor	Not sure/ not reported	Not convincing	Relevant	Adequate	Not sure/ not reported	-
Nicholls 2012	Appropriate	Clear	Unsure	Unsure/ inadequately reported	Not described	Unclear	Not sure	Not sure/ not reported	Not sure/not reported	Not sure/ not reported	Convincing	Relevant	Adequate	Not sure/ not reported	-
Ingram 2008	Appropriate	Clear	Defensible	Appropriately	Clearly described	Clearly described	Reliable	Rigorous	Poor	Reliable	Convincing	Relevant	Adequate	Appropriate	++
Jessiman 2013	Appropriate	Clear	Defensible	Appropriately	Clearly described	Clearly described	Reliable	Rigorous	Poor	Reliable	Convincing	Relevant	Adequate	Appropriate	++

Key:
++ All or most of the checklist criteria have been fulfilled, where they have not been fulfilled the conclusions are very unlikely to alter.
+ Some of the checklist criteria have been fulfilled, where they have not been fulfilled, or not adequately described, the conclusions are unlikely to alter.
– Few or no checklist criteria have been fulfilled and the conclusions are likely or very likely to alter.

D.2: Quality assessment criteria and table: quantitative studies

Section 1: Population

1.1: Is the source population or source area well described?
1.2: Is the eligible population or area representative of the source population or area?
1.3: Do the selected participants or areas represent the eligible population or area?

Section 2: Method of allocation to intervention (or comparison)

2.1: Allocation to intervention (or comparison).
2.2: Were interventions (and comparisons) well described and appropriate?
2.3: Was the allocation concealed?
2.4: Were participants or investigators blind to exposure and comparison?
2.5: Was the exposure to the intervention and comparison adequate?
2.6: Was contamination acceptably low?
2.7: Were other interventions similar in both groups?
2.8: Were all participants accounted for at study conclusion?
2.9: Did the setting reflect usual UK practice?
2.10: Did the intervention or control comparison reflect usual UK practice?

Section 3: Outcomes

3.1: Were outcome measures reliable?
3.2: Were all outcome measurements complete?
3.3: Were all important outcomes assessed?
3.4: Were outcomes relevant?
3.5: Were there similar follow-up times in exposure and comparison groups?
3.6: Was follow-up time meaningful?

Section 4: Analyses

4.1: Were exposure and comparison groups similar at baseline? If not, were these adjusted?
4.2: Was intention to treat (ITT) analysis conducted?
4.3: Was the study sufficiently powered to detect an intervention effect (if one exists)?
4.4: Were the estimates of effect size given or calculable?
4.5: Were the analytical methods appropriate?
4.6: Was the precision of intervention effect given or calculable: Were they meaningful?

Section 5: Summary

5.1: Are the study results internally valid (i.e. unbiased)?
5.2: Are the findings generalisable to the source population (i.e. externally valid)?

Quality criterion	McGee and Shaw 2013	Moy et al., 2012	Nicholls and Stocker 2012
1.1	++	++	+
1.2	++	++	+
1.3	++	++	+
2.1	N. A.	N. A.	N.A.
2.2	++	++	+
2.3	N.A.	N.A.	N.A.
2.4	N.A.	N.A.	N.A.
2.5	N.A.	N.A.	N.A.
2.6	N.A.	N.A.	N.A.
2.7	N.A.	N.A.	N.A.
2.8	N.A.	N.A.	N.A.
2.9	++	++	+
2.10	++	++	+
3.1	++	++	-
3.2	+	+	N.A.
3.3	N.A.	N.A.	+
3.4	++	++	+
3.5	N.A.	N.A.	N.A.
3.6	++	++	+
4.1	+	+	-
4.2	N.A.	N.A.	N.A
4.3	N.A.	N.A.	N.A
4.4	N.A	N.A	N.A
4.5	++	++	N.A
4.6	N.A.	N.A.	N.A
5.1	-	-	-
5.2	++	++	-
Grade	++	++	-

Key:

++ All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter

+ Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are through unlikely to affect conclusions

- Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter

N.A. Not applicable

D.3: Quality assessment criteria and table: surveys

Relevance of the study to the project

1.1: Does the paper address a clearly focussed issue in terms of population studied?
1.2: Does the paper address a clearly focussed issue in terms of outcomes considered?
1.3: Are the aims of the study clearly stated?

Choice of study methods

2.1: Is the choice of study method appropriate (is justification for the study method given)?

Is the population studied appropriate?

3.1: Were sampling techniques described?
3.2: Was the sample representative of its target population?
3.3: Was the sample size justified?

Is confounding and bias considered?

4.1: Have all possible explanations of the effects been considered?
4.2: Did the study achieve a good response rate?
4.3: Were rigorous processes used to develop the questions? (e.g. were the questions piloted/validated?)
4.4: Does the study measure what it intended to?

Results

5.1: Are tables/graphs adequately labelled and understandable?
6.1: Are you confident with the authors' choice and use of statistical methods, if employed?
7.1: Can the results be applied to the local situation?

Interpretation and discussion

8.1: Do the study results answer the original question?
8.2: Are limitations or weaknesses identified?
8.3: Do the inferences/conclusions make sense?
8.4: Would you be able to replicate the study?

Overall assessment

9.1: As far as can be ascertained from the paper, how well was the study conducted?

Quality criterion	Alemu 2012	Austin 2012	Cleghorn 2006	Feeding for Life Foundation 2012	Garton 2008	Jagatia 2012	Jain 2011	Leven 2012	Ling 2011	Lockyer 2011	Lucas-Herald 2012	NHS England (no date)	Roberts 2012	Sharma 2009	Sharma 2011	Zipitis 2011
1.1	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.3	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
2.1	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.1	Y	N	Y	N	N	Y	N	N	N	Y	Y	N	N	N	N	N
3.2	N.R.	Y	Y	N.R.	N	N.R.	N.R.	N.R.	N.R.	Y	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
3.3	N.R.	N	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	N
4.1	N	Y	N	N.R.	N	N.R.	N.R.	Y	N.R.	N	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
4.2	Y	Y	Y	N.R.	N	N.R.	Y	Y	N	Y	Y	N.R.	N.R.	Y	N.R.	Y
4.3	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N	N.R.	N.R.
4.4	N.R.	Y	N.R.	N.R.	N.R.	N.R.	N.R.	Y	N.R.	N.R.	N.R.	N.R.	N.R.	Y	N.R.	N.R.
5.1	Y	Y	Y	Y	Y	Y	Y	Y	N.A.	Y	N.A.	N.A.	N	Y	N.A.	N.A.
6.1	Y	Y	Y	N	N	N	N	N	N	Y	N	N.A.	N	N	N	N
7.1	N.R.	N.R.	Y	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	Y	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
8.1	Y	Y	N.R.	Y	N	Y	Y	Y	Y	N.R.	N	Y	Y	Y	Y	N.R.
8.2	Y	Y	Y	N	N	N	N	N	N.R.	Y	N	Y	N	N	N	N
8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N.R.	N	Y	Y	Y
8.4	Y	N.R.	N	N	N	Y	N	N	N	N	N	N.R.	N	N.R.	N	N
9.1	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key:

Y Yes

N No

N.A. Not applicable

N.R. Not reported

++ All or most of the checklist criteria have been fulfilled, where they have not been fulfilled the conclusions are very unlikely to alter.

+ Some of the checklist criteria have been fulfilled, where they have not been fulfilled, or not adequately described, the conclusions are unlikely to alter.

– Few or no checklist criteria have been fulfilled and the conclusions are likely or very likely to alter.

D.4: Quality assessment table: economic analyses

Study	McGee, E. 2010. Prevention of rickets and vitamin D deficiency in Birmingham: The case for universal supplementation, Birmingham, National Health Service.	
Applicability		
Quality criterion	Yes/No/Partly/ Unclear/N.A.	Comments
1.1 Is the study population appropriate for the guideline?	Yes	Pregnant women (and up until their child is 12 months old) + children under 4 years old.
1.2 Are the interventions appropriate for the guideline?	Yes	Vitamin D supplements
1.3 Is the healthcare system in which the study was conducted sufficiently similar to the current UK NHS context?	Yes	City of Birmingham
1.4 Are costs measured from the NHS and personal social services (PSS) perspective?	Yes	NHS
1.5 Are all direct health effects on individuals included?	Yes	
1.6 Are both costs and health effects discounted at an annual rate of 3.5%?	No	No discounting reported.
1.7 Is the value of health effects expressed in terms of quality-adjusted life years (QALYs)?	No	No health effects measured.
1.8 Are changes in health-related quality of life (HRQoL) reported directly from patients and/or carers?	N.A.	
1.9 Is the value of changes in HRQoL (utilities) obtained from a representative sample of the public?	N.A.	
Quality		
2.1 Does the model structure adequately reflect the nature of the health condition under evaluation?	N.A.	This was a cost analysis only.
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?	Partly	Costs were estimated for one year.
2.3 Are all important and relevant health outcomes included?	No	Cost analysis only.
2.4 Are the estimates of baseline health outcomes from the best available source?	N.A.	
2.5 Are the estimates of relative treatment effects from the best available source?	N.A.	
2.6 Are all important and relevant costs included?	No	For the intervention, the study includes only the cost of purchasing vitamins and vitamin delivery.
2.7 Are the estimates of resource use from the best available source?	No	No resource use estimates reported.
2.8 Are the unit costs of resources from the best available source?	Partly.	Prices used as proxies for Healthy Start vitamins.
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?	No No	
2.10 Are all important parameters, whose values are uncertain, subjected to appropriate sensitivity analysis?	No	No sensitivity analysis performed.
2.11 Is there no potential conflict of interest?	Unclear	Source of funding not reported.
2.12 **Overall assessment:** minor limitations/potentially serious limitations/very serious limitations	Very serious limitations	All relevant costs not included, resource use not estimated, costs not discounted, and no sensitivity analysis performed.

Study	Zipitis, C. S., Markides, G. A. & Swann, I. L. 2006. Vitamin D deficiency: prevention or treatment? Archives of Disease in Childhood, 91 (12), 1011-4.	
Applicability		
	Yes/No/Partly/ Unclear/N.A.	Comments
1.1 Is the study population appropriate for the guideline?	Yes	Asian children with vitamin D deficiency
1.2 Are the interventions appropriate for the guideline?	Yes	Vit D supplements
1.3 Is the healthcare system in which the study was conducted sufficiently similar to the current UK NHS context?	Yes	Burnley
1.4 Are costs measured from the NHS and personal social services (PSS) perspective?	Yes	NHS
1.5 Are all direct health effects on individuals included?	Yes	
1.6 Are both costs and health effects discounted at an annual rate of 3.5%?	No	No discounting reported.
1.7 Is the value of health effects expressed in terms of quality-adjusted life years (QALYs)?	No	No health effects measured.
1.8 Are changes in health-related quality of life (HRQoL) reported directly from patients and/or carers?	N.A.	
1.9 Is the value of changes in HRQoL (utilities) obtained from a representative sample of the public?	N.A.	
Quality		
2.1 Does the model structure adequately reflect the nature of the health condition under evaluation?	N.A.	This was a cost analysis only.
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?	Partly	Costs were estimated over a 2-year and 5-year period
2.3 Are all important and relevant health outcomes included?	No	
2.4 Are the estimates of baseline health outcomes from the best available source?	N.A.	
2.5 Are the estimates of relative treatment effects from the best available source?	N.A.	
2.6 Are all important and relevant costs included?	No	For the intervention the study includes only the cost of purchasing vitamins.
2.7 Are the estimates of resource use from the best available source?	Unclear	
2.8 Are the unit costs of resources from the best available source?	Unclear	
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?	No No	
2.10 Are all important parameters, whose values are uncertain, subjected to appropriate sensitivity analysis?	No	No sensitivity analysis done
2.11 Is there no potential conflict of interest?	Unclear	Source of funding not reported.
2.12 **Overall assessment:** minor limitations/potentially serious limitations/very serious limitations	Very serious limitations	All relevant costs not included, resource use not estimated, costs not discounted, and no sensitivity analysis performed.

