All-Party Parliamentary Osteoporosis Group (APPOG)

Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health

Main report
June 2011
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of abbreviations</td>
<td>3</td>
</tr>
<tr>
<td>Foreword</td>
<td>4</td>
</tr>
<tr>
<td>About the All-Party Parliamentary Osteoporosis Group</td>
<td>5</td>
</tr>
<tr>
<td>About the inquiry</td>
<td>6</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>7</td>
</tr>
<tr>
<td>Executive summary</td>
<td>8</td>
</tr>
<tr>
<td>Nutritional and scientific factors</td>
<td>16</td>
</tr>
<tr>
<td>Public health, socio-economic, ethnic and geographical factors</td>
<td>18</td>
</tr>
<tr>
<td>Supplementation and fortification</td>
<td>21</td>
</tr>
<tr>
<td>Influencing, advertising and the media</td>
<td>24</td>
</tr>
<tr>
<td>Public policy</td>
<td>26</td>
</tr>
<tr>
<td>Conclusions and recommendations</td>
<td>32</td>
</tr>
<tr>
<td>References</td>
<td>38</td>
</tr>
</tbody>
</table>
Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health

List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPOG</td>
<td>The All-Party Parliamentary Osteoporosis Group</td>
</tr>
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<td>BMI</td>
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<td>CPTA</td>
<td>The Cosmetic, Perfumery &amp; Toiletry Association (CPTA)</td>
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<td>CQC</td>
<td>Care Quality Commission</td>
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<td>European Food Standards Authority</td>
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<td>EU</td>
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<td>LRNI</td>
<td>Lower Reference Nutrient Intake</td>
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<td>NDNS</td>
<td>National Diet and Nutrition Survey</td>
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<td>NICE</td>
<td>National Institute for Health and Clinical Excellence</td>
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<td>nmol/l</td>
<td>nanomoles (nmol) per litre (l)</td>
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<td>NOS</td>
<td>National Osteoporosis Society</td>
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<td>PCT</td>
<td>Primary Care Trust</td>
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<td>SACN</td>
<td>Scientific Advisory Committee on Nutrition</td>
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<td>SCIE</td>
<td>Social Care Institute for Excellence</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>US</td>
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<td>UV</td>
<td>Ultraviolet</td>
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<td>World Health Organisation</td>
</tr>
</tbody>
</table>
4

It is a long-held adage that we are what we eat. Our skeletons are no exception to this rule: food and nutrition plays a vital role in the health of our bones.

Broken bones are a major public health concern. In the UK, 1 in 2 women and 1 in 5 men will suffer a fracture at some point after the age of 50, mainly because of poor bone health. Hip fractures are the commonest cause of accident-related death in older people. They are also expensive to treat and care for. Between 1998/99 and 2008/09, the number hospital admissions in England for hip fracture increased by 17%. At 87,000 cases per year, UK hip fracture rates are currently among the highest in the EU.

Osteoporosis, which causes fragile bones, can lead to painful and disabling fractures. Fragility fractures are low-trauma fractures, such as those which result from a fall from a standing height or less. Vertebral fractures can occur spontaneously. Every year in the UK, there are more fragility fractures than heart attacks and strokes. Broken bones resulting from osteoporosis cannot be ignored.

A healthy lifestyle, including a balanced diet, can help to reduce the risk of osteoporosis and broken bones. However, the reality is that a significant proportion of the UK population are deficient in the vitamins and minerals needed to maintain good bone health. One in three people do not know about the positive role that diet can play in preventing osteoporosis. Across all generations, a greater focus is needed on better nutrition to improve the health of our bones.

The Government is taking steps to address this: it has set out a systematic approach to falls and fracture prevention in the Prevention Package for Older People. This is supplemented by a range of guidance on nutrition in individuals of all ages.

This report describes the challenge of improving bone health through better nutrition, in addition to how it may be met. It sets out a number of recommendations to Government, the NHS, Local Authorities, social care providers, those delivering public health messages and industry. The general public deserve to be fully informed about the steps they can take to prevent the risk of osteoporosis in later life. They should also be able to access services which will help them to do so.

Gordon Marsden MP
Co-Chair
APPOG

The Baroness Cumberlege CBE DL
Co-Chair
APPOG
About the All-Party Parliamentary Osteoporosis Group (APPOG)

APPOG has been in existence for more than a decade and is supported by the National Osteoporosis Society. We seek to inform both Houses about all aspects of osteoporosis. The group meets twice a year at Westminster. It is co-chaired by Gordon Marsden MP (Labour, Blackpool South) and the Baroness Cumberlege CBE DL (Conservative). Lorely Burt MP (Liberal Democrat, Solihull) and Linda Riordan MP (Labour/Co-operative, Halifax) hold the positions of vice-chair and secretary respectively.

More information on the group’s work is available on our website: http://www.nos.org.uk/appog

All correspondence should be addressed to James Cooper APPOG Administrative Secretary. James can be contacted by email (appog@nos.org.uk) or telephone (01761 473 253). You can write to APPOG c/o National Osteoporosis Society, Camerton, Bath, BA2 0PJ.
Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health

About the inquiry

APPOG has examined the role of nutrition in promoting good bone health and preventing osteoporosis, incorporating the role of both diet and safe-sunlight exposure.

The inquiry has examined the types of lifestyle choice that we need to make to provide ourselves with the nutrients necessary for healthy bones. We have sought to establish the impact of current dietary and sunlight exposure patterns upon bone health in England. APPOG has scrutinised the barriers that prevent people from eating a healthy diet and obtaining safe exposure to sunlight. We have also studied the place of supplements and food fortification in supporting good nutrition for our bones.

Terms of reference

The inquiry has sought written submissions which address the following issues:

a) nutritional and scientific factors
b) public health, socio-economic, ethnic and geographical factors
c) supplementation and fortification
d) influencing, advertising and the media
e) public policy

The inquiry sought submissions from all stakeholders with an interest in bone health and other relevant parties which included:

• patients, carers and the organisations that represent them
• health and social care professionals
• nutritionists and scientists whose work falls within the scope of the inquiry
• public health officials
• commissioners
• third sector organisations
• the food industry, including those organisations involved in manufacturing, processing, advertising and retail
• the cosmetics industry.
Timescale

A call for written evidence was made on 10 November 2010 with a deadline for submissions set for 4 January 2011. Following this date, the APPOG co-chairs selected witnesses to approach to provide oral evidence to a panel of MPs and Peers.

The oral evidence sessions were held at Westminster on Tuesday 8 February and Wednesday 2 March. The transcript of the first session, in addition to a summary of the second, can be read in Appendix One.

Evidence

We received 58 written replies to the call for written evidence and welcomed seven witnesses in total to the two oral evidence sessions. The key messages in this report have been drawn from this evidence and form the basis of the recommendations which APPOG makes.

Acknowledgements

APPOG wish to thank the National Osteoporosis Society for coordinating the call for evidence, submission handling, oral evidence session and writing this final report.

The group also extends its thanks to all those who submitted evidence and attended to give evidence at the oral sessions.

**This inquiry has covered England only**
Our bone health is largely dependent on the genes we inherit from our parents. Evidence shows, however, that individuals can take steps throughout their lives to build and maintain healthy bones. These include:

- eating a healthy, balanced, calcium-rich diet
- obtaining 10 minutes of sun exposure to the face and arms without sunscreen once or twice a day, every day, between May and September, taking care not to burn
- taking weight-bearing exercise at least 3-4 times a week for a minimum of 20 minutes
- avoiding smoking
- drinking only moderate amounts of alcohol.

In this report, the All-Party Parliamentary Osteoporosis Group (APPOG) examines the link between diet, sunlight exposure and good bone health. The group has sought oral and written evidence from a variety of sources and a summary of the group’s recommendations are contained in this executive summary. APPOG’s recommendations apply to England only.

Osteoporosis, which causes fragile bones, can lead to painful and disabling fractures. Fragility fractures are a major public health concern: 300,000 fragility fractures occur in the UK annually, compared to 275,000 heart attacks and 110,000 strokes and Transient Ischemic Attacks (TIAs). At 87,000 cases per year, UK hip fracture rates are currently among the highest in the EU.

APPOG is concerned that the recorded incidence of fractures among older people in England has risen in the past decade: in England, between 1998/99 and 2008/09, the number of men admitted to hospital for a hip fracture increased by 77%. The overall rise for both men and women was 17%. Many patients die within weeks of their fracture: 20% of hip fracture patients will die within four months of their injury; 30% will die within a year.

