ANSES Opinion
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The Director General

Maisons-Alfort, 23 December 2019

OPINION
of the French Agency for Food, Environmental and Occupational Health & Safety

on the updating of the PNNS dietary guidelines for women from menopause and men over 65 years of age

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It also contributes to the protection of the health and welfare of animals, the protection of plant health and the evaluation of the nutritional characteristics of food.

It provides the competent authorities with all necessary information concerning these risks as well as the requisite expertise and scientific and technical support for drafting legislative and statutory provisions and implementing risk management strategies (Article L.1313-1 of the French Public Health Code).

Its opinions are published on its website. This opinion is a translation of the original French version. In the event of any discrepancy or ambiguity the French language text dated on 23 December 2019 shall prevail.

On 12 July 2016, ANSES received a formal request from the Directorate General for Health to conduct an expert appraisal aimed at updating the French National Nutrition and Health Programme (PNNS) dietary guidelines for elderly people and postmenopausal women.

1. BACKGROUND AND PURPOSE OF THE REQUEST

The scientific basis for establishing the dietary guidelines of the French National Nutrition and Health Programme (PNNS) was updated by ANSES for the general adult population in 2016, on the basis of new dietary reference values and existing data on food consumption and composition (Anses 2016c).

Since these guidelines concern the general population, i.e. male and female adults excluding special populations, the Director General for Health submitted a formal request to ANSES on 12 July 2016 in order that guidelines could also be formulated for the specific populations of pregnant and breastfeeding women, children and adolescents, elderly people and postmenopausal women. This opinion concerns the updating of the PNNS dietary guidelines for women from menopause and men over 65 years of age.

1.1. Background

This section presents an analysis and summary of the dietary and physical activity recommendations from national and international health agencies.

1.1.1. Current recommendations in France

The current PNNS recommendations for people over 55 years of age were published in 2008 in the form of a guide based on scientific principles validated by AFSSA's Working Group on "National Nutrition and Health Programme food guidelines" (INPES 2008).

Pages 4 and 5 of this guide contain the nine general recommendations made for adults (INPES 2003) and only differ from them by the following additions:

- possibility of consuming a fourth serving of dairy products;
- clarification regarding how much water to drink each day: between 1 and 1.5 L.

Other clarifications are also provided:

- fruits and vegetables can be consumed "fresh, frozen or canned";
- consumption of "a freshly-squeezed fruit juice or a glass of juice without added sugar at breakfast or the snack" is recommended;
- the recommendations for meat and fish state that it is advisable to "limit fried and breaded preparations" and "consider offal", whose consumption is encouraged because of its high "vitamin and mineral" content;
- regarding sweet products, consumption should be "mainly during meals and snacks", and particular care should be taken with sweets;
- it is specified that "salt should not be eliminated from the diet without a medical prescription";
- physical activity is recommended "for periods of at least ten minutes" (for a total of thirty minutes per day, as for adults in general).

Specifically for postmenopausal women, a page on the *Manger Bouger* website provides recommendations on diet and physical activity (MangerBouger.fr 2018). The main focus is on preventing bone demineralisation by providing sufficient calcium, vitamin D and protein in the diet and by regular physical activity. Following the nine recommendations of the adult nutrition guide is encouraged.

1.1.2. Current recommendations abroad

For postmenopausal women

There are no specific nutrition recommendations from health agencies for this population. Depending on their age, postmenopausal women have available to them documents intended either for adult subjects or the elderly.

In September 2014, the first chapter of the Journal of Obstetrics and Gynaecology Canada proposed specific recommendations for this population. The effects of lifestyle – including diet and physical activity – on the health of postmenopausal women were discussed in detail. The authors referred postmenopausal women to the national food guide and made recommendations for adult women aged 51 to 70, as follows:

- consume seven servings of vegetables and fruits daily, limiting juices and varying the colours, six servings of starches, at least half of which are made from wholegrain cereals, three servings of low-fat dairy products (or plant-based substitutes fortified with calcium), two servings of meat or alternatives (eggs, fish, at least two per week, but also plant-based alternatives such as pulses or tofu);
- reduce sodium and simple sugars in foods from the previous groups, and replace saturated and *trans* fats with unsaturated fats;
- vitamin D supplementation is recommended for all adults because of the decreased sunshine in winter, and calcium supplementation can be offered for women over 50 years of age;
- maintain a healthy weight (BMI < 25 kg/m² and waist circumference < 88 cm);
- women aged 18 to 64 are advised to take at least 150 minutes of moderate to vigorous physical exercise per week in 10-minute sessions.

The authors then focused on the foods or measures that can reduce the risks specific to postmenopausal women. They highlighted the importance of controlling consumption of salt and simple sugars, ensuring a balanced intake of fat and sufficient fibre, monitoring weight, and engaging in regular physical activity to reduce the risk of cardiovascular disease.

To reduce the risk of cancer, they highlighted daily consumption of vegetables (at least half of the plate), controlling calorie intake, regular physical activity, limiting the consumption of red meat and processed meat, as well as stopping or reducing smoking.

Lastly, exposure to the sun or vitamin D supplementation, meeting calcium requirements through dairy products, plant-based products fortified with calcium, or canned fish (sardines consumed with their bones, mackerel and salmon) were recommended to reduce the risk of osteoporosis (Société des obstétriciens et gynécologues du Canada 2014).

For the elderly

Recommendations addressed to the elderly are better documented. A review of the available guides, posters or booklets revealed some common trends, which are listed below.