APPENDIX E

Data Extraction Tables for Included Studies

Guide to viewing data extraction tables

A number of different templates were used to extract data from studies included in the review. These included a template for quantitative studies, one for qualitative studies, another for cross-sectional /survey studies (a modified qualitative study template) and one for an economic evaluation study. This reflected the variety of studies that were identified in the review. The tables are listed in alphabetical order by first author.

Abbreviations:

F.S. = Flying Start
H.S. = Healthy Start
H.V. = Health Visitor
M.W. = Midwife
N.A. = Not applicable
N.R. = Not reported

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Alemu *et al.*, 2012 **Design**: Survey **Setting:** Manchester **Quality score:** -	**Questions:** Knowledge about Vitamin D deficiency in at risk people. **Theoretical approach:** N.R. **Data collection:** Completion of questionnaire in GP surgery.	**Source:** GP patients in waiting room who were of dark-skinned ethnicity or wearing garments providing total or near total skin coverage. **Recruitment:** Patients were approached in the GP practice waiting room. **Sample:** n=363 approached and 293 participated (81%). Mean age=35 and 43% female.	**Analysis:** Descriptive statistics presented. **Study results by key themes:** N=160 (72%) had heard about vit D; n= 74 (46%) were aware of symptoms of vitamin D deficiency; N = 143 (89%) consume milk, fish or eggs; N = 10 (6%) were taking vitamin D supplements; N = 105 (66%) exposed more than their face to the sun.	**Limitations identified by author:** Closed questions, sample non-random. **Limitations identified by review team:** As above. Study only assessed face validity of the questionnaire. **Evidence gaps:** N.R. **Source of funding:** N.R.
Authors: Austin *et al.*, 2012 **Design**: Survey **Setting:** Newham London. **Quality score:** -	**Questions:** Awareness and knowledge of vitamin D and Healthy Start. **Theoretical approach:** N.R. **Data collection:** Telephone survey of pregnant women using a structured questionnaire.	**Source:** Pregnant women in Newham. English speaking. **Recruitment:** No details given. **Sample:** n=70 pregnant women resident in Newham. This was a randomised sample from all antenatal centres. No justification for sample size given.	**Analysis:** Descriptive statistics presented. **Study results by key themes:** Response rate not reported but appears to be 100%. <u>Healthy Start Scheme</u> 91% were aware of Newham's universal Healthy Start vitamins in pregnancy. 93% had received their first bottle. 64% were aware that they could receive three bottles during pregnancy. 100% were aware of why the healthy start vitamins were needed . <u>Knowledge/awareness of vitamin D</u> 73% were informed about vitamin D via their midwives. 83% of those informed correctly indicated that sunshine was a source. 50% were able to correctly identify oily fish and dairy as dietary sources of vitamin D. There was no difference in self-reported risk of vitamin D deficiency between high and low risk ethnicity groups.	**Limitations identified by author:** Risk of bias due to survey of English speaking women only. Problems of recall due to remembering events months past. **Limitations identified by review team:** As above. Also, validity and appropriateness of questions not discussed. **Evidence gaps:** N.R. **Source of funding:** Newham public health, North East London and the City in partnership with Barts Health NHS Trust, Newham University Hospital

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Chandaria *et al.,* 2011 **Study design:** Focus group. Reported in abstract form only. **Setting:** Not reported. **Quality score:** -	**Research questions:** To ascertain local perceptions about vitamin D; To raise awareness about vitamin D and its health effects; To explore how health information is obtained by members of the local community; To use local views to help direct future public health policy. **Theoretical approach:** N.R. **Data collection:** Data obtained from a community-based focus group, which involved an interactive discussion and teaching session. Data collected on the group's demographics, awareness of vitamin D sources, and where they obtained health information. Participants were asked to feedback	**Source:** Members of the local community. **Recruitment:** 'Mothers' attending a local community centre were invited to participate in an interactive discussion and teaching session with local paediatricians about vitamin D. **Sample:** 47 people attended the focus group. The group was mainly female (proportion not reported); age 12 to 84 years; 33 (70%) South Asian and remainder Black African or White. No further details.	**Analysis:** Responses were collated and thematic analysis was used to identify key themes. Some descriptive statistics also presented. **Study results by key theme:** Awareness: at the start of the session, 23 (50%) of participants were aware of vitamin D, 19 (40%) were aware of its sources, and 8 (17%) knew about the consequences of insufficiency. Three major themes emerged during and following the session: Improved awareness of vitamin D sources; Improved knowledge about the consequences of vitamin D deficiency; Increased awareness of national Vitamin D recommendations. Preferred information sources were word-of-mouth, community websites and local Gujarati newspapers. GP and NHS branded materials were perceived as reliable and accurate sources. Conflicting information given by health professionals and the use of jargon caused confusion and worry. The group reported specifically that they had not been told about the importance of vitamin D in breastfeeding infants and children.	**Limitations identified by author:** N.R. **Limitations identified by review team**: Abstract only. Methodological details of the study were sparse, The researchers identified three major themes, but no statements or original data were presented in support. Limited description of characteristics of the focus group or the local community from which it came. Study stated that mothers were invited to participate, but results say the group was mainly female, (age 12 to 84 years). Given the research question centered on local people, not specifically mothers, the high proportion of mothers and South Asian participants in the sample could result in bias.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
	on the information gained from the session.			**Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Cleghorn *et al.,* 2006 **Design**: Survey **Setting:** London **Quality score:** -	**Questions:** health visitors' (HV) knowledge of the government guidelines for vitamin supplementation for infants and children and the advice given to mothers. **Theoretical approach:** N.R. **Data collection:** Survey posted to all health visitors in Brent, Harrow and Westminster PCTs. Prepaid envelopes for return.	**Source:** Health visitors in Brent, Harrow and Westminster. **Recruitment:** By post. **Sample:** n=143 and response rate n=98 (69%).	**Analysis:** Descriptive statistics presented. **Study results by key themes:** Response rate = 69% Seventy-nine HV (81%) recommend vitamins for the breastfed infant at 6 months or younger, 18 of which would recommend at 1 month of age. Fifty-six HV (57%) recommend vitamins until 5 years of age. Seventy-nine HV correctly identified Asians to be at risk of developing rickets. However, only 28 and 16 HV, respectively, identified Black Africans and Black Caribbeans to be at risk.	**Limitations identified by author:** Questionnaire not piloted. **Limitations identified by review team:** Wording of questions not presented. **Evidence gaps:** N.R. **Source of funding:** British Dietetic Association and SMA Nutrition

Study details	Audit/survey parameters	*Population and sample* selection	Outcomes and methods of analysis Results	Review team comments
Authors: Feeding for Life Foundation (FfLF).2012 **Study design:** Survey. The survey was conducted by a private company and just the results presented within the FfLF report. **Setting:** UK wide **Quality score:** -	**Research questions:** To establish levels of awareness of vitamin supplementation recommendations among both healthcare professionals (HCPs) and the parents of young children. The main report provides a view of the current vitamin supplementation situation in the UK, and highlights where current provision falls short. It focuses on children under the age of 5. **Theoretical approach:** N.R. **Data collection:** An online survey, commissioned by the FfLF and conducted by Opinion Health, took place between 3rd October and 5th December 2011. No further details provided.	**Source:** Health care professionals and parents of young children. 'Young children' was not specifically defined but appears to be the under 5-s. No further details provided. **Recruitment:** N.R. **Sample:** 1001 parents and 227 HCPs (102 health visitors, 100 midwives and 25 general practitioners). The survey was stated to be nationally representative. No further details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** <u>Health Care Professionals</u>**:** Advice about vitamin supplementation (58% of HCPs do not discuss the importance of vitamin supplementation with all parents, while 24% do not discuss the importance of supplementation or Healthy Start at all). Knowledge of vitamin recommendations (53% of HCPs were not sure or unaware of the UK Health Departments' supplementation recommendations; 44% of those who were aware did not know which vitamins are recommended daily [meaning 26% knew the correct UK Health Department recommendations]; 85% were not always or not really clear on the specific nutritional needs and advice for the under-5s; 83% were not always confident discussing supplementation with parents; 74% agreed that HCPs had insufficient training about the benefits of supplements). Strategies for most effective improvement of	**Limitations identified by author:** N.R. **Limitations identified by review team**: The research was commissioned by the FfLF and conducted by a private company, with just the results presented in the main FfLF report. The results were not discussed within the report. The development, validation and content of the online survey were not described. Nor were there any details of how the survey was conducted, or how the sample was recruited. The participants' characteristics were not reported, and there was no justification for the survey being described as nationally representative, especially considering the size of the sample studied. There was variation in the relative

Study details	Audit/survey parameters	*Population and sample* selection	Outcomes and methods of analysis Results	Review team comments
			the nutritional status of the under-5s (free vitamin supplements for all under-5s considered by 51% of HCPs, increased promotion of Healthy Start scheme by 35%, clearer advice and guidance on sunlight exposure by 35%, and accessible advice for parents on how to provide a healthy balance diet by 59%. **Parents:** Awareness of vitamin D (70% of parents are aware that it is difficult to get vitamin D from diet alone). Advice about vitamin supplementation (65% of parents have not received advice from an HCP and 77% have not received advice from a health visitor. Of those parents who received information from an HCP, 32% initiated the conversation). Knowledge of vitamin recommendations (74% of parents were unaware of the UK Health Departments' recommendations; 65% of those who were aware did not know which vitamins are recommended daily [meaning 3% knew the correct UK Health Department recommendations]; 78% did not feel they had received enough information on supplementation; 76% agreed they would like to know where to get more nutritional information)	proportions of parents and HCPs, with general practitioners appearing to be under represented in comparison with midwives and health visitors. These factors could lead to bias. **Evidence gaps:** N.R. **Source of funding:** The Feeding for Life Foundation is supported by Cow & Gate.