Broken bones caused by osteoporosis are hugely expensive to treat and care for: the combined annual cost of hospital and social care for patients with a hip fracture in the UK was calculated in 2001 to be £1.7 billion; we now estimate this to be £2.3 billion - that’s more than £6 million a day.

There are a number of factors which contribute to fracture risk, including individuals’ bone health and their likelihood of suffering a fall. There are also a number of clinical and lifestyle factors which can increase the risk of osteoporosis, which include poor diet and inadequate safe exposure to sun. Evidence suggests that a significant proportion of the UK population is not receiving the recommended levels of the nutrients that are necessary to maintain good bone
Nutritional guidance and advice provided by Government, based on scientific evidence, shows how bone health can be supported by following certain dietary and lifestyle principles. It is not possible at this time to demonstrate a direct link between the increase in fracture rates and poor nutrition. Indeed, some studies suggest that increases in the incidence of hip fractures may be due to rising life expectancy. However, it follows that by adopting a healthy lifestyle, the risk of breaking a bone as a result of osteoporosis in later life is likely to be reduced.

This inquiry has found that official guidance is being used inconsistently and is inadequately promoted. By following published advice, commissioners and providers of health, social care and public health services could improve bone health through better nutrition. There is, in particular, a plethora of guidance in relation to the nutritional needs of older people in hospital or residential or nursing care, who represent the group most vulnerable to osteoporosis and broken bones. In neglecting the nutritional needs of older people, an opportunity is being missed to reduce their risk of suffering painful, debilitating and costly fractures.

APPOG is concerned about the potential impact of the current nutritional status of the population upon the future fracture incidence, which is already likely to increase as the UK population gets older. Thus, there is considerable scope for all stakeholders to work both independently and collaboratively to promote better nutrition to tackle the devastating effects of osteoporosis.

**APPOG makes the following recommendations:**

1. **Existing guidance on dietary supplementation must be implemented more effectively**

There is a need for more effective targeting of services towards groups of people who have been identified as being vulnerable to undernourishment, particularly with regard to vitamin D. These include:

- young children
- pregnant and breastfeeding women
- vegans and vegetarians who choose not to consume eggs or fortified spreadable fats
- individuals who wear full-body dress or avoid sunshine for cultural, religious or other reasons
- individuals who are unable to go outdoors, and
- elderly people, particularly those in residential care.

Currently, the Department of Health (DH) recommends that vitamin D supplementation is practiced by all vulnerable groups including children under the age of five, pregnant women, breastfeeding mothers and people over the age of 65.
It has made vitamin D supplements available through the Healthy Start initiative.

The National Institute of Health and Clinical Excellence (NICE) also advocates calcium and vitamin D as a pharmacological treatment for post-menopausal women with osteoporosis, to be used in conjunction with other bone-protecting medication. **A recent national audit has shown that this guidance is being poorly and inconsistently implemented.** We note the recent concerns raised about risks associated with calcium and vitamin D supplementation. We support the National Osteoporosis Society’s position, which is that the studies highlight the need for care when considering taking supplements. If individuals can get all of the calcium that they need from their diet, and adequate vitamin D from exposure to sunlight, then a supplement will not be necessary. The charity clearly states that boosting calcium beyond recommended levels has no extra benefit for bones.

Whilst we understand the need for and the benefits of clinical discretion, we regret that guidance on dietary supplementation has been inconsistently implemented by commissioners and providers of health and social care services across England. Thus, a greater awareness of these guidelines is needed among:

- Primary Care Trusts (PCTs) and commissioning consortia (subject to the passage of the Health and Social Care Bill)
- NHS Trusts
- health and social care professionals
- Local Authorities
- providers of social care services (in particular those who run residential care homes and nursing homes for older people)
- patients
- the general public.

**We call upon Local Authorities to use the extended powers proposed for them in the Health and Social Care Bill.** They must scrutinise the extent to which nutrition and safe-sunlight exposure feature within commissioning agreements and care pathways, agreed between GP commissioners and provider organisations. Local Authorities must also deliver outcomes-focussed public health campaigns which seek to achieve reductions in hospital admissions for fractures in older people. As part of this work, they should promote good nutrition and safe-sunlight exposure to individuals of all ages.

Ultimately, local ownership of guidelines by all parties, overseen by the proposed local Health and Wellbeing Boards, would lead to better adherence. Where they are not doing so already, **GPs must take on a strong advocacy role for older patients in residential care:** they must help care professionals to ensure that recommended dietary supplements are administered to older people at the right time and in the right way.
Subject to the passage of the Health and Social Care Bill, the NHS Board and Public Health England will need to work closely with these local stakeholders. There is also an important role for the Care Quality Commission (CQC) in ensuring that guidance is implemented in health and social care settings.

2. A clearer official position on vitamin D intake and safe sunlight exposure is needed

The decline in dairy food consumption and the prevalence of unhealthy diets among the general population means that the full complement of nutrients required for good bone health are not being consumed.

Recent health campaigns such as Cancer Research UK’s SunSafe initiative have emphasised the need to stay out of the sun at peak hours, cover up and apply sun screen. However, completely avoiding sunlight exposure during peak hours may mean that individuals do not get adequate exposure to ensure good vitamin D levels.

It is worrying that the recorded incidence of fractures among older people in England has risen in the past decade. We welcome the National Osteoporosis Society’s plan to publish figures which will provide 25-year projections for the incidence and cost of hip fractures in England shortly after the publication of this report. We understand that both incidence and cost are expected to rise.

Despite concerns about the nutritional intakes of the population of England, it is possible that rising life expectancy may underlie increases in incidences of hip fractures. However, it follows that by adopting a healthy lifestyle, the risk of breaking a bone as a result of osteoporosis in later life is likely to be reduced. As such, it would appear beneficial to promote healthy diet and safe sunlight exposure as part of a strategy to prevent osteoporosis and fractures.

There is also a lack of a clear message regarding safe sun exposure. We recognise the difficulties associated with providing this clarity, due to the need to balance the promotion of sunlight exposure for the benefit of bone health and the need to advocate care in light of the associated risks with skin cancer.

APPOG welcomes the recent joint position statement on vitamin D agreed by the British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society.

The statement describes the time required to make sufficient vitamin D as “typically short and less than the amount of time needed for skin to redden and burn.” It states that “regularly going outside for a matter of minutes around the middle of the day without sunscreen should be enough. When it comes to sun exposure, little and often is best, and the more skin that is exposed, the greater the chance of making sufficient vitamin D before burning. However, people should get to know their own skin to understand how long they can spend outside before risking sunburn under
different conditions.”

The National Osteoporosis Society recommends obtaining 10 minutes of sun exposure to the face and arms without sunscreen once or twice a day, every day, between May and September, taking care not to burn.

Vitamin D is available naturally in oily fish and egg yolks. Otherwise, dietary sources of vitamin D are provided by supplements and fortified products. In the UK, it is mandatory to fortify hard margarines with vitamin D. Soft margarines are voluntarily fortified; vitamin D is also added to some breakfast cereals. In contrast, for example, vitamin D fortification is added to:

- milk in the United States, Canada, Finland and the Republic of Ireland
- bread in Jordan.

It is the view of some that individuals should either take a vitamin D supplement or obtain more safe-exposure to sun during the summer months. Some also advocate the promotion of vitamin D fortification in a wider range of food and drink products. This could be achieved through a mixture of mandatory and non-mandatory food and drink fortification.

Conflicting opinions are a barrier to achieving a clear official position on vitamin D intake and safe sunlight exposure. During this inquiry’s first oral evidence session, health journalist and researcher Dr Oliver Gillie stated that a minimum level of 75nmol/l of vitamin D in the blood should be achieved. He went further by suggesting that recommended blood levels should actually be 100 nmol/l or 120nmol/l to ensure a minimum level of 75nmol/l throughout the year. Dr Gillie even suggests that a level of up to 350 nmol/l is safe.

In contrast, the UK minimum threshold for vitamin D is currently set at 25nmol/l\textsuperscript{15} by the Department of Health. Individuals with a vitamin D blood level below this are considered to be at risk of deficiency. In the United States, the Institute of Medicine (IOM) states that 50nmol/l per litre is adequate.