The analysis focused on documents produced by institutions in the following countries:

- Countries that have issued recommendations for adults including the elderly:
    - Belgium (Conseil supérieur belge de la santé 2016);
    - the United States (U.S. Department of Health and Human Services et U.S. Department of Agriculture 2015);
    - Australia (National Health and Medical Research Council 2013);
    - Canada (Government of Canada 2011);
    - Ireland (Food safety authority of Ireland 2011);
- Countries that have issued reports, posters or booklets dedicated to the elderly:
    - New Zealand (Ministry of Health of New Zealand 2013);
    - Switzerland (Société suisse de nutrition 2011);
    - the United States (Tufts university 2015);
    - Finland (Suominen *et al.* 2014);
    - the Netherlands (Breedveld et Peters 2014);
    - Singapore (Ministry of Health Singapore 2015)

In all cases, the recommendations for diet and physical activity are derived from those made for the adult population, with some modifications, such as:

- reducing the size of servings of starches;
- maintaining, or even slightly increasing, servings of meat, eggs, fish, fruits and vegetables, and dairy products.

The national agencies also stress the importance of:

- ensuring proper hydration by drinking 1.5 L of water per day;
- using only a little salt when cooking and choosing foods with low salt content;
- limiting the consumption of foods with low nutritional value but high energy value, such as sugar-sweetened beverages, alcohol and snack foods;
- maintaining daily physical activity;
- complying with food safety measures when storing and cooking food.

Some countries (New Zealand, Finland, Netherlands) recommend vitamin D supplementation for all elderly people, because age reduces the effectiveness of endogenous synthesis of this vitamin and the elderly are often less exposed to the sun.

Vitamin B12 supplementation is sometimes suggested on a case-by-case basis due to the observed lower absorption of this vitamin with age (Netherlands, Canada, New Zealand).

1.2. Purpose of the request

This opinion focuses on the population of postmenopausal[1] women and men over 65 years of age who do not require special nutritional care. People who are frail, malnourished or at risk of undernourishment, or suffering from acute or chronic diseases that modify basal metabolism and require food intake to be adapted, are not included in the target population. Its purpose is to provide the scientific basis for the dietary guidelines proposed under the PNNS based on the most recent scientific data, as well as on data resulting from work on the revision of the food-based dietary guidelines published in 2016.

[1] Menopause occurs in women in France on average at around 51 years of age. This age is considered in this opinion as a landmark indicating the beginning of menopause for most women. However, since menopause is not characterised by age but by physiological changes that may occur before the age of 51, the recommendations in this opinion are applicable to all postmenopausal women regardless of age.

2. ORGANISATION OF THE EXPERT APPRAISAL

The expert appraisal was carried out in accordance with French standard NF X 50-110 "Quality in Expert Appraisals – General requirements of Competence for Expert Appraisals (May 2003)".

The expert appraisal was based on a bibliographical analysis of the epidemiological links between food groups and certain health issues specific to the elderly and to postmenopausal women, the latest dietary reference values (Anses 2016a, Efsa 2017) and consumption scenarios identified by the optimisation tool developed as part of the work on updating the PNNS dietary guidelines for adults (Anses 2016c).

To this end, ANSES relied on mandated rapporteurs to examine the most recent publications likely to provide insights for adapting the current recommendations to the population covered by this opinion. Their work was presented and discussed at meetings of the Expert Committee (CES) on "Human nutrition" between October 2017 and August 2018.

ANSES also consulted its European counterparts on 27 June 2017 in order to take into account the recommendations in force in the Member States of the European Union.

A hearing with representatives from the French Society for Geriatrics and Gerontology took place on 20 March 2018.

In parallel, ANSES's CES on "Assessment of the biological risks in foods" (BIORISK) was asked to summarise the recommendations on the prevention of foodborne microbiological risks. This collective expert appraisal was carried out during meetings on 30 January and 10 April 2018. The expert appraisal drew on previous Agency opinions and reports, as well as knowledge of the hazards, summarised in the foodborne biological hazard data sheets.

All these data were assessed by the CES on "Human nutrition" and led to recommendations, which were adopted on 29 August 2018.

ANSES analyses interests declared by experts before they are appointed and throughout their work in order to prevent risks of conflicts of interest in relation to the points addressed in expert appraisals.

The experts' declarations of interests are made public via the ANSES website (www.anses.fr).

3. ANALYSIS AND CONCLUSIONS OF THE CES

The following approach was used:

To begin with, the physiological and, where applicable, behavioural specificities of the population were considered.

An analysis was then conducted of the epidemiological links between the food groups consumed and the health status of postmenopausal women and the elderly. This analysis assessed whether recent scientific arguments justified the consumption of certain food groups in different quantities to those recommended for adults, due to specific health relationships.

Dietary reference values were then established for the target populations taking into account the data and justifications from ANSES's 2016 report on the development of dietary reference values for adults (Anses 2016a), as well as EFSA data when these were more recent (Efsa 2017). This led to the population targeted by this opinion being subdivided into four groups: postmenopausal women aged 51-59, those aged 60-65, those over 65 years of age, and men over 65 years of age.

The results from ANSES's 2016 food optimisation scenarios in adults (Anses 2016c) were then transposed to each subgroup, in proportion to their energy requirements, in order to establish to what extent the guidelines designed to meet the requirements of adults in general could also meet those of the populations studied in this report.

When the transposition showed that it was not possible to achieve the reference values for certain nutrients in the target population, the CES on "Human nutrition" proposed additional guidelines on physical activity and consumption based on a list of vector foods, enabling the consumption guidelines to be modified in order to achieve the dietary reference values.

Lastly, in a final step, the CES decided to highlight the current nutritional risks. Therefore, for the nutrients for which the dietary reference values were not achieved by the transpositions, an analysis of the median consumption levels of these nutrients from the INCA 3 study (Anses 2017) was presented to help managers identify particularly critical gaps between the current nutritional intakes and the defined objectives.