Study details	Audit/survey parameters	*Population and sample* selection	Outcomes and methods of analysis Results	Review team comments
Authors: Garton, 2008. **Study design**: Focus groups. **Setting:** N.R. **Quality score: -**	**Research questions:** How much do health visitors and nurses know about children's bone nutrition, and are they able to identify the types of nutritional resources that are needed. **Theoretical approach:** No justification given for this approach. **Data collection:** Did not report methods of data collection.	**Source:** Health visitors and nurses. Does not report any further information. **Recruitment:** Not reported. **Sample:** N=15 health visitors, n=3 practice nurses, n=2 nursery nurses, n=1 NCT nurse and n=1 nursing journal editor.	**Analysis:** N.R. **Study results by key themes:** In regard to bone health, some common misconceptions still exist about the sources of vitamin D. A common misconception was that dairy foods contain vitamin D. Health visitors reported huge confusion over the practicalities of supplying the supplements at mother and baby clinics and a lack of direction from Primary Care Trusts.	**Limitations identified by author:** N.R. **Limitations identified by review team**: Objectives and methods not clearly defined. Lack of reporting of methods used. Lack of quantitative results. **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Ingram *et al.,* **Year:** 2009 **Study design**: Qualitative study using in-depth interviews. **Setting:** Bristol Somali community. **Quality score: +**	**Research questions:** What are the health needs of the Somali community in Britain. **Theoretical approach:** A qualitative approach is required due to language barriers, and lack of trained interpreters and health advocates. **Data collection:** Experienced interviewers used in-depth interviews to collect data from health professionals. Focus groups for community members (one for me and one for women). Analytical frameworks included key themes and sub themes, which were used to code the data.	**Source:** Purposive sampling of health professionals and members of the Somali community. **Recruitment:** Community members approached at community events and asked to bring a friend. **Sample:** N=10 health care professionals. N= 6 women and n=4 men who were Somali residents and service users.	**Analysis:** Analytical frameworks were used to code the data. This data management approach afforded the possibility of exploring the data by both theme and respondent type. **Study results by key themes:** <u>Health information</u> Access to evidence-based information – about vitamin D deficiency was stressed by focus group members, community workers and healthcare professionals to dispel myths. Effective use of interpreters would improve communication and access to primary care Services. An initial health needs assessment for new arrivals would provide signposting to appropriate services. Providing a family support worker and dedicated interpreter at the surgery was seen as important in the integration of the Somali community into the area. Above themes translated into action through health awareness multi-agency days to involve extended school providers, school nurses and other health workers to address and improve communication on vitamin D deficiency for the Somali community.	**Limitations identified by author:** Discussed small sample and rapid appraisal methods which may have limited diversity of views across the community. **Limitations identified by review team**: As above. **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Jagatia *et al.,* **Year:** 2011 **Audit design**: Provider service audit and staff survey re vitamin D and HS. **Setting:** PCTs and Acute Trusts in North West England. **Quality score:** -	**Questions:** Provider service audit and staff survey re vitamin D and Healthy Start **Theoretical approach:** N.R. **Data collection:** Staff survey using online questionnaire for some and paper copies for others.	**Source:** Health visitors (n=450) and midwives (n=1350). **Recruitment:** Online questionnaire sent to all of the above. Poor response so paper copy sent out. **Sample:** n=450 health visitors and n=1350 midwives. Response rates = 44% for health visitors and 14% for midwives.	**Analysis:** Descriptive statistics presented. **Study results by key themes:** <u>Training</u> Among the 13 hospitals, PCTs and Acute Trusts, 6 offered vitamin D training to health visitors and midwives. Of the 178 health visitor survey responders 24% reported having received vitamin D training. Of the 206 midwife survey responders 11% reported having received vitamin D training. <u>Knowledge and awareness</u> Knowledge of vitamin D was poor among both groups: e.g. about one-third were aware of the recommended daily allowance of vitamin D for pre and postnatal women. Only 37% of midwives promoted Healthy Start compared to 76% of health visitors. <u>Trust vitamin D policies</u> Four out of 13 trusts had a written vitamin D policy.	**Limitations identified by author:** Small number of midwives took part in the survey. Findings may not be representative of individual trusts. Poor response to online survey means paper copies were sent out which did not have links to educational material. Since the provider services audit Trusts may have begun to implement new vitamin D policies. May already have acted on recommendations made in the report. **Limitations identified by review team:** As above. **Evidence gaps:** N.R. **Source of funding:** Greater Manchester Supra District Audit Committee.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Jain *et al*. **Year:** 2011 **Study design:** survey. Reported in abstract form only. **Setting:** London **Quality score:** -	**Research questions:** To assess the awareness of vitamin D supplementation among different key groups of healthcare professionals (HCPs). **Theoretical approach:** N.R. **Data collection:** Survey by questionnaire, conducted from June to July 2010. No further details. 77 of the 116 HCPs responded.	**Source:** Health visitors, general practitioners (GPs) and midwives within a South London Borough. **Recruitment:** Questionnaires were distributed to health visitors, GPs and midwives. **Sample:** 116 HCPs. No further details or breakdown according to HCP group.	**Analysis:** Methods of analysis not reported. **Study results by key themes:** Advice about supplementation (8 of 34 midwives and 2 of 21 GPs routinely advised pregnant women about supplements, and 10 of 22 health visitors and 3 of 21 GPs advised vitamin D supplementation for breastfeeding women and breast-fed babies). Targeting high risk groups (8 of 12 HVs, 17 of 26 MWs, and 2 of 19 GPs who do not routinely advise supplementation targeted one or more high risk groups). Knowledge of supplementation (13% of GPs and 68% of HVs knew of at least one occasion when formula-fed infants would need supplementation). Knowledge of effects of vitamin D deficiency (96% of HVs and 53% of MWs knew of vitamin D deficient rickets). Awareness of Healthy Start (0% of GPs, 65% of MWs and 96% of HVs were aware of Healthy Start). Clarification on supplementation (95% of GPs, 74% of MWs, and 50% of HVs requested further information on vitamin D supplementation).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a published abstract, providing limited information. Few details of the study methodology, data collection and analysis methods were reported. The development, validation and content of the questionnaire were not described. The characteristics of the surveyed sample and the relative proportions of each group were not reported. In addition, it is not known how representative they were of HCPs in the South London Borough in which they operate. These factors could lead to bias **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Jessiman *et al.,* 2013 **Study design**: Qualitative study using in-depth interviews. **Setting:** 13 PCTs in England. **Quality score: ++**	**Research questions:** Why the provision of free Healthy Start vitamins has not resulted in higher levels of use among low income families in England. **Theoretical approach:** A qualitative approach is required to identify reasons why eligible families are not accessing free vitamins. **Data collection:** Experienced interviewers used topic guides during in-depth interviews to collect data from parents, HS coordinators and frontline health and children's professionals. Interviews digitally recorded. Analytical frameworks included key themes and sub themes, which were used to code the data.	**Source:** Purposive sampling of 13 PCTs across England. **Recruitment:** Within each PCT recruited local lead for HS and 5 children's professionals. Parents recruited face to face at health and children's centres. Sampling criteria for parents aimed to achieve variation in Healthy Start eligibility and application status (to include current users, participants who were eligible (based on income) but had never applied; previous users of the scheme, and applicants who believed themselves eligible but had not received coupons). **Sample:** 15 HS coordinators, 50 frontline professionals and 107 parents. N=80 face to face interviews and remainder phone interviews. 17 parents approached in health or children's centres who met selection criteria chose not to take part, and a further 67 were unreachable from HS records and 10 refused to take part in a phone interview.	**Analysis:** Analytical frameworks were used to code the data. This data management approach afforded the possibility of exploring the data by both theme and respondent type. **Study results by key themes:** 12/107 women reported taking HS vitamins. Most of the pregnant women who reported taking HS vitamins had been handed them directly by their midwives, in sites piloting universal vitamin supplements. <u>Barriers to accessing HS vitamins</u> Multiple steps to accessing vitamins: apply and be accepted on HS, wait for vouchers, be knowledgeable about vit D, and take voucher to local exchange point. <u>HS applications and late access to vitamins</u> MWs don't check eligibility at 1st appt. Administrative burden on families moving in and out of scheme. Administrative difficulties for health professionals who cannot countersign applications until 10 wks gestation. <u>Low awareness among parents and low promotion by HCPs</u> Many parents did not know about HS vitamins or the reason for taking them. Professionals did not promote because of lack of knowledge about importance. <u>Poor accessibility of vitamins.</u> Lack of knowledge re distribution points by health professionals. Problems with national and local supply.	**Limitations identified by author:** N.R. **Limitations identified by review team**: Authors used the consolidated criteria for reporting qualitative research (COREQ). This helps in reporting important aspects of the research team, study methods, context of the study, findings, analysis and interpretations. Only minor limitations were identified: e.g responses were reported for each of the groups (Healthy Start coordinators, parents and frontline staff) but no diversity of perspective explored within each group. **Evidence gaps:** N.R. **Source of funding:** Policy Research Programme in the Department of Health, UK.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Leven *et al.*, 2012 **Study design:** Survey. Reported in abstract form only. **Setting:** Glasgow **Quality score:** -	**Research questions:** To assess how many of the high risk women recalled receiving advice antenatally, were taking vitamin D supplements as recommended and how many intended to give their children supplements. **Theoretical approach:** N.R. **Data collection:** Interviews for audit purposes were conducted from March 2011 to June 2011, through an interpreter if necessary. No other details provided.	**Source:** Mothers at high risk of vitamin D deficiency using services at a maternity hospital in Glasgow. **Recruitment:** Random sample of mothers attending an infant BCG immunisation clinic at a maternity hospital in Glasgow. **Sample:** 50 mothers. The main ethnic groups were African (n=21) and Pakistani (n=10), followed by Chinese, Other Asian, Indian, Other, Caribbean and Mixed. 24% of mothers interviewed spoke English as their first language. No other details provided.	**Analysis:** Methods of analysis not reported. presented. **Study results by key themes:** Awareness of vitamin supplementation (28 mothers recalled discussing vitamin supplementation antenatally and 16 recalled the Healthy Start leaflet). Vitamin supplementation (11 mothers took a vitamin D supplement, 12 were unsure of the supplement they took, and 27 either took no supplement or a supplement that did not contain vitamin D). Infant vitamin supplementation (27 mothers would give their infants vitamin supplements in the future, 15 did not know, and 8 did not intend to give supplements. One breast-fed infant was receiving vitamins). Awareness of vitamin supplementation in breastfeeding women (Of the 24 mothers of exclusively breast-fed infants, 14 recalled discussing vitamin supplementation). Vitamin supplementation in breastfeeding women (Of the 24 mothers of exclusively breast-fed infants, 6 took a vitamin D supplement, 6 were unsure of the vitamin they took, and 12 either took no supplement or a supplement that did not contain vitamin D).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a published abstract, providing limited information. Details of the study methodology, data collection and analysis methods were sparse. The questions were not presented and development and validation of the survey tool was not discussed. Few sample demographics were reported. The sample comprised mothers considered to be at high risk of vitamin D deficiency, recruited from an infant BCG immunization clinic at one maternity hospital; the majority were not native English speakers. It is unclear how representative this sample

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				was of the local community, although the authors stated the hospital provided maternity services to many ethnic minority and asylum seeking women. **Evidence gaps:** N.R. **Source of funding:** N.R**.**

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Ling *et al.*, 2011 **Study design:** Survey. Reported in abstract form only. **Setting:** Not reported. **Quality score: -**	**Research questions:** To evaluate the knowledge, practice and barriers to implementation of vitamin D supplementation among midwives. **Theoretical approach:** N.R. **Data collection:** Electronic survey and one-to-one interviews which used the critical incident technique. Interviews were structured to elucidate the barriers to offering advice on vitamin D and potential ways to overcome them. No further details. 53 of 200 midwives responded to the electronic survey.	**Source:** Midwives from three inner-city hospital-based maternity units. No further details. **Recruitment:** N.R. **Sample:** 200 midwives were surveyed. Face-to-face interviews were conducted with 40 midwives. N=53 (27%) respondents No further details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** **Survey** Knowledge of vitamin D supplementation (of 53 midwives, 21 correctly identified the recommended daily amount of vitamin D supplements and 17 the duration of supplementation). Identification of risk groups (of 53 midwives, pigmented skin type was identified by 44, conservative Islamic dress by 48, limited sunlight exposure by 42 and obesity by 4). Advice on supplementation (12 of 53 midwives routinely advised women to take supplements). Advice on vitamin D supplementation during pregnancy (of 53 midwives, 36 thought midwives should give advice, 23 thought the general practitioner, and 28 thought obstetricians). **Interviews** Barriers to implementation of vitamin D 40 qualitative interviews found vitamin D supplements were: not a high-profile topic (25), lack of patient information sheet (18), time pressure (13), language barrier (10), supplementation only necessary if vitamin D deficient (3), and none (1). Suggested improvements Training (26), Trust guidelines (9), information sheets/posters (21), booking clinic supplies of vitamin D (7), and general practitioners to advise when pregnancy diagnosed (3).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a published abstract, providing limited information. Limited details of the study methodology, data collection and analysis methods were provided. The development and validation of questions used in the survey and interviews were not described, and the questions themselves were not reported. This study used qualitative and quantitative methods to elicit information from midwives from three hospital-based maternity units. The number of respondents to the survey was small and it was not reported whether the interviews were conducted with these midwives or a separate sample. Characteristics of