A further complication to the debate is the lower vitamin D levels found in populations in northern areas of the UK. During the first oral evidence session, Dr Helen Macdonald cited data from a recent study which shows that a greater proportion of women in Aberdeen demonstrate vitamin D deficiency (below a blood level of 25nmol/l) compared to women in Surrey. In Aberdeen, 40% women had below the minimum recommended amounts of the vitamin during the winter, compared to 10% in Surrey. During the summer, 9% of women in the north-east of Scotland still lacked vitamin D.

Clarity is now required in Government-sponsored sun-safety messages and more needs to be done to emphasise the importance of adequate exposure to sunlight to ensure necessary levels of vitamin D. This would benefit patients, carers, professionals and the population as a whole. It would also help producers and retailers of food and dietary supplements, which
require a clearer policy on the amounts of vitamin D which are effective and safe for the public to consume. This will enable industry to develop and target new products more effectively. We welcome the in-depth review being undertaken by the Scientific Advisory Committee on Nutrition (SACN) into the available evidence on vitamin D. We call upon SACN to complete the review as speedily as possible, and look forward to its findings.

In the meantime, we call upon cosmetics firms to continue to ensure that the range of non-sun-care products they provide (such as moisturiser creams and makeup, for example) enables consumers to choose products which do not have active Ultraviolet (UV) filters added.

3. A wider choice of dietary supplements and fortified and non-fortified products should be made available

APPOG recognises the risks and benefits associated with food fortification. It offers the potential for improving the intake of nutrients vital for bone health among the general public. Fortification is, however, a potential blunt instrument: risks to public health could emerge if those who are not malnourished unwittingly overdose on vitamins and minerals through fortified products.

We also recognise that some consumers hold concerns about the fortification of food. The food and drink industry has drawn attention to data which suggests that consumers can be wary of ‘unnatural’ processing of foods and may be resistant to the fortification of products they consider to be natural, such as milk. Similarly, research has shown that consumers are more attracted to products considered intrinsically healthy as opposed to ones which have been manipulated to be healthy. Thus, whilst the industry is receptive to exploring the idea of fortification of products like milk, they advocate the need to test public perception first.

APPOG recognises that the fortification of food and drink does necessarily not mean that products have been artificially processed. We also believe that fortification should not mean that a food or drink product is rendered ‘unnatural’. Fortification could play a role in improving the bone health of the general public. However, any decisions made by policy makers and the food and drink industry must carefully balance the associated opportunities and risks. The ability for consumers to choose both fortified and non-fortified versions of certain products must also be ingrained in any new approach.

Within this context, we propose that, when the recommendations of the SACN vitamin D review are made public, consumers should be offered a better choice of fortified and non-fortified food products. The labelling of fortified foods can play a role in advocating the health benefits of adequate vitamin D and calcium consumption.

Coupled with better targeted information about sunlight exposure and vitamin D requirements, this should give consumers an opportunity to make better informed choices about their diet and lifestyle.
Consistent with the Government’s new strategy for public health in England, **APPOG calls for a more joined-up, outcomes-focussed approach to the fortification of food.** For example, spreadable fats such as margarine are currently fortified with vitamin D in the UK. However, advocating an increase in spreadable fat intake is not a message which is necessarily consistent with a healthy diet. Spreadable fats are also fortified with vitamin A, which pregnant women are advised not to consume too much of. Fortification should support nutritional messaging which can be targeted at particular groups, including pregnant women.

The inquiry has learnt that excessive intake of vitamin A can be harmful to bone health. **APPOG calls for a better choice of supplements which exclude vitamin A to be made available to consumers.**

4. **Malnutrition among older people in hospital must be tackled**

Malnutrition hinders patients’ recovery from broken bones and harms their overall wellbeing. **Recent studies have shown some deeply concerning cases of malnutrition among older people in hospitals in England.** In February 2011, the Parliamentary and Health Service Ombudsman highlighted common failures in ensuring adequate nutrition in older people. In May 2011, the Care Quality Commission also drew attention to recurring concerns relating to nutrition in NHS hospitals in England.

NHS Trusts in England must ensure that identification of poor nutrition occurs. They must make certain that the guidance and advice produced by DH and other organisations on maintaining good nutritional intakes among inpatients is implemented. Studies have shown that oral nutritional supplements can improve nutritional status and reduce mortality and complications for undernourished elderly patients in hospital. Adequate intakes of protein and calcium are particularly important to promote good bone health in this setting.

This report highlights evidence which shows that older people (and in particular those who are immobile and/or who live in long-term residential or nursing care settings) are at risk of vitamin D deficiency. As such, **it is crucial that those designing and implementing social care services ensure that residents receive a nutritious diet and recommended dietary supplementation.** The Social Care Institute for Excellence (SCIE) has produced guidance on nutrition for professionals working in residential and nursing homes. These institutions should be regularly monitored to assess the extent to which this guidance is implemented.

As stated in recommendation one, **GPs must also take on a strong advocacy role for their older patients in care homes to ensure that they are well-nourished.**

5. The food supplement industry should have greater freedom to create vitamin D products which can be targeted at different demographic groups.
The European Food Standards Authority (EFSA) should make it easier for the food, drink and dietary supplement industries to make positive claims about role of vitamin D in maintaining good bone health. **EFSA should process existing applications which seek approval for health claims in relation to vitamin D consumption.** We call upon the Department of Health highlight this issue as part of its interaction with EFSA. APPOG believes that this would allow the dietary supplement industry greater freedom to create vitamin D products which can be targeted at different demographic groups.

6. Public health messaging on diet must not focus solely on obesity

This inquiry has learnt that a well-balanced diet, consisting of all the food groups and reflecting the eatwell plate, is necessary for good bone health. Nutritional messages pertinent to a reduction in osteoporosis risk can also be used to promote the full spectrum of bone health. They can help to tackle the worrying increase in cases of rickets and osteomalacia among infants and young people, in addition to reducing the risk of broken bones suffered by older individuals.

Expert dietary advice for maintaining bone health is largely consistent with the Government’s own healthy eating messages, which are publicised through initiatives such as Change4Life. Ultimately, a balanced diet and safe-exposure to sunlight could help older people to stay well for longer. This could reduce their risk of being admitted to acute hospitals and save valuable NHS and social care resources. We call upon the Government to ensure that the public’s perception of initiatives to improve nutrition is not confined to a narrow set of intended outcomes, such as a reduction in incidences of obesity. Change4Life participants from all age groups should be told that a healthy lifestyle will improve their overall health and wellbeing, including their bone health, rather than help them to just lose weight.

7. There should be opportunities for young people to learn about bone health in the classroom

Among young people, awareness of osteoporosis and the steps that can be taken to prevent it is poor. As it reviews the National Curriculum in England, **we call upon the Government to ensure that provision is made to allow the teaching of bone health in schools.** APPOG also calls on the Government to encourage Healthy Schools Co-ordinators to cover bone health in the education of pupils, teachers and parents. Local Authorities and School Boards should also ensure that school nurses receive training in understanding bone health.

APPOG recognises the difficulty in developing universal nutritional guidance for bone health, particularly as messaging varies by target population. Thus, moving forward, messages need to be tailored to intended populations.

Industry has shown considerable interest in working with the Government to develop policies and media campaigns centred on promoting good nutrition for bone health. APPOG encourages the development of collaborative campaigns promoting good bone health and the ways of achieving it.
Nutritional and scientific factors

What is the relationship between nutrition and osteoporosis?

Whilst genetic factors account for up to 80% of the variation in adult bone mass, there are interactions between environmental, dietary and lifestyle factors which also add to a person’s susceptibility to osteoporosis.

Nutrition plays a key role in building and maintaining bone mass. An individual’s bone mass increases until their late twenties. It then stabilises, before declining after the age 35. Thus it is important to follow a diet conducive to bone health during the earlier years of life to set the highest peak bone mass possible.

A healthy balanced diet is required to maintain good bone health, as it is to maintain good general health. Bone requires a range of vitamins and minerals in order to remain healthy. The most important nutrients, vitamins and minerals required include calcium, vitamin D, zinc, boron, copper, magnesium, vitamin K, silicon and folic acid, among others.

Poor dietary choices can promote the loss of calcium and hence the structural integrity of bone. Diets high in sodium can promote mineral loss from bone and therefore it is important to avoid diets high in salt.

Rapid weight loss induced by hospital stays will not only have a profound impact on bone health but also inhibit general health and recovery.

Are there key dietary patterns that promote good bone health?