3.1. Physiological specificities of the population of postmenopausal women and people over 65 years of age

3.1.1. Postmenopausal women

Menopause is a natural process of cessation of the menstrual cycle that occurs in women between the ages of 45 and 55. A woman is considered to be postmenopausal when she has not had a menstrual period for twelve consecutive months. In France, the average age of menopause is estimated at 51 years (Cadeau *et al.* 2016).

The decrease in hormonal impregnation with progesterone and then oestrogen causes physiological changes and exposes women to an increased risk of health problems (e.g. osteoporotic fractures and cardiovascular disease) that can be partly prevented by a balanced diet and regular physical activity (Anses 2016d).

3.1.2. People over 65 years of age

Ageing is characterised and influenced by a gradual, lifelong accumulation of molecular and cellular damage that results in a progressive, generalised impairment in many body functions, an increased vulnerability to environmental challenges and a growing risk of disease and death. These biological changes are accompanied by a broad range of psychosocial changes (OMS 2015).

In 2015, the average life expectancy at birth in France was 85 years for a woman and 79 years for a man (Insee 2016).

Ageing is associated with an increased risk of chronic diseases (neurodegenerative, cardiovascular and eye diseases, cancer, osteoporosis, type-2 diabetes, deterioration of respiratory or kidney function, etc.), and physical and cognitive fragility and disabilities that can lead to increased dependency and reduced opportunities for people to remain in their own homes (INVS 2017). Therefore, while total life expectancy at the age of 65 is 23.5 years for women and 19.4 years for men, it is estimated on average to be 8.6 years for women and 6.7 years for men, without chronic morbidity. Similarly, life expectancy without activity limitation at age 65 is estimated at 10.7 years for women and 9.8 years for men (EHLEIS 2018).

However, ageing without severe pathology or functional deficit and with continued fulfilling social and cognitive activity is possible, even at an advanced age, insofar as the occurrence of these diseases and activity limitations is attributable to both dietary and physical activity factors that can be controlled.

Given the heterogeneity of the population over 65 years of age and the specific needs of elderly people regarded as frail[2] (Fried *et al.* 2001), only non-frail subjects are addressed in this opinion.

3.2. Epidemiological links between food and disease

A literature search on the epidemiological links between food consumption, or food groups, and the health status of elderly people and postmenopausal women was conducted between July and December 2017. The published works were identified by a search in the PubMed database. Studies focusing on nutrients, dietary profiles (such as Western or Mediterranean diets), or vitamin, fat or mineral supplementation were excluded from the analysis.

Nor did the analysis cover the diseases already addressed as part of the updating of the PNNS for adults in general (type-2 diabetes, cardiovascular diseases, cancer, etc.). It focused on diseases liable to more specifically affect postmenopausal women and people over 65 years of age. The following keywords were used for the search:

- "Macular degeneration", "Age-related macular degeneration", "Maculopathy", "Frailty", "Sarcopenia", "Dental", "Memory", "Behavior", "Continence", "Arthritis", "Osteoarthritis", "Menopause", "Longevity", "Chronic kidney disease", "Immunity", "Gout", "Metabolic syndrome", "Abdominal aortic calcification", "Psoriasis", "Blood pressure", "Thrombosis", "Venous thromboembolism", "Esophageal cancer", "Gastric cancer", "Lung cancer", "Skin cancer".

Other recent expert appraisals were also used, such as the report by the French High Council for Public Health (HCSP) published in December 2017, which deals in detail with Alzheimer's disease and related disorders (HCSP 2017), and ANSES's report on revisions to the guidelines on physical activity and sedentarity (Anses 2016d).

The CES considered that the epidemiological links between diseases associated with ageing and food groups observed most frequently in this search concerned relationships between:

- sarcopenia and the consumption of protein foods (animal products but also pulses and nuts) and fruits and vegetables;
- osteoporosis and the consumption of dairy products and fruits and vegetables;
- cognitive function, including studies on the risk of Alzheimer's disease, and vegetable consumption;
- eye disorders and the consumption of meat, fish, and fruits and vegetables.

In addition, physical activity was identified as a risk-modulating factor for sarcopenia, osteoporosis and cognitive dysfunction.

a) <u>Sarcopenia</u>

Advancing age is characterised by a change in body composition with a decrease in the percentage of lean body mass and an increase in the percentage of body fat (Kwan 2013, Cederholm, Cruz-Jentoft et Maggi 2013). Specifically, ageing is accompanied by a physiological loss of mass of striated skeletal muscles with a reduction in muscle strength or physical performance (such as walking speed) and infiltration of fat and connective tissue within this tissue (Hügle *et al.* 2012).

[2] The five criteria for assessing the frailty of an elderly person defined by Fried *et al.* (2001) are as follows: unintentional weight loss of 5 kg in the past year, self-reported exhaustion, low physical activity (sedentary lifestyle), slow walking speed and muscle weakness.

Sarcopenia has been defined as a reduction in skeletal muscle mass with age, associated with a decrease in muscle strength or motor performance (Cederholm, Cruz-Jentoft et Maggi 2013).

The time spent physically inactive (especially the time spent sitting) particularly accentuates the sarcopenic state. It may even be directly associated with sarcopenic risk, since for every daily one-hour increment spent sitting, the risk of sarcopenia increases by 33% regardless of physical activity (PA) or lifestyle (Gianoudis, Bailey et Daly 2015). Physical activity is probably one of the most effective ways to limit age-related loss in muscle mass (Anses 2016d).