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				the participants and the communities they serviced were not reported. These factors could lead to bias. **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Lockyer *et al.,* 2011 **Design**: Survey **Setting:** Not reported. Heywood, Middleton and Rochdale. **Quality score:** -	**Questions:** identify current knowledge and practice regarding vitamin D deficiency and supplementation among health visitors and midwives. **Theoretical approach:** N.R. **Data collection:** Questionnaire administered to all health visitors and midwives within the trust 'face-to- face'.	**Source:** All health visitors and midwives in one NHS trust. Location not specified. **Recruitment:** Unclear. **Sample**: All health visiting and community midwifery team members (n=96), with a 76% response rate (n=73).	**Analysis:** Descriptive statistics presented. **Study results by key themes:** N=73/96 (76% response rate) <u>Understanding of vitamin D.</u> 78% (n=57) identified vitamin D as being necessary for bone health and/or calcium absorption. <u>Conditions/symptoms caused by vitamin D deficiency</u> Rickets was the most frequently cited (77%, n=56), followed by poor bone health (33%, n=24) and osteoporosis (22%, n=16). <u>Vitamin supplements</u> HVs recommend vitamin supplements to breastfeeding women (66%, n=39), breastfed infants (78%, n=46) and children from one to five years (65%, n=38). Only 43% (n=6) of midwives recommended vitamins to pregnant women and even fewer to breastfeeding women (36%, n=5).	**Limitations identified by author:** Small sample size. **Limitations identified by review team:** Insufficient detail about development of the survey tool. Did not present wording of questions so cannot comment on level of risk of bias. **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Lucas-Herald *et al.,* 2012 **Study design:** Survey. Reported in a letter only. **Setting:** Glasgow **Quality score:** -	**Research questions:** To identify whether mothers with an adequate knowledge of English were aware of the Healthy Start programme and whether they administered vitamin supplements to their children. **Theoretical approach:** N.R. **Data collection:** An audit, by questionnaire, was conducted between February and March 2012. No further details. Response rate was 92% (34/37).	**Source:** Mothers with an adequate knowledge of English attending a health visitor clinic in Glasgow. No further details. **Recruitment:** A questionnaire was distributed to all mothers attending a health visitor clinic at a general practice in Glasgow. No further details. **Sample:** 37 mothers. 33 (97%) mothers were of white. Scottish ethnic origin with English as their native language. The median age of the infant attending the clinic was 4 months (range: 1–4). No further details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** Vitamins during pregnancy (none of the mothers took Healthy Start vitamins, although all were eligible; 10 mothers paid for over-the-counter vitamins). Vitamins in infants eligible for Healthy Start programme (4 of the 14 eligible children took vitamin supplements; only one of these took Healthy Start vitamins). Information about vitamin supplementation in infants (3 mothers received written information and 8 mothers received verbal information).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a published letter, providing limited information. There were few details of the methods. The development, validation and content of the questionnaire were not reported. Awareness of the HS programmes, which the study aimed to identify, was not specifically reported. The sample was small and recruited from a single centre. The target group was mothers with an 'adequate knowledge' of English, which was not defined. The study was biased towards mothers who were white, Scottish ethnic origin with English as their native language, and without further details of the participants' characteristics it is

Study details	Audit/survey parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				unclear whether the study sample was appropriate to answer the research question. **Evidence gaps:** N.R. **Source of funding:** N.R.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Moonan *et al., 2*012 **Study design:** Systematic review, quantitative analysis and qualitative interviews. Reported in abstract form only **Setting:** UK **Quality score:** -	**Research questions:** To investigate which approach (targeted or universal) is more effective and to identify barriers to implementation (of Healthy Start scheme). **Theoretical approach:** N.R. **Data collection:** Researchers conducted a systematic review of the literature, a quantitative analysis of vitamin uptake rates, and in-depth qualitative interviews with 30 commissioners, providers and service users from a targeted and universal area. No further details provided. Systematic review methodology was not described.	**Source:** National data for pregnant women and pre-school children in targeted (low-income) and universal areas used for quantitative analysis. Commissioners, providers and service users (for qualitative interviews). No further details. **Recruitment:** Commissioners, providers and service users recruited from a targeted and universal area. No further details. **Sample:** interviews conducted with 30 commissioners, providers and service users. No further details. Size of sample taken for quantitative analysis not reported.	**Analysis:** Methods of quantitative analysis not described. Thematic analysis conducted on data from qualitative interviews. Some descriptive statistics reported. **Study results by key themes:** Systematic review: Universal supplementation of vitamins significantly reduces the incidence of preventable ill health due to vitamin deficiencies compared to a targeted approach. Analysis of national data: In areas adopting a targeted approach (vitamins given to low-income families), vitamin uptake was 1.46% for children's drops and 2.56% for women's tablets. In areas that adopted a universal approach, (vitamins given to all eligible, independently of income), the uptake of children's drops was 3.97% and women's tablets 7.72%. Qualitative interviews: Barriers identified were lack of awareness of the Healthy Start scheme amongst health professionals, onerous administrative processes and vitamin availability. Health professionals support the universal scheme as it does not stigmatise recipients.	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a published abstract, providing limited information. No details of methodology or analysis were provided for any of the methods employed. The sample size for qualitative interviews was small and not reported for the quantitative analysis of national data. In addition, no demographic data were reported for either sample. The potential for bias could exist. **Evidence gaps:** N.R. **Source of funding:** N.R.
Authors: McGee and Shaw, 2013.	No formal data extraction was conducted for this review which updates vitamin uptake rates for the Heart of Birmingham public health campaign reported by Moy et al 2012.	See Moy et al., 2012.	**Uptake of Healthy Start vitamins** **Year** **% children** **% women** 2012–2013 20 23 2011–2012 17.7 21.7 2010–2011 13.6 21.6 2009–2010 9.5 7.1 2008–2009 7 3.9 Pharmacies and children's centres contribute	Has been given the same quality rating as the original study [+]

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			significantly to the distribution of vitamin D supplements (distributing 20% and 29.7% of total vitamins respectively). The number of pharmacies that are now registered to issue vitamins has increased from 12–39 since April 2012,	

Study details	Population and setting	Intervention/comparator	Outcomes and methods of analysis	Results	Review team comments
Authors: McGee et al. **Year:** 2010 **Aim of study:** To estimate the cost of universal vitamin D supplementation for pregnant women (and up until their child is 12 months old) and children up to four years old, in Birmingham. **Type of economic analysis:** Cost analysis. Cost of universal vitamin D supplementation vs. Cost of treating cases of vitamin D deficiency. **Economic perspective:** NHS **Quality score:** (-) **Applicability:** Yes. Relevant at-risk group and UK setting.	**Source population/s:** Pregnant women and up to child is 12 months old. Also, children under 4 years old. **Setting:** City of Birmingham. **Data sources:** Local data on population numbers for target groups pregnant women and children under 4 years old (source not cited); incidence of vitamin D deficiency in under-fives 2009-2010 from survey of cases of children in three Birmingham PCTs treated for vitamin D deficiency; number of Healthy Start beneficiaries from DH data; local cost of Healthy Start vitamins; and costs of delivery to different distribution points. Cost of treating vitamin D deficiency estimated at £5,000 per year (source not cited).	**Intervention/s description:** Free universal vitamin D supplementation for pregnant women and up until their child is 12 months old as well as children up to 4 years old. **Comparator/control/s description:** N.A. Although the current situation is free supplementation for those who are eligible for Healthy Start scheme. **Sample sizes:** **Intervention: N=** 17,311 pregnant women and 68,609 children under 4 years old from three PCTs in Birmingham city. **Control N=** N.A.	**Primary outcomes:** Cost of free universal supplementation for 100% people in target group. **Secondary outcomes:** Cost of free universal supplementation for 10% of target group in 2 PCTs and 25% in the third. Cost of free universal supplementation for 25% of target group in all three PCTs **Time horizon:** One year **Discount rates:** Discount rates were not applied. **Costing method:** Study estimated the cost of supplementation for 100% of the target group. Because uptake of vitamin D supplements is currently 18% for women and 11% for children despite a 4 year campaign in the HoB PCT, costs were revised downwards to take into account lower uptake. The lower uptake rates for the two other PCTs reflects the low uptake in HoB PCT area at the start of the campaign.	**Primary analysis:** The maximum potential cost of supplementing all pregnant women, and children under four citywide was £659,952. Estimated cost of treating rickets for one year = £5,000 x 33 cases = £165,000. **Secondary analysis:** Assuming 10% uptake for both women and children in South PCT and BEN PCT, plus 25% uptake in HoB for the year 2011-12 would cost £102,984. Assuming 25% take up for both women and children citywide in subsequent years takes the cost to £164,988.	This was not a formal economic evaluation but an estimate of the costs of rolling out provision of free universal HS vitamins citywide to the target group. The target group included children under 4 years old whereas the current scheme provides for children under 5 years old. The report did not cite the source for the costs of treatment. Neither did it estimate any other benefits from the roll out of the programme citywide. Only the costs of vitamin supplements and delivery charges were included in the costs of the intervention. The study did not take into account other resource use items such as staff training, public awareness campaigns, or promotional materials for the 2 PCTs which do not currently have a free universal scheme in place.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Review team comments
Authors: Moy *et al.,* 2012 **Setting:** Birmingham **Aim of study:** To evaluate the effectiveness of public health campaign in reducing number of cases of vitamin D deficiency. **Study design:** Before-and-after without controls **Quality score:** + **External validity score:** ++	**Source population/s:** Inner city Birmingham. Campaign targeted at all pregnant and lactating women and those with children < 5 who were residents served by Heart of Birmingham Primary Care Trust (HoBPCT). 75% of the population are from at-risk ethnic minority groups. **Eligible population:** Eligible population and source population are the same. **Selected population:** No control group. **Excluded population/s:** N.A. Universal scheme.	**Method of allocation:** N.A. Universal scheme. **Intervention:** Universal vitamin D supplementation (one bottle = 8 weeks supply) programme for all pregnant and lactating women and those with children < 5. First vitamins given to mothers by health visitors when baby 2 weeks old. Health staff issued vitamins at health centres, childrens centres, GP practices and some pharmacies, as required until the child is 5 years old. Programme has been running for 4 years at time of publications. **Controls description:** N.A. **Study sufficiently powered:** N.A.	**Primary outcomes** Three outcomes none of which were specified as primary: change in the incidence rate of vitamin D deficiency; change in public knowledge of vitamin D; and uptake of vitamin D supplements. Validation of outcome measures not reported. **Secondary outcomes** N.A. **Follow-up periods:** All outcomes measured at 4 years. **Method of analysis:** All three outcomes measured before and 4 years after public health campaign. No statistical testing used.	**For primary and secondary outcomes:** Vitamin D deficiency incidence rate = 120/100,000 for children < 5 years resident in HoBPCT in the 12 months during 2005 and incidence rate in the 12 months between 2009 and 2010 = 49/100,000. Uptake data showed a year on year increase in the proportion of pregnant women and young children receiving vitamin D supplements, which in 2010 reached 17% for both women and children. Public awareness surveys in 2007, 2008 and 2011 showed 61%, 73% and 89% of respondents had heard of vitamin D: 21%, 41% and 79% knew that vitamin D	**Limitations identified by author:** This type of uncontrolled study is susceptible to problems of confounding such as an increasing public awareness of vitamin D and/or over the counter purchases by informed parents. **Limitations identified by review team**: The absence of a comparison group makes it impossible to know what would have happened without the intervention. **Evidence gaps:** NR **Source of funding:** Funding for the programme came from the HoB PCT, with a refund of the cost of supplements sought for all those eligible under the national Healthy Start programme.