Calcium intake shows a strong correlation with bone mass in children and therefore, there is a strong requirement for a child’s diet to be rich in calcium. Some evaluations of dietary sources suggest that generally, three portions of dairy food per day are required to maintain adequate calcium intake. However, this will vary over the lifespan as need and ability to absorb naturally varies.

For some people there are considerable obstacles to maintain an adequate calcium intake. Many people are keen to cut down on dairy consumption as it is typically associated with being high in fat and therefore, bad for health. This is despite the fact that lower-fat dairy products typically contain higher levels of calcium. There is an estimated 5% of the UK population with lactose intolerance who are unable to consume dairy foods. Consumer surveys suggest that individuals who follow a vegan diet, which includes avoiding dairy produce, comprise approximately 1% of the UK population. For these people, there is a need to find alternative sources of calcium such as green leafy vegetables, nuts and fortified soya milk.

Whilst the main focus has previously been on calcium, it is clear that vitamin D also plays a key role in good bone health. Whilst the majority of vitamin D is obtained after adequate skin exposure to the sunlight, it can also be found in some foods. The main food sources of vitamin D include oily fish, eggs, liver and meat. However,
in the UK, some foods have been fortified with vitamin D, including spreadable fats and some breakfast cereals.

The requirements for other micronutrients for good bone health can be met by adequate consumption of a balanced diet high in fruit and vegetables.

**What level of vitamin D do we need to achieve?**

There is a no exact definition of an optimal level of vitamin D and this has been a considerable point of conjecture both in the written and oral evidence submitted to APPOG.

The level of 25-hydroxy-vitamin D is currently considered to be the best indicator of overall vitamin D status. There is a broad consensus that blood levels of 25-hydroxy-vitamin D below 25nmol/l equate to deficiency, which is largely based on the prevention of rickets and osteomalacia. It has been a consistent feature of evidence submitted to APPOG that randomised controlled trials are required to establish what optimal vitamin D levels are and there is considerable conjecture about what these optimal levels could be. However, a review panel in the US and Canada concluded that a serum level of 25-hydroxy-vitamin D above 50 nmol/l would be sufficient. It remains to be determined if this is appropriate for the UK population.

**Do vitamin D requirements depend on how much calcium there is in the diet?**

Calcium absorption from the gut can be active or passive. Whilst vitamin D can facilitate the absorption of calcium, this has only been beneficial in diets low in calcium or in postmenopausal women and all older adults where vitamin D supplementation can improve calcium absorption.

**What is the relationship between body mass index (BMI) and osteoporosis?**

A low BMI is associated with reduced bone mass which in turn leads to an increased susceptibility to osteoporosis. This is observed in older populations and those with eating disorders resulting in lower BMI.

Whilst higher BMIs have been associated with higher bone mass, there is emerging evidence that obesity increases the bone fracture risk. Thus, it is recommended that a normal BMI in association with a healthy balanced diet is the best protection against osteoporosis.
Public health, socio-economic, ethnic and geographical factors

What will be the impact on future fracture rates if current dietary and sunlight exposure patterns continue?

The decline in dairy food consumption and the prevalence of unhealthy diets among the general population means that the full complement of nutrients required for good bone health are not being consumed.

Recent health campaigns such as Cancer Research UK’s SunSafe initiative have emphasised the need to stay out of the sun at peak hours, cover up and apply sun screen. However, completely avoiding sunlight exposure during peak hours may mean that individuals do not get adequate exposure to ensure good vitamin D levels.

It is worrying that the recorded incidence of fractures among older people in England has risen in the past decade: in England, between 1998/99 and 2008/09, the number of men admitted to hospital for a hip fracture increased by 77%. The overall rise for both men and women was 17%. We welcome the National Osteoporosis Society’s plan to publish figures which will provide 25-year projections for the incidence and cost of hip fractures in England shortly after the publication of this report. We understand that both incidence and cost are expected to rise.

Despite concerns about the nutritional intakes of the population of England, it is possible that rising life expectancy may underlie increases in incidences of hip fractures. However, it follows that by adopting a healthy lifestyle, the risk of breaking a bone as a result of osteoporosis in later life is likely to be reduced. As such, it would appear beneficial to promote healthy diet and safe sunlight exposure as part of a strategy to prevent osteoporosis and fractures.

What proportion of the population are below the Lower Reference Nutrient Intake (LRNI) for key nutrients?

With regard to vitamin D, the National Diet and Nutrition Survey suggests that 28% women and 24% men aged 19–24 years have low 25-hydroxy-vitamin D levels (<25 nmol/l). 12% of 11–18 year olds also had low 25-hydroxy-vitamin D status. Overall, 15% adult population had low 25-hydroxy-vitamin D. This suggests that the vitamin D in the UK diet is not enough to make up for any suboptimal sun exposure.

Food Standards Agency data suggests that significant proportions of the population are deficient in other key nutrients. For example, 11% or girls and 6% of boys aged 11-18 are not consuming the LRNI for calcium.

Separate studies have shown that 1 in 3 people living in care homes are vitamin D deficient.

One particularly concerning trend in evidence submitted to APPOG is the significant levels of malnutrition in elderly people residing in hospitals. In February 2011, the Parliamentary and Health Service Ombudsman highlighted common failures in ensuring adequate nutrition in older people in English NHS hospitals. In May 2011, the Care Quality Commission (CQC) also reported recurring concerns about older people’s

Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health
nutrition in NHS hospitals in England. In particular, CQC found that:

- older people are not being given the assistance they needed to eat - meaning they struggle to eat and in some cases are physically unable to eat meals

- their nutritional needs not being assessed and monitored - for example, not being weighed throughout their stay, making it impossible to determine if they were losing weight; or identified as malnourished without an action plan being put in place to address this

- older people not being given enough to drink - water left out of reach or no fluids given for long periods of time; in one case, a member of clinical staff described having to prescribe water on medicine charts to ensure patients got enough to drink.

Do socio-economic factors have an impact upon diet, safe sunlight exposure and bone health?

A Food Standards Agency survey published in 2007 showed that levels of calcium deficiency are higher in families from a low-income background. Broadly speaking, there are significant dietary differences between socio-economic groups which are likely to impact on bone health.

There is an increase in the prevalence of vitamin D deficiency and rickets in inner cities, especially among infants, children and adolescents from some ethnic minority groups.

Do nutritional and/or sunlight exposure requirements for good bone health vary according to gender and/or ethnic background?

There are differences in the levels of sunlight exposure required by individuals from different ethnic groups. This is because a higher level of skin pigmentation affects the ability of the skin to absorb the ultraviolet light required for the synthesis of vitamin D.

Is there a relationship between the area of the UK in which an individual lives, the quality of their diet, the amount of sunlight-exposure they receive and their bone health?

There is evidence to suggest that individuals living in northern latitudes are more vulnerable to poor vitamin D status. As a result of this, one study has found one third of adolescent girls and two thirds of elderly women living in northern Europe have low vitamin D status. Another has found that over two thirds of adolescent girls in Manchester have low vitamin D status. This included White and South Asian ethnic groups.

The UK lies in high latitude and has one of the least sunny climates in the industrial world. As a result, people in the UK have generally low blood levels of 25-hydroxy-vitamin D. There is also variation within the UK with evidence that women in...
Aberdeen have lower levels of 25-hydroxy-vitamin D, particularly in winter compared to those living in the south of the UK\textsuperscript{73} which may lead to poorer bone health in these areas.

Somewhat surprisingly, the worst vitamin D status is commonly found in older individuals in Mediterranean countries. This may be explained by the fact that older people in these countries actively avoid the sun\textsuperscript{74}.

Evidence suggests that there are few differences in micronutrient or mineral intake between regions in the UK\textsuperscript{75,76}.

**Are there any socio-economic, ethnic and/or geographical barriers preventing individuals from maintaining dietary and sun exposure patterns conducive to good bone health?**

Some religious practices which involve covering the skin can result in inadequate sunlight exposure and evidence suggests that women who cover up are at a significantly higher risk of osteoporosis than those who do not\textsuperscript{77}. This risk is extended to any individual who is unable to go outdoors into direct sunlight or who chooses to cover their skin. Individuals who are immobile and/or older individuals living in nursing or residential care are therefore at a greater risk of vitamin D deficiency.

Whilst there is no real regional variation in the nutritional wealth of the diets of people living in England\textsuperscript{78}, lower socioeconomic status is associated with poorer diet. Thus, more economically disadvantaged parts of the UK may be at an increased risk of poor bone health.