- Protein foods

According to the literature, an American study that followed 5124 offspring (and spouses) from the original Framingham heart cohort for nine years found that high consumption of protein-rich foods (red meat, poultry, fish, dairy products, soy, nuts, seeds and pulses) was associated with a higher percentage of muscle mass, particularly among older women. Women who consumed two or more servings of red meat per day were characterised by increased skeletal muscle mass. In addition, muscle mass was higher in male subjects who consumed high amounts of protein-rich foods compared to those who consumed the least. Men and women with higher intakes of foods of animal origin were therefore characterised by higher muscle mass, regardless of their level of physical activity. Moreover, active subjects with higher intakes of protein-rich foods of animal or plant origin had a 35% reduced risk of functional decline. The authors concluded that higher consumption of protein-rich foods, alone or in combination with an active lifestyle, was associated with preservation of muscle mass and functional performance in the elderly (Bradlee *et al.* 2017). Two other Australian studies (Daly *et al.* 2014, Torres *et al.* 2017) showed that a protein intake of 1.3 g/kg/day in the form of 160 g/d of meat (6 times per week) coupled with resistance training was more effective than the same exercise without any change in protein intake at increasing muscle mass and strength in elderly women (n = 100).

- Fruits and vegetables

A Korean study (Kim *et al.* 2015a) on a group of 1486 men and 1799 women over 65 years of age revealed that in elderly women, consumption of at least five servings of vegetables per day was inversely associated with low muscle mass. In this study, there was no association between food group consumption and low muscle mass in men. Another Korean study of a cohort of 1900 subjects over 65 years of age divided into quintiles of fruit and vegetable consumption showed that the highest consumers of fruits alone (1.9 times/day), fruits and vegetables (7.9 times/day) and vegetables alone (6.6 times/day) had a significantly reduced risk of sarcopenia in men compared to the lowest consumers (Kim *et al.* 2015b). In women, the associations were not significant, except for high fruit consumers (1.9 times/day) for whom a lower risk of sarcopenia was observed.

- Nuts

A Chinese study conducted on 834 individuals over 60 years of age associated weekly nut consumption with maintained muscle mass (Hai *et al.* 2017).

In conclusion, in view of the recent literature, the CES believes that there is insufficient precision in the available data to be able to establish an intake level for protein foods and fruits and vegetables that reduces the risk of sarcopenia in the elderly. On the other hand, maintaining regular and varied physical activity is an effective lever for preventing the onset of sarcopenia.

b) <u>Osteoporosis</u>

Ageing is characterised by a reduction in mass and a change in the architecture of bone tissue. These histological changes in bone are defined as osteopenia, and are also related to a slower rate of bone remodelling. Beyond a certain bone demineralisation threshold, bones lose their solidity and

are especially exposed to the risk of fracture, affecting mainly the proximal end of the femur (femoral neck), vertebral bodies and the distal end of the radius (Khosla, Westendorf et Oursler 2008).

According to the World Health Organisation (WHO 1994), a bone mineral density (BMD) value between 1 and 2.5 standard deviations below the mean normal density for young adults corresponds to osteopenia, and a value greater than 2.5 standard deviations below corresponds to osteoporosis. The prevalence of osteoporosis increases with age.

Osteopenia and osteoporosis can begin to appear as early as the age of 40 and can be worse in women, especially after menopause (Guggenbuhl 2009). After the age of 65, the risk of fracture may be more than twice as high for women as for men (Khosla, Westendorf et Oursler 2008, Mitchell et Streeten 2013). In addition, hip fractures in men are associated with higher morbidity and mortality than in women (Guggenbuhl 2009, Khosla, Westendorf et Oursler 2008).

- Dairy products

Regarding food groups, the link between osteoporosis and dairy intake remains the most studied, but the conclusions vary according to the studies, which very rarely specify the servings or quantities examined. A meta-analysis conducted on seven cohort studies of men and women aged from 34 to over 80 years concluded that there was no link between milk consumption alone and the risk of hip fracture (Bischoff-Ferrari *et al.* 2011). A study conducted in 1479 Japanese men aged 73 on average showed a statistically significant positive dose-response relationship between hip BMD and milk consumption (between less than one glass per week and two or more glasses of milk per day). However, this relationship was not found for the spine or femoral neck (Sato *et al.* 2015). Another study in Korea examined the potential risk factors associated with osteoporosis in a representative sample of 1467 postmenopausal women, aged 65.2 years on average. Participants who did not consume milk or milk products were characterised by a 45% increased risk of having osteoporosis compared to those who consumed milk or milk products (Mi-Hyun Kim, Jung Sun Lee et Johnson 2015). One study showed that dairy consumption was positively associated with BMD and negatively associated with the risk of fracture in American men and women aged 55 on average (Sahni *et al.* 2013). Another reported a positive association between very regular consumption of dairy products (up to four servings per day) and BMD, and a negative association with the risk of hip fracture in Australian women aged from 80 to 92 years (Radavelli-Bagatini *et al.* 2014). Lastly, an Icelandic study concluded that there was a positive association between daily milk consumption before age 65 and BMD measured between 66 and 96 years of age. This observation suggests that consumption patterns over decades may have an effect on bone status during the ageing process (Eysteinsdottir *et al.* 2014).