Study details	Population and setting	Intervention/comparator	Outcomes and methods of analysis	Results	Review team comments
				was essential for bone health; and 20%, 56% and 85% knew that sunlight was the main source of vitamin D, respectively. **Total Sample:** Survey sample sizes for 2007, 2008 and 2011 were 100, 108 and 76, respectively. **Intervention Group(s)** N.A. **Control group(s)** N.A.	

NHS England results relevant to question 4

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: NHS England, 2010-2013 **Study design:** Survey within Healthy Start website. **Setting.** England and Scotland **Quality score:** -	**Research questions:** Not specifically reported, but appears to be to assess implementation of Healthy Start (HS), a UK-wide government scheme to improve the health of low-income pregnant women and families on benefits and tax credits, in health trusts across the UK. **Theoretical approach:** N.R. **Data collection:** Not specifically reported. A survey of health boards/trusts across the UK appears to have been conducted from 2010-2013. It is unclear whether this was a formal survey. Responses indicate that the same questionnaire was not used throughout, but variation was slight. No further details.	**Source:** Health organizations implementing the HS scheme across the UK. **Recruitment:** A selection of case studies describing vitamin distribution from 2010 to 2013, from health boards/trusts across the UK, was presented. The website implied these were good practice examples of HS vitamin distribution, but did not describe on what basis these were selected. 'Good practice' was not defined. **Sample:** 11 case studies were presented: Newham (London), Tower Hamlets (London), Birmingham East and North, Devon, East Sussex, Greater Glasgow and Clyde, Luton, South Birmingham, Stockport, Sussex Community NHS Trust – West Sussex, and Torbay (CS 1-11, respectively).	**Analysis:** The website displays a list of the health boards/trusts with links to individual case study. There was no analysis of the results. The experiences and achievements of 11 health organizations considered good practice examples were presented as case studies. **Study results by key themes:** Responses considered relevant to the review question have been reported, by case study, under four main themes: advertisement/promotion of the scheme; what worked well; challenges/difficulties encountered; advice for other primary care trusts. <u>Advertisement/promotion of the scheme:</u> CS 1: promotional materials displayed at all sites; staff wearing HS badges; article in the Council newsletter; media press release; hospital bulletin; presentation on the scheme at the Medicines Management Committee team meeting. CS 2: postcode based poster for health centres detailing the distribution centres in their area; detailed information leaflet on the	**Limitations identified by author:** The website notes that the case studies refer to organisations and arrangements which may no longer be in effect from April 2013 and the beginning of the new Health and Care system in England. **Limitations identified by review team**: The case studies were listed on the Healthy Start website providing information on the free vitamin scheme for users, health professionals and retailers. It was unclear whether a formal survey of health trusts had been conducted since no methodological details were provided. A series of case studies

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			HS scheme, with details and map of distribution centres. CS 5: local leaflet with vitamin distribution information is available widely, in libraries, GPs and local pharmacies. CS 6: selection of specific centres used solely by asylum seekers to promote the uptake of HS vitamins. <u>What worked well:</u> CS1: vitamin distribution exceeded targets, with 97% of women receiving first bottle and 73% collecting subsequent bottles; giving first bottle of vitamins to women at their initial antenatal appointment with directions to where to collect subsequent bottles; having one main site for vitamin distribution where all pregnant women can collect vitamins during antenatal care appointments. CS 2: provision of the vitamins universally to all women from their antenatal booking appointment; regular communication with key stakeholders to raise awareness of the scheme; development of operational procedures for the midwives and health visitors; outreach work within the community; increasing the number of distribution centres; having a small budget for communication and evaluation purposes. CS 4: engaging children's centres	considered to represent good practice was presented. 'Good practice' was not defined, so it was unclear what governed the selection of these examples. Characteristics of the sample not reported **Evidence gaps:** N.R. **Source of funding:** Department of Health, England.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			as the key distribution point. CS 6: engaging community pharmacies as the sole distribution points for the day-to-day distribution; the distribution of vitamin drops close to expiry (3 months left; collected from pharmacies) to those most in need through selected specific centres used solely by asylum seekers. CS 9: having the vitamins available at a central point so distribution can be monitored. CS 10: distributing from children's centres has resulted in increased uptake of vitamins. <u>Challenges/difficulties encountered</u>: CS1: poor knowledge amongst women of why they need to take HS vitamins and the benefits of vitamin D; getting midwives to register eligible women for the HS scheme and to talk to women about the importance of taking HS vitamins; getting GPs and community pharmacies to promote the local scheme. CS 2: key stakeholders fully engaging with the scheme; midwives and health visitors being able to allocate adequate time for discussion within clinics; increasing uptake for children. CS 4: encouraging children's centres to see that training new staff in child nutrition is beneficial in	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			terms of the services they provide to young families. CS 5: getting staff to have every available conversation with clients to boost the idea that vitamins are of value to their health. CS 11: collaboration with other health professionals to help market the vitamins more; difficult to inform the public of the scheme in their area. <u>Advice for other primary care trusts:</u> CS 1: if feasible, embed the scheme as part of the initial and routine care antenatal pathway from one main site, rather than organizing distribution from multiple sites. CS 2: engage the stakeholder, including the community, from the outset; communicate regularly with stakeholder to raise awareness of the scheme; ensure easy access. CS 3: engage stakeholders in the early stages and on an ongoing basis. CS 5: need for a good way of informing families of where they can get the vitamins. CS 7: establish simple procedures to encourage children's centres to become involved. CS 8: engage stakeholders in the early stages and on an ongoing basis. CS 9: consider midwives being able	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			to distribute to pregnant women; set up a system whereby all staff can distribute. CS 10: involve children and family centres as these venues are at the heart of the community. CS 11: organise a joint meeting with health centres, children centres, and nurseries to develop a marketing plan for the vitamins.	

NHS England results relevant to question 5

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: NHS England **Year:** 2010-2013 **Study design:** survey. Embedded within a website. **Country of study:** UK **Quality score:** -	**Research questions:** Not specifically reported, but appears to be to assess implementation of Healthy Start (HS), a UK-wide government scheme to improve the health of low-income pregnant women and families on benefits and tax credits, in health trusts across the UK. **Theoretical approach:** N.R. **Data collection:** Not specifically reported. A survey of health boards/trusts across the UK appears to have been conducted from 2010-2013. It is unclear whether this was a formal survey. Responses indicate that the same questionnaire was not used throughout, but variation was slight. No further details.	**Source:** Health organizations implementing the HS scheme across the UK. **Recruitment:** A selection of case studies describing vitamin distribution from 2010 to 2013, from health boards/trusts across the UK, was presented. The website implied these were good practice examples of HS vitamin distribution, but did not describe on what basis these were selected. 'Good practice' was not defined. **Sample:** 11 case studies were presented: Newham (London), Tower Hamlets (London), Birmingham East and North, Devon, East Sussex, Greater Glasgow and Clyde, Luton, South Birmingham, Stockport, Sussex Community NHS Trust – West Sussex, and Torbay (CS 1-11, respectively).	**Analysis:** The website displays a list of the health boards/trusts with icons to represent how vitamins are being distributed within that area, and provides a link to each individual case study. There was no analysis of the results. The experiences and achievements of 11 health organizations considered good practice examples were presented as case studies. **Study results by key themes:** Responses considered relevant to the review question have been reported, by case study, under four main themes: vitamin availability; distribution embedded into local delivery; organization of HS supply; evaluation/monitoring of distribution. Vitamin availability: CS1: 3 distribution centres (hospital antenatal centre, children's centre, birthing centre; HS vitamins distributed by midwives, health care assistants, children's Centre front desk staff and the maternity dietitian. CS2: 30 distribution centres across 8 local area partnerships; sites are a combination of antenatal clinics. Health visitor clinics, children's centres, health centres and pharmacies; not able to sell vitamins as no cash handling infrastructure; can exchange vouchers for vitamins. CS3: universal distribution in 26 child health centres, 17 children's centres, 25	**Limitations identified by author:** The website notes that the case studies refer to organisations and arrangements which may no longer be in effect from April 2013 and the beginning of the new Health and Care system in England. **Limitations identified by review team**: The study was embedded within a website providing information on the HS free vitamin scheme for users, health professionals and retailers. It was unclear whether a formal survey of health trusts had been conducted since no methodological details were provided. The numbers of organizations that implement the scheme, were approached and responded were not reported. There appeared to be slight variation on the questions asked; development and validation of the questions was not described. A series of case studies considered to represent good practice was