As stated previously, the UK population faces a significant challenge to ensure adequate sunlight exposure. The wavelength of UV light required for effective vitamin D synthesis in the skin is only available in the summer: as such, there is a real need to ensure that enough vitamin D is synthesised during this period to supply the body for the rest of the year\textsuperscript{79}. 

Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health
Supplementation and fortification

What role does supplementation have in maintaining a diet that contributes to good bone health? What role should it have?

Whilst obtaining nutrients naturally from the diet is preferable to supplementation, the latter may be necessary for those who are vulnerable to inadequate dietary intakes of key nutrients. For example, individuals who cannot tolerate dairy foods will invariably find it difficult to derive enough calcium from their diet. Similarly, among individuals with limited sun exposure, current dietary composition means that it is not possible to derive all of the required vitamin D from the diet. Supplementation is therefore recommended for such individuals. Regular supplementation has been found to increase blood levels of vitamin D.

A Cochrane review has suggested that there is a dose-dependent relationship between vitamin D supplementation with calcium and incidences of non-vertebral fractures. Supplements can play a key therapeutic role in the management of individuals with osteoporosis. Other studies have also indicated that vitamin D supplementation can reduce incidences of falls. However, a recent study has also suggested a modest increase in the risk of heart attacks in people taking calcium and vitamin D supplementation.

On balance, APPOG believes that there is a role for dietary supplementation in maintaining good bone health. However, we urge caution. APPOG supports the National Osteoporosis Society’s position, which is that care should be taken when considering supplementation. If individuals can get all of the calcium that they need from their diet, and adequate vitamin D from exposure to sunlight, then a supplement will not be necessary. The charity clearly states that boosting calcium beyond recommended levels has no extra benefit for bones.

DH currently advocates that vitamin D supplements should be given to young children, pregnant women, those who cover their skin for religious reasons and the elderly. However, for a variety of reasons, including a lack of awareness by key-stakeholders, this is not widely implemented. For older women, NICE guidelines support calcium and vitamin D supplementation in those women receiving osteoporosis treatment unless clinicians are confident that the patient already has adequate levels. Disappointingly, the national audit of falls and bone health services in older people in England, Northern Ireland, Wales and the islands (published by the Royal College of Physicians in May 2011) finds that this guidance is not being fully implemented. It shows that:

- prior to a non-hip fracture, just 18% of patients had been prescribed calcium (1g per day); for hip fracture patients, the figure was 24%;
- prior prescribing rates of vitamin D (800 iU per day) amongst older fracture patients are even poorer; 16% for non-hip fracture patients and 22% for hip fracture patients.

As long ago as 1980, investigators from the
United States reported that 68% of women and 59% of men presenting with hip fractures had experienced a prior fracture\(^91\). As such, a higher proportion of older patients who suffer a hip fracture should be identified, assessed and prescribed calcium and vitamin D supplementation, as per NICE guidance. Other issues identified by the audit are:

- just 45% of NHS acute trusts provide prescribing advice (such as a local protocol promoting the routine offer of calcium and vitamin D) to patients who are housebound
- only 51% of NHS acute trusts provide prescribing advice for residents of residential and nursing care homes
- among community service providers, mental health trusts, specialist hospitals, care homes and community health organisations, only 41% perform audits on calcium and vitamin D3 prescribing in high-risk groups
- two-thirds of hip fracture patients and only one third of non-hip fracture patients are receiving calcium and vitamin D3 supplementation 12 weeks after their fracture; the audit report highlights this as a gap between protocol and clinical practice.

It is important to sound a note of caution at this point: whilst there is disagreement over whether there have ever been any reported cases of vitamin D intoxication\(^92\) \(^93\), it is clear that the risks of over-supplementation of vitamin D are yet to be well understood. APPOG supports the view that investigations should be undertaken before any widespread attempts at supplementation for the wider population (over and above the identified at-risk groups) are made\(^94\).

What role does food fortification have in maintaining a diet which is conducive to good bone health? What role should it have?

In the UK, the mandatory fortification of most flours contributes significantly to calcium intakes\(^95\) and the consumption of foods fortified with vitamin D such as cereals and margarine account for nearly 40% of an adult’s intake of vitamin D\(^96\). This is particularly important as few foods provide abundant sources of vitamin D\(^97\).

Some advocate the fortification of more foods to ensure better bone health, citing examples of other countries which have a wider-choice of fortified products. For example, milk is currently fortified with vitamin D in the US, which makes a considerable contribution to vitamin D intake in the US population\(^98\). However, there are concerns associated with over-fortification\(^99\).

Regulation EC 1925/2006 homogenises rules across the EU for food fortification. It permits the addition of vitamin D, calcium, vitamin K and B vitamins to food. These are nutrients which are conducive to good bone health\(^100\).

The food and drink industry has drawn attention...
to data which suggests that consumers can be wary of ‘unnatural’ processing of foods and may be resistant to the fortification of products they consider to be natural, such as milk\textsuperscript{101}. Similarly, research has shown that consumers are more attracted to products considered intrinsically healthy as opposed to ones which have been manipulated to be healthy\textsuperscript{102}. Thus, whilst the industry is receptive to exploring the idea of fortification of products like milk, they advocate the need to test public perception first\textsuperscript{103}.
How do the public, private and third sectors encourage individuals to eat a healthy, balanced, calcium-rich diet and gain sufficient levels of safe sun exposure during the summer months? Could they do more?

The concept of a healthy diet is often oversimplified by the media. More emphasis should be placed on initiatives like the eatwell plate, which explains the composition of a healthy balance. Evidence submitted to APPOG has advocated a need for clearer labelling and advertisement of health claims to help consumers make better informed choices.104

Industry takes an active role in advocating a calcium-rich diet to the general public. For example, the Dairy Council disseminates educational materials which emphasise the need to consume calcium as part of a healthy balanced diet.105 This includes targeted information for pregnant and young individuals. The ‘Make Mine Milk’ campaign is part-funded by the European Union and promotes milk consumption based on health benefits using celebrity endorsement.106 Another initiative which focuses on benefits of milk for sport participation largely targets teens.107

Representatives from industry have advocated a bigger and broader-based promotional push, with a focus on bone health targeted at important groups. These groups include teenagers, young adults and mothers, given the need for individuals to achieve the highest possible peak bone mass in the years leading up to their late twenties.108

In recent years, little has been done to emphasise the need to obtain safe levels of time in the sun to ensure adequate vitamin D synthesis.109 Prior messaging on sun exposure from both official and commercial sources has focussed largely on promoting avoidance. This has been based upon the strict “no-sun policy” developed in Australia in the early 1980s, which in turn led to a globally targeted programme organized by the WHO.110 However, Australian authorities have recently become aware of the danger of vitamin D insufficiency if sun avoidance is too strict.111

Industry has expressed an interest in assisting with promoting a sun safe message which encompasses adequate exposure but one that still emphasises the risk of skin cancer.112 The UK cosmetics industry, which is responsible for the manufacture and marketing of sun protection products, maintains that advising the public to worry about UVA represents sound policy. In light of the emerging evidence on vitamin D, it does, however, admit that more detailed advice about sunlight exposure is required. This should, it states, achieve a balance between the risks and benefits of sunlight exposure. The Cosmetic, Perfumery & Toiletry Association Ltd (CPTA) states that if official advice on vitamin D and sun exposure altered, the cosmetics industry would also change its position to reflect agreed health messages.113

A number of organisations, including the British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care...
Dermatology Society have, for the first time in the UK, produced a joint consensus statement on vitamin D. It states that enjoying the sun safely, while taking care not to burn, can help to provide the benefits of vitamin D without unduly raising the risk of skin cancer\textsuperscript{114}.

**What impact does advertising have upon bone health?**

There is currently no evidence directly linking advertising with bone health\textsuperscript{115-116}. However, it is encouraging to see that other endeavours such as the ‘business4life’ and ITV initiatives have been successful in delivering health messages to the general public\textsuperscript{117}. It is clear that bone health could be promoted in this way.

An innovative and catchy campaign to promote a milk product newly fortified with vitamin D proved successful in Europe but there is no evidence to suggest it had any impact on bone health\textsuperscript{118}. However, given the decline in dairy consumption\textsuperscript{119} and its importance in maintaining healthy bones, it is reasonable to propose that there could be some health benefits to active advertising.