- Fruits and vegetables

Studies on fruits and vegetables are very diverse in their methodologies and in the types of fruits and vegetables studied (some examine only one particular fruit or vegetable, others study groups such as citrus fruits, etc.). Many have potential biases (such as a failure to adjust results for the subjects' calcium or vitamin D intake). These elements prevented the authors of a Canadian literature review on the subject from reaching any conclusion as to the association between this food group and bone health in women over 45 years of age (Hamidi *et al.* 2011). More recently, however, some studies have reported positive associations between fruit (Liu *et al.* 2014, Jing-Jing Li *et al.* 2012) and/or vegetable (Yang et Kim 2014, Qiu *et al.* 2017) consumption and BMD. A cross-sectional study of 4000 Chinese men and women aged 65 and over reported that habitual fruit and vegetable consumption was positively associated with BMD among both men and women, even after adjusting for many potential confounding factors. A 100 g/1000 kcal increase in fruit consumption was associated with an increase in whole-body BMD of 4.5% for men and 6.4% for women (Liu *et al.* 2014). Another cross-sectional study investigated the general determinants and dietary factors

influencing BMD in 2305 men aged from 50 to 79 years from the Korean KHANES cohort. Besides age, anthropometric factors (height, weight, body mass index, body fat, lean body mass, waist circumference), serum vitamin D and parathyroid hormone status, and physical activity level, diet quality (estimated by the mean adequacy ratio) and intake of vegetables, fruits and calcium were also positively associated with BMD. Whole-body BMD was positively associated with the consumption frequencies of cereals, potatoes, vegetables and fruits. More specifically, femur BMD was positively associated with the consumption frequency of fruits, and femoral neck BMD was positively associated with the consumption of fruits and dairy products, after adjusting for confounding factors (Yang et Kim 2014). In 333 Chinese postmenopausal women aged from 50 to 70 years who consumed an average of 435 g/d of vegetables (half of which were green leafy vegetables) and 174 g/d of fruits, a positive association was observed between fruit consumption and BMD after adjusting for potential confounding factors. BMDs for the total body, lumbar spine, total hip and femoral neck were higher in participants in the top consumption tertile compared to those in the bottom tertile. There was no significant association between vegetable intake and bone markers, regardless of the bone site studied, except for total-body BMD (Jing-Jing Li *et al.* 2012). A cross-sectional study interviewed Chinese adults (2083 women and 1006 men) aged from 40 to 75 from a national cohort to assess fruit and vegetable consumption patterns over the year leading up to the interview date. No association between BMD at the different measured sites and vegetable consumption was observed. In contrast, BMD was associated with the consumption of all fruit subgroups, except persimmon, mango, melon and durian. The authors explained the weaker (or lack of) association of cooked vegetables with BMD by the loss of micronutrients caused by cooking, as well as by their natural sodium content, which could increase urinary calcium loss. The results showed that after stratification, total fruit and vegetable consumption was positively associated with BMD and a lower occurrence of osteoporosis only in people with a BMI of less than 24 kg/m². The authors also pointed out that the median consumption of total fruits and vegetables was 499 g per day for women, including 141 g of fruits, and 434 g for men, including 109 g of fruits (Qiu *et al.* 2017).

Lastly, a "probable" level of scientific evidence has been established regarding the ability of physical activities involving repeated impacts on bone (running, jumping, dancing, vibration-platform exercises) to increase bone mineral density (spine, femoral neck and trochanter) and reduce the number of fractures in postmenopausal women and men over 65 years of age (Anses 2016d).

In conclusion, the available literature data do not provide any additional arguments likely to change the dietary guidelines for the study population, compared to adults. Regular moderate- to high-impact physical activity is recommended to increase BMD and limit the risk of fractures.

c) Cognitive function and Alzheimer's disease:

Brain ageing is accompanied by structural and functional changes of varying degrees depending on the individual. In clinically healthy subjects, it is first manifested by memory impairment (ability to memorise vocabulary or newly learned information) and then by a regression in cognitive performance (reaction time, selective attention, visual spatial abilities, learning abilities, ability to adapt to the environment) (Anses 2016d). Alzheimer's disease is characterised by a loss of neurons (and therefore synapses) in the cerebral cortex and in some subcortical regions. This neuronal loss leads to atrophy of the affected regions (Anses 2016d). Dementia is defined as a syndrome in which there is deterioration of memory, reasoning, behaviour and the ability to perform daily activities (OMS 2015). The prevalence of dementia in France is estimated at 6-8% after the age of 65 with an incidence that increases exponentially with age (from 2.4 per 1000 person-years between 65-69 years to over 50 per 1000 after 85 years). Alzheimer's disease is responsible for 70% of dementia cases, the remaining 30% being vascular or mixed (HCSP 2017).

- Fruits and vegetables

An analysis of nine cohorts with a total of 44,004 American and European participants aged 43 and older concluded that most studies showed a negative association between higher vegetable consumption (at least 200 g or three servings per day, particularly green leafy vegetables, cruciferous vegetables and squash) and the risk of dementia and cognitive decline. This association was not observed for fruits alone (Loef et Walach 2012).

- Fish

Consumption of at least one serving of fish per week reduced semantic memory loss in a prospective cohort study of 915 American participants (average age 81.4 years) followed for an average of five years with an annual cognitive function test (van de Rest *et al.* 2016). A prospective cohort study on 1566 Chinese subjects over 55 years of age followed for more than five years showed that age had an effect on the benefits of eating at least one 100 g serving of fish per week: a reduction in cognitive decline associated with fish consumption was observed among those over 65 years of age, while among those aged 55-64 no association could be demonstrated (Qin *et al.* 2014). However, other prospective studies over similar follow-up times failed to establish an association between the amount of fish consumed and cognitive decline: in 1023 American men aged 68 on average (van de Rest *et al.* 2009) and in 2612 Dutch men and women aged 43-70 followed for five years (Nooyens *et al.* 2017).