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			pharmacies and 8 GP surgeries; can exchange coupons for vitamins. CS4: 43 children's centres. CS5: 30 part-time distribution points (health centres and children's centres); decision not to sell as lack of cash handling infrastructure; also provides 'free' to homeless team clients. CS6: 52 community pharmacies; vitamins can be exchanged for coupons or purchased by those not on scheme. CS7: 23 children's centres and 3 health centres; vitamins can be exchanged for coupons or purchased by those not on scheme. CS8: universal distribution in 4 health centres, 18 child health clinics, 15 children's centres and through Family Nurse partnership and specialist midwives in local acute trust. CS9: 13 health clinics and 2 children's centres; vitamins sold to those not on the scheme. CS10: 6 health centres, 52 children and family centres, and midwifery and health visitor clinics. CS11: 4 children's centres; vitamins sold to those not on the scheme. Distribution embedded into local delivery: CS1: one main distribution site at the hospital antenatal booking centre (used by all pregnant women in the borough). CS2: Sticker goes on the front of the maternity hand held record as a record and prompt for vitamins. CS3: HS vitamin distribution in both maternity and health visiting service	presented. 'Good practice' was not defined, so it was unclear what governed the selection of these examples. Some case studies provide a very general statement relating to the demographic make-up of the area serviced by the health trust, but aside from that no other sample characteristics were given. There seems to be a lack of case studies from health boards/trusts in the North of England, Scotland, Northern Ireland and Wales. The potential for bias exists. **Evidence gaps:** N.R. **Source of funding:** Department of Health, England.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			specification. CS7: service located in heat of community, in locations that families will naturally frequent; avoided locating services in premises traditionally associated with ill health. CS8: HS vitamin distribution in both maternity and health visiting service specification. CS9: vitamins distributed in 15 community venues, during Well Baby clinics and other 'appointments'. Organization of HS supply: CS1: Dedicated part-time HS coordinator employed to order, distribute and monitor vitamins; single point of ordering and distributing vitamins and collating returns to Department of Health. CS2: HS support worker responsible for ordering vitamins, taking them to distribution centres, collecting and collating monitoring data. CS3: Dedicated health visiting clerical time for centralized ordering of drops and collation of distribution. CS4: Children's centres order through NHS locality bases, who order through supply chain. CS5: single point of ordering and collating returns through Public Health Coordinators office. CS6: community pharmacies order vitamins through the Public Health Pharmacy, who order from TPS Healthcare Group. CS7: PCT supplies vitamins to children's centres. Children's centres	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			complete monthly return of vitamins distributed and PCT despatches quantity of vitamins to ensure a small stock level is maintained. CS8: Dedicated health visiting clerical time for centralized ordering of drops and collation of distribution. CS9: central point of distribution. CS11: one person co-ordinates the vitamins for all the children's centres and liaises with the PCT. Evaluation/monitoring of distribution: CS1: HS Receipt Form used for all sites to record vitamins distributed and vouchers received, and data entered onto monitoring spreadsheet. CS2: evaluating distribution through uptake of HS vitamins and drops. CS3: monthly monitoring of distribution. CS4: monitoring form provides audit trail for distribution. CS5: simple internal stock monitoring. CS6: Participating pharmacies complete and return a monitoring form on a monthly basis. CS8: monthly monitoring of distribution. CS9: each clinic administrator gives monthly figures of vitamins distributed.	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Nicholls and Stocker, 2012 **Study design:** Interview and focus group. **Setting:** Cardiff, Wales. **Quality score:** -	**Research questions:** To assess levels of awareness of Healthy Start (HS) vitamins amongst health professionals and parents and to identify barriers to access to HS vitamins. The study was conducted during a project to pilot a process of provision of free Healthy Start vitamins amongst pregnant women, new mothers and children under 4 years in Cardiff. **Theoretical approach:** N.R. **Data collection:** From April to September 2012, structured telephone interviews were conducted with parents of children who had collected HS vitamins between 27/02/2012 and 11/03/2012 and structured face-to-face interviews were conducted with parents of children eligible for HS who were attending 'Flying Start' (FS) settings for sessions such as	**Source:** Parents of children who had collected HS vitamins in the preceding month, parents with eligible children attending sessions as part of the FS programme, and health visitors within the FS programme and in the generic service. The study was conducted in Cardiff. No further details. **Recruitment:** There appears to have been a list of children who had collected HS vitamins in the preceding month, the parents of whom comprised the telephone interview group. Apart from being recruited in Cardiff, no further details of recruitment were reported. **Sample:** 212 children were listed as having collected HS vitamins in the preceding month, of which 60 parents responded to the telephone interviews; 31 parents of eligible children attending sessions as part of the FS programme; 20 health visitors attended focus groups. No further details.	**Analysis:** Methods of analysis not reported Results presented as a mixture of descriptive statistics and collated responses, arranged in bulleted lists. **Study results by key themes:** **April to September 2012** **<u>Parents of children who had collected HS vitamins</u>** Use of HS vitamins (of the 60 parents interviewed, 5 had not used the vitamins issued, 14 had used them once only, and 14 had used more than one lot issued. **<u>Parents of eligible children engaged n the FS programme</u>** Awareness of HS vitamins (of the 31 parents interviewed, 26 had heard about HS vitamins from a health visitor (17), leaflet (4), midwife (2), jobcentre (1), milk vouchers (1) or from a friend when it was too late to access them (1)). Use of HS vitamins (7 of the 26 parents who had heard of HS vitamins did not use them, 17 had used them but stopped while the child was still eligible, and 14 of these had had repeat vitamins issued).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported as part of a performance evaluation report, which was incomplete. Details were obtained from several documents (two 4-slide summary presentations, and a 4-page report of the qualitative evaluation), reporting results at different time periods. Methodological details of the study were sparse, in particular for the first year of the project. The development and validation of the questionnaires was not reported, and no statements or original data were presented in support of material obtained from focus groups. It was unclear whether the same participants were followed throughout the study. The characteristics

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
	'State and Play'. Details of the interview questions and proforma were provided. Telephone responses were obtained from 60 of the 212 children listed; the other contacts did not have a telephone number, were unavailable, or did not wish to answer questions. Data from health visitors within FS and in the generic service were elicited through three focus groups. Information also appears to have been obtained from health visitors by questionnaire (April 2011) response rate approximately 18%. No further details provided.		**<u>Both sets of users</u>** Reasons for not using or repeating vitamins (parents found it difficult to access repeat issues; less contact with health visitor as child gets older; thought them unnecessary as child having formula milk or eating a healthy diet; used commercial vitamins instead as more convenient or thought to be better). Perceived benefits of taking HS vitamins (benefits most frequently mentioned by the parents were beneficial, good for health generally(16), recommended by health professionals (3), vitamin D/healthy bones or teeth (10) and a source of vitamins (9)). **<u>Health visitors</u>** Awareness (all health visitors in focus groups were aware of HS vitamins). Experience of working with project (problems with access if parent not seeing a health visitor; short expiry date for children's HS vitamins; some patients refuse vitamins as they believe their children have a healthy diet). Raising the topic of vitamins (best ways to raise the subject were both in clinic and during home visits, at birth and at 6 and 12 weeks, at 6 months for women breastfeeding, when the child is 12 months and 18 months, and at weaning parties;	of the participants were not reported, nor were details of the communities from which they were recruited. There is a potential for bias. The authors did not draw any formal conclusions, although they did list key points and issues identified from the data. **Evidence gaps:** N.R. **Source of funding:** Welsh Assembly Government.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			main message is the need for vitamin D intake due to lack of exposure to sunlight, especially in black and minority ethnic communities, although health visitors working in Ely thought their clients did not perceive vitamin D as an issue). Response to raising the topic of vitamins (very positive but access a major issue; working mothers do not go to the clinic to collect the free vitamins or coupons; some prefer to buy vitamins from supermarkets). Message reinforcement (at every clinic/home visit; involve other health professionals; more engagement with parents antenatally; use media to raise awareness). Reasons for low repeat vitamin use (parents do not understand or keep their coupons, or forget to take them when collecting vitamins; stock levels are occasionally low; parents rely on health visitors for their supply; underreporting on database programme). Perception of parental understanding (varies depending on what area they live in). Scheme improvements (easier access, such as receptionists in GP surgeries issuing vitamins; clinics which do not require parents to wait to be seen in order to collect their	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			vitamins; phase out coupons as they get lost). **1 April 2010 to 31 March 2011** Awareness (30% of parents spoken to during FS early years settings in February 2011 were aware of how to access free HS vitamins; 50% of health visitors correctly identified the children who should be offered HS vitamins; 86% of health visitors rated themselves as 7 or more in a *confidence in explaining Healthy Start vitamins to parents/carers*' scale (1 being not at all confident and 10 being very confident), with 81% rating themselves as 7 or more on a similar scale for confidence in issuing vitamins).	

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Review team comments
Authors: Stocker and Nicholls, 2012 **Setting:** Cardiff Wales. **Aim of service**: To pilot a process for distribution of Healthy Start vitamins that increases uptake and ensures equity of access. To raise awareness of the importance of HS vitamins. **Study design:** Before-and-after without controls **Quality score:** - **External validity score:** -	**Source population/s:** Pregnant women and mothers of young children up to age 4 years in Cardiff. No further details of the population **Eligible population:** Eligible population and source population are the same. **Selected population:** N.A. No control group makes it impossible to know what would have happened without the intervention. **Excluded population/s:** N.A. Universal scheme.	**Method of allocation:** N.A. Universal scheme. **Intervention:** Healthy Start vitamins for all pregnant women, new mothers and children under 4 years. Programme commenced in 2010. One of the performance measures is staff training but details are not reported. **Controls description:** N.A. **Sample sizes at baseline:** N.A. **Total sample:** N.A. **Intervention group:**N.A. **Control group:**N.A. **Study sufficiently powered:** N.A.	**Primary outcomes** Uptake of vitamins by children under 4 years and women. Staff training delivered. Awareness of Healthy Start vitamins among the public. Validation of outcome measures not reported. **Secondary outcomes** N.A. **Follow-up periods:** Performance measured each year for 2 years. **Method of analysis**: All outcomes measured before and each year after public health campaign. No statistical testing used.	**For primary and secondary outcomes:** 20% (4104) children in Cardiff, aged under 4 years, have received at least one bottle of Healthy Start vitamins. 35% (928) Flying Start children in Cardiff have received at least one bottle of Healthy Start vitamins. Flying Start is a service for children living in the most deprived areas. Among other things they have enhanced health visitor services. 100% GP practices received a promotional pack at start of the project including a copy of all project resources that had been developed. 68% of Health Visitors had received training on nutrition including healthy start vitamins in the last 12 months. 100% cardiff student health visitors had received training on nutrition including healthy start vitamins. All HV in focus groups aware of HS vitamin project. 84% parents interviewed at community play sessions had heard of healthy start vitamins **Total Sample:** N.A. **Intervention Group(s):** N.A. **Control group(s):** N.A. **Reporting results:** No statistical tests reported for differences over time in any of the outcomes. **Attrition details:** N.A.	**Limitations identified by author:** Not reported. **Limitations identified by review team**: This is a performance evaluation report whose aim is not to present results of a study but to report on the progress of a relatively recent public health campaign. The report is 4 pages long and summarises in bullet point format much of the projects successes. T The absence of a comparison group makes it impossible to know what would have happened without the intervention. The report does not present details of design or methods used for evaluation. Nor does it report details of how outcomes were measured. **Evidence gaps:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Review team comments
					Source of funding: Government of Wales.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Roberts, 2012 **Study design:** Survey. Reported in a draft local evaluation report, the documentation for which was incomplete. **Setting:** East London **Quality score:-**	**Research questions:** To measure registration and uptake of the Healthy Start for All campaign for Hackney between target groups (children aged under 4, pregnant women, women who have had a baby in the last year); to use SONAR pharmacy data to evaluate uptake by ethnicity, GP practice and pharmacy in the London borough of Hackney; and to obtain qualitative feedback on the awareness, perceptions of accessibility, knowledge and understanding of the scheme and its aims in scheme users (and eligible non-users) and healthcare professionals (HCPs) (scheme providers). **Theoretical approach:** N.R. **Data collection:** Surveys were conducted using questionnaires targeted at either the scheme provider or scheme user. Face-to-face and phone interviews	**Source:** Women who were pregnant, breast feeding or had recently had a baby, children under the age of 4, and HCPs (pharmacists, health visitors, midwives, GP surgery front line staff, children's centre workers, dietitians) in the London Borough of Hackney. **Recruitment:** The target populations came from six varied (unspecified) locations in the London Borough of Hackney. Interviews were conducted with scheme users at three children's centres. No further details. **Sample:** 19 mothers with children (from 3 children's centres). The mothers were either on the scheme or eligible for the scheme. The number of pharmacies, GP surgeries and other HCPs participating in the study was unclear. No further details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** **Scheme users and eligible non-users:** Knowledge and awareness of vitamins (most mothers lacked nutritional knowledge and understanding about the effects of vitamin D deficiency). Awareness of free vitamin schemes (12 mothers were unaware that vitamins could be obtained for free or could identify why they were needed; most mothers were unfamiliar of the Hackney scheme unless an HCP offered the service; 3 mothers were unaware of the Hackney scheme). Eligibility and access to the scheme (mothers not on the Hackney scheme confused it with the national scheme and thought they were not entitled to be on it; 5 mothers found the application process easy and straightforward, whilst 2 mothers found the scheme hard to get hold of and found follow-up poor, especially from midwives). Use of the scheme (7 mothers used the scheme for themselves, their children or both, and were very positive and happy with the service. One mother reported children drops were a nuisance. Those on the scheme were put off by the vitamins since they lacked other vitamins contained in multi-vitamin tablets).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This study was reported in a draft local evaluation report, comprising two incomplete documents. Details of the study methodology, data collection and analysis methods were lacking. The development and validation of the questionnaires was not described, and appendices showing the interview sheets were absent. Interpretation of the results was hindered by poor labelling of the graphs and a lack of explanatory comments regarding the tables. The tables appear to summarize individual responses from 18 of the 10 mothers and a selection of HCPs. The authors did not highlight that the