**In conveying health messages, do the media help or hinder in improving nutrition and/or sunlight exposure for bone health? Do the media encourage people to overdose on supplements?**

It is clear that media sources can sometimes over-simplify the health messages they communicate to the public. For example, an over-emphasis on cutting down on the consumption of fats in favour of low-fat alternatives means that some people have been tempted to abandon dairy foods. This is despite the fact that they can be an important component of a healthy balanced diet.

There is now an abundance of stories and features available through a wide-range of media that advocate a need for adequate vitamin D intake, both through sunlight exposure and dietary supplementation. It is unclear to what extent this is encouraging individuals to take or even overdose on dietary supplements in practice. The use of supplements is not widespread in the UK as highlighted by the Proprietary Association of Great Britain\textsuperscript{120}. The results of the National Diet and Nutrition Survey (NDNS) show that nearly two thirds of adults do not use dietary supplements at all\textsuperscript{121}, with 18% of men and 30% of women currently using supplements.

The NDNS shows that supplement consumption is more common amongst toddlers and young children than older children. The survey suggests also that supplement use may be infrequent, intermittent or seasonal. Current supplement use is similar to that reported in previous surveys. In the 2000/01 NDNS, 29% of men and 40% of women reported taking supplements.

The two most common types of supplements consumed in all age groups are fish oils (including cod liver oil) and multivitamins and/or minerals.
Public policy

Is there a cross-Governmental approach being taken to encourage better nutrition for bone health?

As part of the reforms to health and social care in England proposed by the 2011/12 Health and Social Care Bill, the Government plans to introduce a public health outcomes framework\textsuperscript{122}. DH plans to use this to hold local authorities and other public bodies to account in delivering positive health and wellbeing outcomes for local populations. One of the indicators included aims to measure local authorities’ progress in helping to reduce acute admissions as a result of falls or fall injuries for over 65s. The majority of fractures in older people occur as a result of a fall from standing height\textsuperscript{123}. However, not all fragility fractures (for example spinal compression fractures) result from a fall.

APPOG notes that the National Osteoporosis Society has welcomed this development. The charity has called for the indicator to be reworded so as to measure the incidence of acute admissions resulting from fractures in men and women over the age of 65. This would have the benefit of providing incentives to local authorities and the emerging commissioning consortia to work together to prevent all low-trauma fractures in older people. This would necessitate the introduction of evidence-based public health campaigns in communities which would promote good bone health to individuals of all ages.

In 2009, DH published a suite of documents as part of a ‘Prevention Package for Older People’, designed to provide the tools required by PCTs and local health authorities to commission comprehensive falls and fracture services. The document ‘Falls and fractures: effective interventions in health and social care’\textsuperscript{124} sets out DH’s systematic approach to falls and fracture prevention. This approach is demonstrated by the illustration in figure one (see overleaf). Objective four, which is centred on older people, sets out DH’s aim to ‘prevent frailty, preserve bone health and reduce accidents through: preserving physical activity, healthy lifestyles and reducing environmental hazards.’

The main Government initiative to promote healthy lifestyles in England is ‘Change4Life’. Change4Life is promoted as a mechanism to help individuals of all ages maintain a healthy weight reduce the risk of cancer, type 2 diabetes and heart disease\textsuperscript{125}. DH also provides a number of leaflets on healthy eating which are targeted at different age groups. ‘The good life’ is a healthy eating leaflet for older people\textsuperscript{126}.
A systematic approach to falls and fracture prevention

Objective 1: Improve outcomes and improve efficiency of care after hip fractures – by following the 6 “Blue Book” standards

Objective 2: Respond to the first fracture, prevent the second – through Fracture Liaison Services in acute and primary care

Objective 3: Early intervention to restore independence – through falls care pathway linking acute and urgent care services to secondary falls prevention

Objective 4: Prevent frailty, preserve bone health, reduce accidents – through preserving physical activity, healthy lifestyles and reducing environmental hazards

Figure one: DH Systematic approach to falls and fracture care & prevention: four key objectives
DH’s nutritional advice on osteoporosis and bone health is underpinned by a number of official policy documents\textsuperscript{127}. In light of the availability of new evidence on vitamin D, SACN decided to instigate a risk assessment of the vitamin in October 2010. This is expected to take approximately two years\textsuperscript{128}.

In terms of sun exposure, DH sponsors Cancer Research UK’s ‘SunSmart campaign’. This provides information on the link between sunlight exposure and vitamin D\textsuperscript{129}.

DH recommends that all children from six months to five years old are given supplements containing vitamins A, C and D, in the form of vitamin drops. Individuals are entitled to free vitamin drops if they qualify for the Healthy Start initiative\textsuperscript{130}. This is available to mothers who receive benefits, have children who are under four and/or are pregnant and under the age of 18.

Unfortunately, a number of problems have been identified with Healthy Start vitamin D product\textsuperscript{131}:

- the license obtained by DH for the product from the Medicines and Healthcare products Regulatory Agency (MHRA) means that it can only be sold in pharmacies
- the shelf life of the vitamin D product is too short, which acts as a disincentive for pharmacies to sell it
- the product is now being distributed through community pharmacies in connection with baby care clinics, whilst mothers attend these in the first year of their child’s life, they tend not to thereafter
- the sale of Healthy Start vitamins within a community has to be arranged by the local Primary Care Trust; as a result, there are local variations in the access that parents have to the products.

This report has already highlighted evidence which shows that older people (and in particular those who are immobile and/or who live in long-term residential or nursing care settings) are at risk of vitamin D deficiency. As such, it is crucial that those designing and implementing social care services ensure that residents receive a nutritious diet and recommended dietary supplementation. The Social Care Institute for Excellence (SCIE) has produced guidance on nutrition for professionals working in residential and nursing homes.

This is underpinned by a number of policy instruments which are designed to improve the nutrition of individuals in care, also outlined by SCIE:

- NHS ‘Essence of Care’ benchmarks for food and drink\textsuperscript{132}: these include attention to nutritional assessment, the environment, presentation of food and appropriate assistance; the benchmarks can be used by care homes, as well as healthcare providers, to benchmark services\textsuperscript{134}
- the DH joint action plan, ‘Improving nutritional care’\textsuperscript{135}
• the Council of Europe’s 10 Key Characteristics of good nutritional care offers a concise summary of the meaning of good nutritional care.

Despite this, SCIE identifies that there are still serious concerns about nutrition in the health and social care sectors:

• a report by the Patient and Public Involvement Forums has found that more than a third of hospital patients leave their food uneaten; problems were also identified with choice, the temperature and presentation of food and people not receiving the help they need to eat their meals

• Age Concern and Age UK have published reports which outline the extent of malnourishment among older people in hospitals in England.

• respondents to a 2006 DH online survey complained that not enough help is available to those who need assistance with eating.

• British data from the Dignity and Older Europeans study supports these findings.

With specific reference to bone health, findings from SACN estimate that 38% of care-home residents over the age of 65 are vitamin D deficient. This is a greater proportion than the 34% of all over-65s and 8% of free living over-65s who are vitamin D deficient.

Implementation of national guidelines on diet and sunlight exposure by health and social care professionals is integral to ensuring good nutrition for bone health. The Royal College of General Practitioners (RCGP) states that general dietary advice and guidance on safe sunlight exposure against the setting of reducing the risk of osteoporosis will be provided by GPs. RCGP feels that that most GPs would be aware of the risk of osteoporosis in the elderly and follow the vitamin D guidance. It notes that GPs would feel that dietary factors are outweighed by the need to get vitamin D from direct sunlight and are more likely to provide dietary advice as part of general dietary and lifestyle advice.

RCGP suggests that guidance issued by Government could have been disseminated by GPs in different ways. GP implementation of Government advice on vitamin D supplementation will have been affected by the following factors:

• variations in doses recommended by the guidance

• the level of clarity over the relationship between vitamin D levels and outcome

• the extent to which evidence is strong enough to initiate a prescription, for which clear dosing schedules are needed

• the amount of information disseminated about side effects and toxicities of treatments
the existence of a strong evidence base within primary care through good quality, well designed clinical studies and systematic reviews.

RCGP state that confidence is likely to be lost by the professions if these factors are not clearly defined in guideline dissemination and implementation.

Is new public policy needed to ensure that individuals eat a diet and gain sufficient levels of safe sun exposure to maintain and improve their bone health? If so, what should this be, and what evidence base is there for it?