Regular physical activity is associated with a decrease in the risk of dementia and the incidence of Alzheimer's disease, with a dose-response relationship (Abe 2012). Therefore, compared to active subjects, inactive subjects may be twice as likely to develop the disease (Karceski 2012). In addition, other research has shown that physical inactivity increases the risk of developing Alzheimer's disease (Barnes et Yaffe 2011). The neuroprotective effects of physical activity are well documented (Anses 2016b).

In conclusion, the dietary and physical activity guidelines formulated by ANSES for adults in 2016 seem to be compatible with the nutritional and physical activity factors for preventing cognitive decline identified more specifically for elderly people.

d) Eye disorders (including age-related macular degeneration, AMD):

Impaired sensory function is a common problem with advancing age. In particular, some visual acuity disorders are due to multiple factors, some of which can be modified by diet. This is especially the case for age-related maculopathy, which can progress to macular degeneration (AMD), a multifactorial disease that affects 25 to 30% of the population over 75 years of age (Inserm 2014).

- Fruits and vegetables

A diet rich in fruits and vegetables appears to protect against age-related eye diseases, particularly those favoured by exposure to oxidative stress (AMD, but also cataracts and glaucoma) (Braakhuis, Raman et Vaghefi 2017, Kim *et al.* 2018, Raman, Vaghefi et Braakhuis 2017, Yang et Kim 2014). An increased risk was reported by a New Zealand study for consumption of fewer than three servings of fruits and vegetables per day (Raman, Vaghefi et Braakhuis 2017). The respective contributions of fruits and vegetables to this protective effect vary according to the studies. Some studies have analysed the specific links between vegetable and fruit consumption and the risk of AMD. A Thai study showed an inverse association between green vegetable consumption and AMD risk but no association with fruit consumption (Khotcharrat *et al.* 2015). Another study of 1183 Algerians over 55 years of age reported an increased risk of AMD in cases of high fruit consumption. In contrast, the consumption of green vegetables was inversely associated with this risk (Lazreg *et al.* 2016). Lastly, another study based on data from a European genetic database showed no significant link

for vegetable consumption but found an inverse association between fruit consumption and AMD risk (Ersoy *et al.* 2014). It is therefore difficult to identify the respective contributions of fruit and vegetable consumption to reducing the risk of AMD. The follow-up of two American cohorts (63,443 women and 38,603 men in total over the period 1984 to 2010) showed a relative risk inversely related to the consumption of fruits and vegetables that are vectors of lutein, zeaxanthin and several other carotenoids. The authors concluded that a "protective" intake of carotenoids, particularly zeaxanthin and lutein, through a diet rich and varied in fruits (yellow in colour) and vegetables (dark green or yellow) should be encouraged (Wu *et al.* 2015).

- Meat and fish

Several recent studies confirm a link between the consumption of fish and red or processed meat and the risk of AMD (Braakhuis, Raman et Vaghefi 2017, Ersoy *et al.* 2014, Zhu *et al.* 2016). The risk increases significantly with daily red meat consumption (OR = 2.34; 95% CI: 1.61-3.40; p <0.001). It remains higher for consumption of two to six servings per week (OR = 1.67; 95% CI: 1.296 -2.162; p < 0.001) (Ersoy *et al.* 2014). Similarly, the New Zealand study by Braakhuis *et al.* (2017) reported a positive association between consumption of meat and nuts (which are considered protein sources but could not be assessed separately in the study) and eye diseases (glaucoma, AMD, cataract or a combination of all three) in a sample of 78 cases and 149 controls. Lastly, the frequency of fish consumption, particularly dark-meat fish such as tuna, was negatively associated with the risk of AMD according to the results of a Chinese meta-analysis of eight cohorts (4202 cases). The effects associated with fish consumption frequencies differed according to the stage of the disease under consideration and the consumption of certain fatty acids such as omega 6 polyunsaturated fatty acids (Zhu *et al.* 2016).

The epidemiological data available do not justify a different consumption frequency of food groups to that recommended for the general adult population. On the other hand, they stress the importance of diversifying fruit and vegetable intakes and promoting fish consumption, especially for the elderly population in the context of AMD prevention.

<u>Conclusion of the literature study:</u>

It is important to note that most studies on the diet of elderly people focus on a late exposure window, whereas the health status of this population also seems to depend on lifelong lifestyle and nutrition. However, few epidemiological studies can distinguish between the early and late influences of human nutrition.

With a view to prevention of sarcopenia, osteoporosis and cognitive and eye disorders, the bibliographic analysis of the epidemiological data did not enable the CES to identify any food groups for which consumption should be modified in relation to the guidelines proposed for the general adult population in 2016.

On the other hand, the importance of limiting sedentary time and engaging very regularly in activities that promote cardiorespiratory capacity, muscle strengthening, balance and flexibility at any age, including menopause or in old age, is now well documented with regard to the risk of sarcopenia, osteoporosis and cognitive decline.

3.3. Do the dietary guidelines defined for adults meet the needs of postmenopausal women and men over 65 years of age? Analysis of a transposition.

To answer this question, research and a process of reflection were undertaken on the dietary reference values specific to the target population.

3.3.1. Dietary reference values

In 2016, ANSES defined and justified the dietary reference values used to establish dietary guidelines for the French adult population (Anses 2016a).

In December 2017, EFSA published its technical report on dietary reference values, supplementing some of the references that were missing at the time the ANSES opinion was drafted (Efsa 2017). The CES on "Human nutrition" reassessed the dietary reference values for the target population, adopting EFSA's dietary reference values when they had been derived from opinions subsequent to an ANSES opinion but retaining the dietary reference values established by ANSES in 2016 whenever the Agency had issued a reasoned opinion different from that of EFSA (which was the case for proteins, fibre, fatty acids and vitamin C).