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
	were conducted with scheme providers. Face-to-face interviews with scheme users were conducted at children's centres. Scheme providers were asked about their overall understanding of the scheme and whether they considered it necessary. Scheme users were asked about their awareness of the scheme and their knowledge of vitamins. Each location was targeted on a different day. Information on vitamin uptake was obtained from SONAR pharmacy data.		Non-use of the scheme (the main reason for not using the scheme was the belief that vitamin supplements are not needed if children have a good diet rich in fruit and vegetables). Promotion of the scheme (all 19 mothers felt the scheme was not promoted sufficiently and should be promoted outside of the medical setting). Recommendations (scheme should be more widely advertised; information leaflets should be translated into different languages; the scheme should be differentiated from the national Healthy Start scheme). **Scheme providers (HCPs):** Knowledge and awareness of the scheme (scheme providers had excellent knowledge of why the scheme should be used, and were happy and supportive of the scheme; midwives, community nurse specialists, pharmacists, dietitians and health visitors were all aware of the scheme, whereas GPs could not be contacted and front line staff at GP clinics were less aware). Promotion of the scheme (midwives and health visitors promoted the scheme most directly to families and expectant mothers; three pharmacies reported they would directly approach families and expectant mothers; dietitians often referred to the scheme but directed eligible families to the pharmacy rather than sign them up). Perceptions of the scheme (the majority of scheme providers thought the scheme was	scheme in Hackney appeared identical in name to the national scheme for free vitamins. The study sampled from locations across the Borough of Hackney. Details of the numbers of mothers and HCPs approached and subsequently interviewed were lacking, both overall and according to location. The 19 mothers interviewed only represented three children's centres. The characteristics of the populations studied were also not reported, either overall or according to area. Such lack of data compromises the value of the results. **Evidence gaps:**N.R. **Source of funding:** NR.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
			an excellent idea, especially for Hackney because of the socioeconomic status of the area, and thought it was running well and was an efficient, effective service; pharmacies attributed the lack of repeat prescriptions to mothers being unaware that they do not need to re-register to obtain vitamins). Local and national vitamin schemes (there appeared to be confusion between the Hackney scheme and the national Healthy Start campaign, even amongst front line staff and especially within eligible target groups). Recommendations (more posters needed in children's centres; promotional information available in different languages; wider advertisement of the scheme; the scheme should be differentiated from the national Healthy Start scheme). Vitamin uptake by ethnicity (graphs showed the highest uptake by mothers was by the British in two of the three areas studied and by the 'other' category in the third; uptake by children was highest in the British in two areas, and in the Orthodox Jewish group in the third).	

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
Authors: Sharma *et al.*, 2009 **Study design:** Survey. **Setting:** London **Quality score:** -	**Research questions:** To determine the extent of biochemical vitamin D deficiency in infants (<1 year old) as a surrogate marker of maternal vitamin D deficiency. To find out the number of London antenatal units with established guidelines regarding vitamin D in pregnancy. **Theoretical approach:** N.R. **Data collection:** A retrospective audit was conducted for the focus of the study (infant vitamin D deficiency), which was not relevant to this question and will not be considered further. A telephone survey was conducted in June 2008. Enquiries were made to the midwife coordinator of the antenatal unit as to whether the department had guidelines on vitamin D. Responses were obtained for antenatal clinics in 24 of the 28 maternity units.	**Source:** Antenatal clinics of National Health Service (NHS) maternity units providing antenatal care in London. **Recruitment:** N.R. **Sample:** Antenatal clinics in 28 maternity units. No other details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** Departmental guideline on vitamin D in pregnancy (none of the 24 NHS antenatal care providers in London contacted had guidelines in place).	**Limitations identified by author:** N.R. **Limitations identified by review team**: This survey was not the focus of the study, and the details provided were sparse. In particular, there were no details of the sample selection method. The survey appears to have been conducted as a direct enquiry over the telephone. Characteristics of the maternity units (e.g. location) and communities they serviced were not reported. The survey has the potential to obtain reliable results. However, the potential for bias exists given the lack of details of the study sample and how it was selected. **Evidence gaps:** N.R.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				Source of funding: Not reported.
Authors: Sharma *et al.,* 2011 **Study design:** Survey. Reported in abstract form only**.** **Setting:** London **Quality score: -**	**Research questions:** To assess parental and paediatric healthcare staff's knowledge of vitamin D, and the need for vitamin D supplementation in children. **Theoretical approach**: N.R. **Data collection:** Survey by questionnaire, conducted between March and September 2010. No further details. 116 parents in total returned the questionnaire (number distributed was not reported).	**Source:** Parents, including paediatric healthcare staff, attending or working at St. Mary's Hospital, London, UK. **Recruitment:** A questionnaire was given to parents of children attending the paediatric outpatient department at St. Mary's Hospital, London, UK, and paediatric staff who were parents. No further details. **Sample:** 116 respondents. 92 parents attending the outpatients department (74 mothers, 18 fathers) and 24 parents who were healthcare staff (23 female and 1 male). 93 (80%) had children aged under 5. No other details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes:** Vitamin D supplementation (22 mothers received supplements during pregnancy and 14 while breastfeeding; 40% of children received supplements). Awareness of vitamin D supplementation (14% of mothers advised to take supplements during pregnancy and breastfeeding and 24% advised to give vitamin D to their children). Awareness of sources of vitamin D (18% of respondents unable to cite any sources). Awareness of risk factors for vitamin D deficiency (39% of respondents unaware). Awareness of government recommendations for vitamin D supplementation in children (84% of parents, 79% of healthcare staff unaware). Awareness of government recommendations for vitamin D supplementation for mothers during pregnancy and lactation (91% of parents, 88% of healthcare staff unaware).	**Limitations identified by author**:N.R. **Limitations identified by review team:** This study was reported in a published abstract, providing limited information. Details of the study methods were sparse. The development, validation and content of the questionnaire were not described. In addition, the response rate was not reported. The results are not reported separately for parents with children aged under 5, the at-risk group referred to in this review. This survey was conducted on parents, predominantly mothers, visiting the paediatric outpatients department or working as paediatric staff at one hospital. These factors could lead to

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				bias. **Evidence gaps**:N.R. **Source of funding:** N.R.
Authors: Zipitis *et al.,* 2011 **Study design**: Survey. Reported in a letter only. **Setting:** Manchester Quality score: -	**Research questions:** To assess maternity team awareness of the 2008 NICE antenatal guideline which recommends that all women should be informed at the booking appointment about the importance of maintaining vitamin D levels during pregnancy and the breastfeeding period. **Theoretical approach**: N.R. **Data collection**: A prospective audit over 1 week, conducted in January 2010, using specially designed proformas. No further details. Response rate 100%.	**Source**: New mothers and midwives at St. Mary's Hospital, Manchester UK. **Recruitment:** A random sample selected from a list of staff and mothers on postnatal wards at St. Mary's Hospital, Manchester, UK. **Sample**: 50 new mothers and 52 midwives. 72% of the mothers approached had at least one risk factor that put them in the high-risk category for vitamin D deficiency. No further details provided.	**Analysis:** Methods of analysis not reported. Descriptive statistics presented. **Study results by key themes**: <u>New mothers</u> Awareness of vitamin D supplements (16% of mothers had been informed). Vitamin D supplementation (19 mothers had been taking vitamin D supplements, of which 16 had obtained them over the counter). <u>Midwives</u> Awareness of guidelines (22 midwives were aware of NICE guidelines and 29% were aware of the Department of Health guideline for babies). Confusion as to who prescribes vitamin D supplements (68% thought the GP, 18% thought the obstetrician, and 14% were unsure). Knowledge of when supplements should be started (16 midwives knew that supplements should be started in the first trimester). Awareness of risk factors for vitamin D deficiency (65% of midwives were aware of who is considered high risk). Vitamin D levels (34% of midwives would want to have the blood levels checked of women considered high risk).	**Limitations identified by author:** N.R. **Limitations identified by review team:** This study was reported in a published letter, providing limited information. Details of the study methodology, data collection and analysis methods were lacking. The development, validation and content of the proforma were not provided. This was an audit of a small sample taken from one hospital, and the characteristics of the participants were not reported. Although the research aim was to assess maternal team awareness, only midwives were interviewed and not other members of the team. These factors could lead to bias.

Study details	Research parameters	Population and sample selection	Outcomes and methods of analysis Results	Review team comments
				Evidence gaps: N.R. **Source of funding**: NR.

Study details	Population and setting	Intervention/comparator	Outcomes and methods of analysis	Results	Review team comments
Authors: Zipitis et al. **Year:** 2006 **Aim of study:** To verify whether vitamin D deficiency is re-emerging in the catchment area since funding of vitamin D supplementation by Primary Care Trusts ceased, and to assess the cost-effectiveness of reintroducing vitamin D supplementation in the Burnley Health Care NHS Trust. **Type of economic analysis:** Reported cost-effectiveness analysis. However is a cost analysis based on retrospective patient data. **Economic perspective:** NHS **Quality score:** (-) **Applicability:** Yes. Relevant at-risk group and UK setting.	**Source population/s:** Vitamin D deficient patients presenting at a hospital paediatric department in Burnley, UK, between January 1994 and May 2005.. The area has a population of 242, 000 and has a large Asian community. **Setting:** Outpatient/inpatient care: Hospital paediatric department in Burnley, North West England, UK. **Data sources:** Data on patient demographics, prior vitamin use, investigations and treatment, inpatient care, follow-up appointments and final outcome were obtained from a review of patient records. Costs of investigations, hospital expenses and medication based on published sources (Trust departments and British National Formulary values). Yearly cost of multivitamins (Abidec) was an average from the published range. Trust figures and 2001 Census data also used.	**Intervention/s description:** Introduction of free vitamin D supplements to all Asian children in the Trust area up until they are 2 years old. **Comparator/control/s description:** Comparison is no free supplementation. **Sample sizes:** **Intervention** N.A. **Control** N.A. N=14 cases of vitamin D deficiency in the Trust area. 13 (93%) patients Asian; 1 (7%) White. 9 (64%) male and 5 (36%) female. 2 (14%) patients >2.5 years at presentation. 4 with rickets, 1 with hypocalcaemic fits, 1 with hypocalcaemic tetany, and 8 incidental findings. Iron deficiency anaemia present in 10 patients.	**Primary outcomes:** Total cost of treating vitamin D deficiency and the cost of primary prevention. **Secondary outcomes:** N.A. **Time horizon:** One year **Discount rates:** Discount rates were not applied. **Modelling method:** The cost of vitamin D supplementation was calculated for the Asian community and the entire Trust population, based on Committee on Medical Aspects of Food and Nutritional Policy (COMA) recommendations and current Department of Health (DH) guidelines. The analysis used an incidence of vitamin D deficiency of 1 in 117 children for the Trust's Asian population and 1 in 923 children for the Trust's overall population.	**Primary analysis:** The total cost of treating vitamin D deficiency was £2505 per patient, The cost of preventing one case of vitamin D deficiency (rickets) in the Trust's overall population was £19 013 (£47 534) per child according to COMA (DH) guidance, using an incidence of vitamin D deficiency of 1 in 923. The cost of preventing one case of vitamin D deficiency rickets in the Trust's Asian population was £2410 (£6025) per child according to COMA (DH) guidance using an incidence of vitamin D deficiency of 1 in 117. **Secondary analysis:** N.A.	This was a retrospective study based on a small sample of vitamin D deficient patients identified through hospital records. 8 of the 14 patients had been picked up incidentally, i.e. vitamin D deficiency was identified during investigation of a different complaint. Not all the health effects of supplementation with Abidec, a multivitamin preparation, were considered; just rickets. Not all relevant costs were included: costs of distribution, ordering or supply; public awareness raising; promotional materials, staff training. The authors acknowledge limitations of their study in that it was retrospective, and that the low socioeconomic status of the population studied may render generalisation of the results and recommendations problematic.