A YouGov survey found that just 35% of respondents could identify vitamin D as being essential for healthy bones. 94% of those surveyed could not identify the best way of getting vitamin D. This clearly underlines the need for a focussed campaign to raise the profile of vitamin D and its vital importance to bone health. Other survey findings in relation to bone health have found:

• little more than half of people know that calcium rich foods are important for bone health
• less than a quarter of people realised that they need to start looking after their bones before the age of 30, despite the fact that our bone strength actually peaks during our 20s
• almost half (49%) of young people (18-24 yrs) do not know that there are steps they can take to keep their bones healthy
• more than half are unaware that exercise can help to reduce the risk of osteoporosis
• one in three do not know about the positive role that diet can play.

A general lack of awareness about how to improve and maintain bone health clearly needs to be tackled and there is a key role for education to ensure people become aware of the need to consume a variety of vitamins and micronutrients. As the Government reviews the National Curriculum in England, we call upon it to ensure that provision is made to allow the teaching of bone health. We note the a thematic approach to health and well-being taken by the Scottish Curriculum for Excellence is clear in stipulating that pupils aged 7–11 should:

• build on a knowledge of the human body in order to maintain and improve physical well-being
• have opportunities to be physically active and to learn the knowledge necessary to help maintain a healthy lifestyle
• be helped to understand the contribution made by participation in physical education, physical activity and sport in keeping them healthy in preparation for life beyond school
• be helped to gain an understanding of the...
relationship between food, health and well-being

• be helped to develop an understanding of what constitutes a healthy-balanced diet.

APPOG also calls on the Government to encourage Healthy Schools Co-ordinators to cover bone health in the education of pupils, teachers and parents. Local Authorities and School Boards should also ensure that school nurses receive training in understanding bone health.

Industry has also demonstrated an interest in working with the government to improve the general population’s bone health\textsuperscript{148,149}.

The European Food Safety Authority (EFSA) has given positive opinions in relation to health claims for calcium and vitamin D which relate to maintaining and improving bone health\textsuperscript{150}. Problems have been identified with the speed at which health claims are processed by EFSA. The food and drink industry is also keen for restrictions on health claims in labelling to be relaxed\textsuperscript{151}. 
1. **Conclusion:** vitamin D is of vital importance to good bone health and it is clear that the population as a whole faces significant challenges to achieving good vitamin D status; these include stay-at-home lifestyles, lack of appropriate UV light during the UK winter and the impact of clothes which cover all of the skin. The scientific evidence-base on the relationship between nutrition, osteoporosis and bone health is clear. Government policy and advice represents this evidence base: it identifies a number of groups who are at risk of malnourishment and poor vitamin D status and recommends dietary supplementation of calcium and/or vitamin D. However, this advice is being poorly and inconsistently implemented.

**Recommendation:** DH must work closely with commissioners, NHS and social care provider organisations and professional bodies to ensure that existing guidance on nutrition and osteoporosis can be disseminated and implemented as widely as possible. This will require close collaboration with:

- Primary Care Trusts (PCTs) and commissioning consortia (subject to the passage of the Health and Social Care Bill)
- NHS Trusts
- health and social care professionals
- Local Authorities
- providers of social care services (in particular those who run residential care homes and nursing homes for older people)
- patients
- the general public.

We call upon Local Authorities to use the extended powers proposed for them in the Health and Social Care Bill. They must scrutinise the extent to which nutrition and safe-sunlight exposure feature within commissioning agreements and care pathways, agreed between commissioners and provider organisations. Local Authorities must also deliver outcomes-focused public health campaigns which seek to achieve reductions in hospital admissions for fractures in older people. As part of this work, they should promote good nutrition and safe-sunlight exposure to individuals of all ages.

Ultimately, local ownership of guidelines by all parties, overseen by the proposed local Health and Wellbeing Boards, would lead to better adherence to guidelines. Where they are not doing so already, GPs must take on a strong advocacy role for older patients in residential care: they must help care professionals to ensure that recommended dietary supplements are administered to older people at the right time and in the right way.

Subject to the passage of the Health and Social Care Bill, the NHS Board and Public Health England will need to work closely with these local stakeholders. There is also an important role for the Care Quality Commission (CQC) in ensuring that guidance is implemented in health and social care settings.
2. Conclusion: The decline in dairy food consumption and the prevalence of unhealthy diets among the general population means that the full complement of nutrients required for good bone health are not being consumed.

Recent health campaigns such as Cancer Research UK's SunSafe initiative have emphasised the need to stay out of the sun at peak hours, cover up and apply sun screen. However, completely avoiding sunlight exposure during peak hours may mean that individuals do not get adequate exposure to ensure good vitamin D levels.

It is worrying that the recorded incidence of fractures among older people in England has risen in the past decade: in England, between 1998/99 and 2008/09, the number of men admitted to hospital for a hip fracture increased by 77%. The overall rise for both men and women was 17%. We welcome the National Osteoporosis Society's plan to publish figures which will provide 25-year projections for the incidence and cost of hip fractures in England shortly after the publication of this report. We understand that both incidence and cost are expected to rise.

Despite concerns about the nutritional intakes of the population of England, it is possible that rising life expectancy may underlie increases in incidences of hip fractures. However, it follows that by adopting a healthy lifestyle, the risk of breaking a bone as a result of osteoporosis in later life is likely to be reduced. As such, it would appear beneficial to promote healthy diet and safe sunlight exposure as part of a strategy to prevent osteoporosis and fractures.

There is also a lack of a clear message regarding safe sun exposure. We recognise the difficulties associated with providing this clarity, due to the need to balance the promotion of sunlight exposure for the benefit of bone health and the need to advocate care in light of the associated risks with skin cancer.

APPOG welcomes the recent joint position statement on vitamin D agreed by the British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society.

Conflicting opinions are a barrier to achieving a clear official position on vitamin D intake and safe sunlight exposure. A further complication to the debate is the lower vitamin D levels found in populations in northern areas of the UK.

We also recognise that Government-sponsored sun-safety messages promoted through the SunSmart campaign do emphasise the need for safe sunlight-exposure to enable individuals to synthesise vitamin D.

Recommendation: research is required to define the optimum levels of vitamin D that the UK population needs to achieve. Clarity is also required in Government-sponsored sun-safety messages and more needs to be done to emphasise the importance of adequate exposure to ensure necessary levels of vitamin D. This would benefit patients, carers, professionals and the population as a whole. It would also help produc-
ers and retailers of food and dietary supplements, which require a clearer policy on the amounts of vitamin D which are effective and safe for the public to consume. This will enable industry to develop and target new products more effectively.

We welcome the in-depth review being undertaken by SACN into the available evidence on vitamin D. We call upon SACN to complete the review as speedily as possible, and look forward to its findings.

In the meantime, we call upon cosmetics firms to continue to ensure that the range of non-sun-care products they provide (such as moisturiser creams and makeup, for example) enables consumers to choose products which do not have active UV filters added.

3. Conclusion: APPOG recognises the risks and benefits associated with food fortification. It offers the potential for improving the intake of nutrients vital for bone health among the general public. Fortification is, however, a potential blunt instrument: risks to public health could emerge if those who are not malnourished unwittingly overdose on vitamins and minerals through fortified products.

We also recognise that some consumers hold concerns about the fortification of food. The food and drink industry has drawn attention to data which suggests that consumers can be wary of ‘unnatural’ processing of foods and may be resistant to the fortification of products they consider to be natural, such as milk. Similarly, research has shown that consumers are more attracted to products considered intrinsically healthy as opposed to ones which have been manipulated to be healthy. Thus, whilst the industry is receptive to exploring the idea of fortification of products like milk, they advocate the need to test public perception first.

APPOG recognises that the fortification of food and drink does necessarily not mean that products have been artificially processed. We also believe that fortification should not mean that a food or drink product is rendered ‘unnatural’.

Recommendation: fortification could play a role in improving the bone health of the general public. However, any decisions made by policy makers and the food and drink industry must carefully balance the associated opportunities and risks. The ability for consumers to choose both fortified and non-fortified versions of certain products must also be ingrained in any new approach.

Within this context, we propose that, when the recommendations of the SACN vitamin D review are made public, consumers should be offered a better choice of fortified and non-fortified food products. The labelling of fortified foods can play a role in advocating the health benefits of adequate vitamin D and calcium consumption.