In particular cases where an adequate intake (AI) was selected by ANSES as the reference value, taking into account the consumption data from the INCA 2 survey, this value was retained (example: manganese).

Energy requirements

Resting energy expenditure (REE) was calculated by EFSA using the factorial method, which is best suited for taking into account the heterogeneity of heights, body masses and compositions, as well as physical activity levels in adults (Efsa 2013).

EFSA compared five predictive equations (Harris-Benedict (1919), Schofield *et al.* (1985), Mifflin *et al.* (1990), Müller *et al.* (2004) and Henry (2005)) using anthropometric measurements of 16,500 men and 19,969 women from national surveys conducted in 13 EU Member States and corresponding to a BMI of 22 kg/m².

This comparison showed that the five equations described a decrease in REE with advancing age in men and women, but also that the differences in results between these equations were greater as age increased.

The REE measurements performed by indirect calorimetry in 551 people aged 60 to 96 years, living at home and participating in the GISELA study (Luhrmann, Edelmann-Schafer et Neuhauser-Berthold 2010), concluded that with the exception of the Müller (2004) equation for elderly men and that of Schofield (1985) for elderly women, all the other equations systematically and considerably (between 26 and 67%) underestimated REE compared to the values obtained by calorimetric measurement (Efsa 2013).

Henry's equations, which draw on the most comprehensive European database in terms of number of subjects, nationality and age groups, were selected by EFSA to estimate average energy requirements (AER) according to age. However, due to a lack of anthropometric data for the population over 79 years of age, EFSA did not calculate AERs beyond that age.

Like EFSA, the CES on "Human nutrition" believed Henry's equations to be the most reliable. They were applied to calculate the AERs of the target population for this opinion.

The CES on "Human nutrition" therefore estimated the AER based on Henry's equations for women over 51 and men over 65 years of age living in France. The reference height used for each age group was the median height measured in the INCA 3 study. Body mass was estimated by taking the BMI value of 22 kg/m² used by EFSA (Table 2).

The CES on "Human nutrition" stresses that this BMI value is not a recommendation for a target value for the population in question. As body composition changes with age and is characterised by a decrease in lean body mass percentage and an increase in body fat percentage, BMI is not a sufficiently robust criterion to reflect the health and nutritional status of an individual, particularly an elderly individual. In addition, a BMI less than or equal to 21 kg/m², regarded as normal in adults, is one of the criteria for diagnosing undernourishment in the elderly (HAS 2007).

The physical activity level (PAL) used for each population was the median PAL from the INCA 3 data. It is equal to 1.63.

Table 1: Calculation of target weight and reference AER from data on median height and PAL from INCA 3 and Henry's equations* with a BMI of 22 kg/m² (2005)

Populations	Median height from INCA 3 (in m)	Weight calculated according to BMI of 22 (in kg)	Median PAL	Theoretical AER estimated with Henry's equation (in kcal/day)
Men >65 years	1.72	65.1	1.63	2308
Postmenopausal women from 51-59 years	1.61	57		2056.7
Women from 60-65 years	1.62	57.7		1927.7
Women >65 years	1.59	55.6		1877.8

*Henry's (2005) equations to calculate the REE (in megajoules per day):
Men >60 years: REE = 0.0478 x Weight (kg) + 2.26 x Height (m) - 1.07
Women >60 years: REE = 0.0356 x Weight (kg) + 1.76 x Height (m) + 0.0448
Women <60 years: REE = 0.0342 x Weight (kg) + 2.10 x Height (m) - 0.0486
MJ are converted to kcal assuming that 1 MJ = 238.85 kcal.

The target population of women was divided into three sub-populations to take account of:

- firstly, the decrease in REE reflected by the modification of Henry's equation from the age of 60 years;
- secondly, belonging to the elderly people group from the age of 65, like men.

Macronutrients

EFSA considers that protein requirements for the elderly are equal to those of adults (0.83 g/kg/day) (Efsa 2015).

However, in its 2016 report on the formulation of dietary guidelines, ANSES believed that the comparison of digestive and metabolic phenomena between subjects under 70 years of age and those over 70 years of age should lead to a specific dietary reference value for protein being set for subjects over 70 years of age, at 1 g/kg/day of good quality protein (Anses 2016a).

This reference value of 1 g/kg/day was retained and extended to subjects over 65 years of age when transposing the results of the food optimisation scenarios obtained in adults, in order to simplify the analysis of the transposition data.

Consequently, the selected reference values were as follows:

- for postmenopausal women under 65 years of age: 0.83 g/kg/d, i.e. 47.3 g for 51-59 years and 47.9 g for 60-65 years.
- for men and women over 65 years of age: 1 g/kg/d, i.e. 65.1 g for men and 55.6 g for women.

In the absence of specific data for elderly people and postmenopausal women suggesting that fat and carbohydrate requirements differ from those of other adults, the dietary reference values for these two macronutrients as defined for adult subjects apply to postmenopausal women and the elderly.

The dietary reference value for fibre chosen by ANSES, as part of the revision of dietary guidelines, was 30 g/day for adults. However, as with adult women, an AI of 25 g/day may be used as an acceptable value for postmenopausal and elderly women and elderly men if the value of 30 g/day cannot be reached by the intakes from the transposition of the adult scenarios (Anses 2016a).

The following table lists the macronutrient dietary reference values used in this report.