APPENDIX F

Excluded Studies List

Reference	Exclusion Reason
Anderson, F. 2005. Vitamin D for older people: how much, for whom and - above all - why? *Age and Ageing*, 34 (5), 425-6.	Ineligible intervention
Anon 2003. New guidelines for preventing rickets. *Child Health Alert*, 21, 3.	Ineligible intervention
Anon 2005. Noticeboard. Healthy Start for children in Devon and Cornwall. *Journal of Family Health Care*, 15 (6), 187.	Ineligible intervention
Avenell, A., Campbell, M. K., Cook, J. A., Hannaford, P. C., Kilonzo, M. M. & Et Al 2005. Effect of multivitamin and multimineral supplements on morbidity from infections in older people (MAVIS trial): pragmatic, randomised, double blind, placebo controlled trial. *BMJ*, 331 (7512), 324-9.	No relevant outcomes
Boullata, J. I. 2012. A rational approach to vitamin D supplementation. *Nutrition*, 28 (11-12), 1204-5.	Ineligible intervention
Chief Medical Officers 2012. Vitamin D – advice on supplements for at risk groups [letter], London, Department of Health.	No relevant outcomes
Cooke, L. 2011. Vitamin D and the impact on the health of the UK: our role as health professionals. Nursing in Practice, (62), 83-86.	Ineligible intervention
Cox, H., Puffer, S., Morton, V., Cooper, C., Hodson, J., Masud, T., Oliver, D., Preedy, D., Selby, P., Stone, M., Sutcliffe, A. & Torgerson, D. 2008. Educating nursing home staff on fracture prevention: a cluster randomised trial. Age & Ageing, 37 (2), 167-72.	Ineligible intervention
Crooks, P. 2006. Make sure they get a Healthy Start. Practising Midwife, 9 (11), 22-23.	Ineligible intervention
Dean, E. 2012. Tackling the deficiency. Midwives, 15 (6), 42-43.	Ineligible intervention
Department of Health 2012. Recommendations on using product label messages on vitamin D supplements for at risk groups. Aim is to promote the Chief Medical Officers recommendations vit D supplementations, London, Department of Health. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/141445/Wording-and-conditions-of-use-CMO-Vitamin-D-statement-05_E2_80_A6.pdf.pdf	No relevant outcomes
Dhesi, J. K., Moniz, C., Close, J. C. T., Jackson, S. H. D. & Allain, T. J. 2002. A rationale for vitamin D prescribing in a falls clinic population. Age & Ageing, 31 (4), 267-71.	Ineligible intervention
Dobson, R., Meier, U., Marta, M., Ramagopalan, S. & Giovannoni, G. 2011. Vitamin D deficiency-do we follow our own advice? Clinical Medicine, 11 (6), 521-3.	Ineligible population
Feeding for Life Foundation 2012. Best practice guidance. Community Practitioner, 85 (11), S6-S7.	Ineligible intervention
Feeding for Life Foundation 2012. Practical approaches to improve vitamin D intake. Community Practitioner, 85 (7), 1-5.	Ineligible intervention
Grant, W. B. 2009. Sufficient knowledge of the health benefits of vitamin D exists to modify public health recommendations now. Internal Medicine Journal, 39 (7), 488-9.	Ineligible intervention
Handel, A. E., Gillie, O. & Ramagopalan, S. V. 2011. Inequities in advice on vitamin D? QJM, 104 (6), 547-9.	Ineligible intervention
Hull, S. & Boomla, K. 2010. Vitamin D deficiency. New vitamin D preparations needed. BMJ, 340, c906.	Ineligible intervention
Hunter, D. 2012. Peep into policy, politics, Parliament. Current Vitamin D issues in the UK. *Perspectives in Public Health*, 132 (3), 103.	Ineligible intervention
Hypponen, E. & Boucher, B. J. 2010. Avoidance of vitamin D deficiency in pregnancy in the United Kingdom: the case for a unified approach in National policy. British Journal of Nutrition, 104 (3), 309-14.	Ineligible intervention
Jacobs, B. 2013. The forgotten vitamin? Journal of Family Health Care, 23 (2), 18-20.	Ineligible intervention

Reference	Exclusion Reason
Jean-Marie, S. 2007. Vitamin supplements: ensuring a healthy start in life. Nursing in Practice: The Journal for Today's Primary Care Nurse, (33), 43.	Ineligible intervention
Kirklees Council. 2013. Kirklees Council gives families a healthy start [Online]. Kirklees: Kirklees Council. Available: http://www2.kirklees.gov.uk/news/onlinenews//newsdesk/fullstory.aspx?id=5242 [Accessed 24 July 2013].	No relevant outcomes
Leaf, A. A. & Royal College of Paediatrics and Child Health Standing Committee on Nutrition 2007. Vitamins for babies and young children. Archives of Disease in Childhood, 92 (2), 160-4.	Ineligible intervention
Lowdon, J. 2008. Getting bone health right from the start! Pregnancy, lactation and weaning. Journal of Family Health Care, 18 (4), 137-41.	Ineligible intervention
Mouratidou, T., Ford, F., Wademan, S. & Fraser, R. 2010. Are the benefits of the 'Healthy Start' food support scheme sustained at three months postpartum? Results from the Sheffield 'before and after' study. Maternal & Child Nutrition, 6 (4), 347-57.	Ineligible intervention
National Health Service 2010. Healthy start: free milk, fruit, vegetables and vitamins for you and your family [leaflet], London, National Health Service. Available: http://www.healthystart.nhs.uk/wp-content/uploads/2012/06/HS01_Feb12_acc2.pdf	Ineligible intervention
National Institute for Health and Clinical Excellence 2008. PH11 Maternal and Child Nutrition, London, National Institute for Health and Clinical Excellence.	Ineligible intervention
NHS Central London Community Healthcare 2011. Improvement actions identified by local clinical audits conducted during 2010/11 London, National Health Service. Available: http://www.clch.nhs.uk/media/13314/CLCH_Clinical_Audit_Actions_for_Improvement_2010-11.pdf	No relevant outcomes
NHS East London and City & Roberts, H. no date. *Process evaluation of a new scheme offering free vitamins to families in Hackney and the City,* London, Public Health ELC [manuscript].	No relevant outcomes
NHS Scotland 2011. Prevention of ill health in older people: an economic analysis, Edinburgh, Scotland: Scottish Government.	Ineligible intervention
Renfrew MJ. 2012. *Healthy Start: Understanding the use of vouchers and vitamins* [Online]. Available: http://public.ukcrn.org.uk/search/StudyDetail.aspx?StudyID=11714 [Accessed 20 Jun 2013].	Ineligible intervention
Rhodes, L., Sunlight Exposure and Vitamin D Status of Children of South Asian Ethnicity Living in the UK. In: ClinicalTrials.gov [Internet]. Bethesda (MD): National Library of Medicine (US). 2000-2013. Available from: http://clinicaltrials.gov/show/NCT01623414 NLM Identifier: NCT01623414.	Ineligible intervention
Root, T. 2006. Lump sum needed (antenatal services). Community Care, (1623), 34-35.	Ineligible intervention
Santamour, B. 2009. AHA NOVA Awards. Hospitals & Health Networks, 83 (8), 36-40.	Ineligible setting
Scharla, S., 2005. Prevention of low-trauma fractures in older people. *Lancet,* 366 (9485), 543.	Ineligible population
Silver, H. J. 2009. Oral strategies to supplement older adults' dietary intakes: comparing the evidence. Nutrition Reviews, 67 (1), 21-31..	Ineligible intervention
Sivalokanathan S, Mcaree T, Jacobs B, Manickavasagar T, Brennan L, Bassett P, Rainbow S & M., B. 2012. Vitamin D deficiency in pregnancy a failure of public health policy? BMC Proceedings, 6 (Suppl 4), 9.	Ineligible intervention
Switzer, J. A., Jaglal, S. & Bogoch, E. R. 2009. Overcoming barriers	Ineligible population

Reference	Exclusion Reason
to osteoporosis care in vulnerable elderly patients with hip fractures. Journal of Orthopaedic Trauma, 23 (6), 454-9.	
Tedstone, A. 2013. Chief Medical Officer advice - Vitamin D supplements [letter], London, Department of Health.	Ineligible intervention
Tulchinsky, T. H., Kaluski, D. N. & Berry, E. M. 2004. Food fortification and risk group supplementation are vital parts of a comprehensive nutrition policy for prevention of chronic diseases. European Journal of Public Health, 14 (3), 226-8.	Ineligible setting
Twaddle, S., Bhatti, F., Marshall, M., Scottish Government, Nhs Scotland & Asd, H. 2011. Prevention of ill health in older people: an economic analysis, Edinburgh, Scotland: Scottish Government. Available: http://www.jitscotland.org.uk/downloads/1300715381-Prevention_of_Ill_Health_in_Older_People_-_Economic_Analysis%5B1%5D.pdf	Ineligible intervention
Walker, A. 2007. "Healthy Start": replacing Welfare Food Scheme for women and families. Journal of Family Health Care, 17 (2), 53-5.	Ineligible intervention
Wilkinson, S. & Walker, A. 2007. Healthy Start: improving maternal, infant and child health. Nursing Standard, 21 (20), 48-55.	Ineligible intervention

APPENDIX G

Literature Search Results

Table G.1: Literature search results

Resource	Number of results
AMED (Allied and Complementary Medicine)	94
ASSIA (Applied Social Science Index and Abstracts)	311
British Nursing Index	232
CINAHL (Cumulative Index of Nursing and Allied Health Literature)	2137
ClinicalTrials.gov	145
Cochrane Central Register of Controlled Trials (CENTRAL)	711
Cochrane Database of Systematic Reviews (CDSR)	43
Database of Abstracts of Reviews of Effectiveness (DARE)	166
DoPHER (EPPI Centre database)	19
Embase	6217
Google	91
Health Management Information Consortium (HMIC)	146
International Clinical Trials Registry Platform (ICTRP)	285
MEDLINE and MEDLINE in Process	7335
metaRegister of Controlled Trials (mRCT)	282
OAISTER	711
OpenGrey	11
PAIS International (Public Affairs Information Service)	38
POPLINE	317
PsycINFO	525
Social Care Online	35
Social Policy and Practice	98
Social Sciences Citation Index (SSCI), Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH)	698
TRoPHI (EPPI Centre database)	26
UK Clinical Research Network Portfolio Database	92
WHOLIS	12
Web of Science citation search	35
Google Scholar citation search	77
MEDLINE and MEDLINE in Process author name search	292
Lead author webpage search	102
Additional results	90
TOTAL LITERATURE SEARCH RESULTS	21373
TOTAL LITERATURE SEARCH RESULTS AFTER ENDNOTE DE-DUPLICATION	12955

APPENDIX H

Additional Publications to the Included Primary Studies

Table H.1: Secondary publications to the primary study included in this review

Excluded publication	Type of publication	Related to included study
McGee 2013	Journal article reports on the orginal public health campaign. No new data.	Moy *et al.,* 2012
McGee, 2011	Presentation slides of the original campaign.	Moy *et al.,* 2012
Lucas, 2013	Full report of the Healthy Start vouchers study	Jessiman, 2013
Lucas, 2013a	Executive report of the Healthy Start vouchers study	Jessiman, 2013
Lucas, 2013b	Leaflet for professionals produced from the Healthy Start vouchers study	Jessiman, 2013
Nicholls and Stocker, 2011	Evaluation report for first year of Cardiff Vitamin Project	Nicholls and Stocker, 2012

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