Coupled with better targeted information about sunlight exposure and vitamin D requirements, this should give consumers an opportunity to make better informed choices about their diet and lifestyle.
Consistent with the Government’s new strategy for public health in England, APPOG calls for a more joined-up, outcomes-focused approach to the fortification of food. For example, spreadable fats such as margarine are currently fortified with vitamin D in the UK. However, advocating an increase in spreadable fat intake is not a message which is necessarily consistent with a healthy diet. Spreadable fats are also fortified with vitamin A, which pregnant women are advised not to consume too much of. Fortification should support nutritional messaging which can be targeted at particular groups, including pregnant women.

The inquiry has learnt that excessive intake of vitamin A can be harmful to bone health. APPOG calls for a better choice of supplements which exclude vitamin A to be made available to consumers.

4. Conclusion: malnutrition hinders patients’ recovery from broken bones and harms their overall wellbeing. Recent studies have shown some deeply concerning cases of malnutrition among older people in hospitals in England. Studies have shown that oral nutritional supplements may improve nutritional status and reduce mortality and complications for undernourished elderly patients in hospital. Adequate intakes of protein and calcium are particularly important to promote good bone health in this setting.

This report highlights evidence which shows that older people (and in particular those who are immobile and/or who live in long-term residential or nursing care settings) are at risk of vitamin D deficiency.

Recommendation: NHS Trusts in England must ensure that identification of malnutrition occurs. Guidance and advice produced by DH and other organisations on maintaining good nutritional intakes among inpatients must be implemented.

It is also crucial that those designing and implementing social care services ensure that residents receive a nutritious diet and recommended dietary supplementation. The Social Care Institute for Excellence (SCIE) has produced guidance on nutrition for professionals working in residential and nursing homes. These institutions should be regularly monitored to assess the extent to which this guidance is implemented.

As stated in recommendation one, GPs must also take on a strong advocacy role for their older patients in care homes to ensure that they are well-nourished.

5. Conclusion: manufacturers and marketers of food and drink products are able to make a limited number of claims about the benefits of calcium and vitamin D on bone health on packaging. The industry feels that this is restricting its ability to market vitamin D products to population groups who are vulnerable to deficiency. This area is regulated by the European Food Standards Authority (EFSA). Issues have been identified with regard to the speed at which EFSA processes claims.

The inquiry has learnt that excessive intake of vitamin A can be harmful to bone health.

Recommendation: the European Food Standards Authority (EFSA) should make it easier for the
food, drink and dietary supplement industries to make positive claims about role of calcium and vitamin D in maintaining good bone health. EFSA should process existing applications which seek approval for health claims in relation to calcium and vitamin D consumption. We call upon the Department of Health highlight this issue as part of its interaction with EFSA. APPOG believes that this would allow the dietary supplement industry greater freedom to create calcium and vitamin D products which can be targeted at different demographic groups.

APPOG calls for a better choice of supplements which exclude vitamin A to be made available to consumers.

6. Conclusion: this inquiry has learnt that a well-balanced diet, consisting of all the food groups and reflecting the eatwell plate, is necessary for good bone health. Nutritional messages pertinent to a reduction in osteoporosis risk can also be used to promote the full spectrum of bone health. They can help to tackle the worrying increase in cases of rickets and osteomalacia among infants and young people, in addition to reducing the risk of broken bones suffered by older people.

 whilst we recognise the need to reduce the prevalence of obesity, we are concerned that the public’s perception of Change4Life may only focus on this intended outcome. In reality, pursuing a healthy lifestyle will benefit an individual’s overall wellbeing, including their bone health. Expert dietary advice for maintaining bone health is largely consistent with the Government’s own healthy eating messages, which are publicised through initiatives such as Change4Life.

Health messages can be oversimplified and the resultant focus on tackling obesity means that people have been disinclined to consume dairy foods. However, lower fat dairy options tend to have higher calcium contents than their higher-fat equivalents, so can be consistent with a healthy diet.

Recommendation: we call upon the Government to ensure that the public perception of Change4Life is not confined to a narrow set of intended outcomes, such as a reduction in incidences of obesity. Change4Life participants of all ages should be told that a healthy lifestyle will improve their overall health and wellbeing, including their bone health, rather than help them to just lose weight.

7. Conclusion: among young people, awareness of osteoporosis and the steps that can be taken to maintain bone health is poor.

Recommendation: as the Government reviews the National Curriculum in England, we call upon it to ensure that provision is made to allow the teaching of bone health in schools. APPOG also
calls on the Government to encourage Healthy Schools Co-ordinators to cover bone health in the education of pupils, teachers and parents. Local Authorities and School Boards should also ensure that school nurses receive training in understanding bone health.
References

1 UK Department of Health. Presentation: Developing effective services for falls and fracture patients. Presented by member of Older People & Dementia Branch, Department of Health. 2009.


3 Northern Ireland 2007/08 Hospital Inpatient Information. 2010.

4 Data collected on discharges from non obstetric and non psychiatric hospitals in Scotland (SMR1/01). 2010.

5 Health Solutions Wales, PEDW Statistics. 2010.


10 Figures in12 updated using mid-2007 population data13 and the Hospital and Community Health Services (HCHS) pay and price inflation 06-0714.


15 APPOG oral evidence session one, 8 February 2011


22 Submission to APPOG. UK, Bel. 2010.


26 BBC Health: Vegetarian and vegan diets. 2011. Available


28 Consensus Vitamin D Position Statement. British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society.

29 APPOG oral evidence session one, 8 February 2011


33 APPOG oral evidence session one, 8 February 2011


35 Consensus Vitamin D Position Statement. British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society.


National Diet and Nutrition Survey Results for Year 1. Food Standards Agency. 2010.


National Diet and Nutrition Survey Results for Year. Food Standards Agency. 2010.


APPOG oral evidence session one, 8 February 2011


The Dairy Council’s response to the inquiry into the role of nutrition in preventing osteoporosis and promoting good


APPOG oral evidence session one, 8 February 2011

APPOG oral evidence session two, 2 March 2011.


The All-Party Parliamentary Osteoporosis Group (AP- POG);. Limited), Butler K (Holland & Barrett Retail. 2010.


PAGB Submission to the inquiry by the All Party Parlia- mentary Osteoporosis Group into the role of nutrition in preventing osteoporosis and promoting good bone health. Propriety Association of Great Britain. 2010.

Submission to APPOG. Galen Ltd. 2010.


Falling standards, broken promises: report of the national audit of falls and bone health in older people 2010. Royal
Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health


94 Editorial: Vitamin Vitamin Vitamin Vitamin D; A place in the sun? Grey A, Bolland M. s.l. : Arch Intern Med , 2011, Vols. 170 (13); 1099-1100.

95 Submission to APPOG: All-Party Parliamentary Osteoporosis Group (APPOG) – labelling and fortification. (FDF), Barbara Gallani. 2010.

96 Submission to APPOG: All-Party Parliamentary Osteoporosis Group (APPOG) – labelling and fortification. (FDF), Barbara Gallani. 2010.


100 Submission to APPOG: All-Party Parliamentary Osteoporosis Group (APPOG) – labelling and fortification. (FDF), Barbara Gallani. 2010.


104 Submission to APPOG. Food and Drink Federation. 2011.


109 PAGB Submission to the inquiry by the All Party Parliamentary Osteoporosis Group into the role of nutrition in preventing osteoporosis and promoting good bone health. . Propriety Association of Great Britain. 2010.


112 APPOG oral evidence session one, 8 February 2011
113 APPOG oral evidence session two, 2 March 2011.

114 Consensus Vitamin V D Position Statement. British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society.


120 PAGB Submission to the inquiry by the All Party Parliamentary Osteoporosis Group into the role of nutrition in preventing osteoporosis and promoting good bone health. Propriety Association of Great Britain. 2010.


126 Evidence submitted to APPOG. The Department of Health: letter from Anne Milton MP, Parliamentary Under-Secretary of State for Health 2011.

127 Evidence submitted to APPOG. The Department of Health: letter from Anne Milton MP, Parliamentary Under-Secretary of State for Health 2011.

128 APPOG oral evidence session one, 8 February 2011


131 APPOG oral evidence session one, 8 February 2011


143 Written evidence submitted to APPOG. The Royal College of General Practitioners, 2011.

144 YouGov.


146 Inquiry into the role of nutrition in preventing osteoporosis and promoting good bone health. Solgar Vitamins. 2010.


151 APPOG oral evidence session one, 8 February 2011