Table 2: Summary of dietary reference values (DRVs) used in the transpositions for the targeted populations

Populations	Proteins	Fibre	EPA+ DHA	α-linolenic acid	Linoleic acid
Unit/day	g	g	mg	mg	mg
DRV selected	(Anses 2016a)		(Anses 2011)		
Type of DRV	PRI*	AI*		PRI	AI
Men over 65 years of age	65.1 (1 g/kg)	25-30***	500	(1% TEI**) 2.6	(4% TEI) 10.3
Women **51-59 years** **60-65 years** **over 65 years of age**	 47.3 (0.83 g/kg) 47.9 (0.83 g/kg) 55.6 (1 g/kg)			(1% TEI) 2.3 2.1 2.09	(4% TEI) 9.1 8.6 8.3

* PRI = population reference intake; AI = adequate intake
** TEI = total energy intake
*** For fibre, an acceptable value of 25 g/day was adopted in both elderly people and adult women.

Minerals

The dietary reference values for minerals for postmenopausal women and elderly men are the same as those defined for adults.

For iron, the reference value was set at 11 mg/d for women from menopause onwards.

Given the existence of an equimolar ratio between potassium and sodium and in the absence of a validated dietary reference value for sodium, the CES on "Human nutrition" decided not to define a dietary reference value for potassium.

For zinc, requirements depend on the amount of phytates consumed. The CES on "Human nutrition" considered that there was no reason to think that the population of postmenopausal women and men over 65 years of age consumed more phytates than the general adult population. Precise data on

phytate consumption by the French are unknown, but data from other nearby European countries (United Kingdom, Italy, Sweden and Italy) were used by the CES to select a value of 900 mg/day for adults (Anses 2016a). This value was used to define the PRI for zinc in the populations studied in this opinion.

The dietary reference values for fluorine, chromium and molybdenum are not presented in this opinion because they were not included when developing the adult scenarios due to a lack of data available in the Ciqual table in 2016. These nutrients cannot therefore be taken into account when transposing the results from the adult food optimisation scenarios to the elderly population.

The table below lists the dietary reference values for minerals used in this opinion.

Table 3: Summary of dietary reference values (DRVs) for minerals used in the transpositions for the population

Population	Ca	Cu	Fe	I	Mg	Mn	P	Se	Zn
Unit/day	mg	mg	mg	µg	mg	mg	mg	µg	mg (for 900 mg of phytate intake)
DRV selected	(Efsa 2017)				(Anses 2016a)		(Efsa 2017)		
Type of DRV	PRI	AI*							PRI*
Men >65 years	950	1.6	11	150	420	2.8	550	70	14
Women from menopause onwards		1.3			360	2.5			11

* PRI = population reference intake; AI = adequate intake

Vitamins

The dietary reference values for vitamins for postmenopausal women and elderly men are the same as those defined for adults.

Vitamins B1 and B3 were calculated from total energy intakes (TEI expressed in megajoules) at 0.1 mg/MJ for B1 and 1.6 mg/MJ for vitamin B3. The values are shown in Table 4.

For vitamin D, the PRI of 15 µg/d was chosen, assuming no endogenous synthesis (exposure to the sun). This protective assumption was adopted because it is impossible to estimate the level of endogenous synthesis, which varies greatly according to the latitude where the individual lives and the time spent outdoors, and potentially decreases with advancing age. It is particularly difficult to achieve this dietary reference value by food alone, whether for adults or the elderly.

Table 4: Summary of dietary reference values (DRVs) for vitamins used for the analysis of transpositions

Populations	Vitamin A	Thiamine (B1)	Riboflavin (B2)	Niacin (B3)	Pantothenic acid (B5)	Vitamin B6	Folate (B9)	Cobalamin (B12)	Vitamin C	Vitamin D	A-tocopherol (E)
Unit/day	µg	mg	mg	mg	mg	mg	µg	µg	mg	µg	mg
DRV selected	(Efsa 2017)				(Anses 2016a)	(Efsa 2017)			(Anses 2016a)	(Efsa 2017)	(Anses 2016a)
Type of DRV	PRI*				AI*	PRI		AI	PRI		AI
Men over 65 years of age	750	0.97	1.6	15.5	5.8	1.7	330	4	110	15	10.5
Women											
51-59 years	650	0.86		13.8	4.7	1.6					9.9
60-65 years		0.81		12.9							
over 65 years of age		0.79		12.6							

* PRI = population reference intake; AI = adequate intake

Lastly, since the dietary reference values for vitamin B8 (biotin) and vitamin K had not been included in the development of the adult scenarios, they are not relevant for the analysis of transpositions.

3.3.2. Description of the transposition carried out

The CES on "Human nutrition" assessed whether the guideline values proposed by ANSES in 2016 for the adult population were in line with the dietary reference values for postmenopausal women over 50 years of age and men over 65 years of age.

To do this, the results from the food optimisation scenarios obtained in adults were transposed.

Using the scenarios[3] selected by ANSES in 2016 (B2 for adult women and C2 for adult men), achievement of the dietary reference values for postmenopausal women over 50 years of age and men over 65 years of age was verified in proportion to their theoretical average energy requirements (AERs) (Table 1).

3.3.3. Results of the transpositions using the B2 (women) and C2 (men) adult scenarios of the optimisation tool developed by ANSES in 2016

[3] The term "scenario" corresponds to the parameters of an optimisation model chosen to obtain the quantities of each food group needed to achieve the dietary reference values of a population while integrating different constraints, such as consumption habits (B2 and C2 scenarios) and contaminants (C2 scenario only).

In order to estimate the extent to which the dietary guidelines for the general adult population can be applied to the populations studied here, the CES on "Human nutrition" analysed the ability of the B2 and C2 scenarios, adjusted for each population's specific AER, to achieve the selected dietary reference values, considering the threshold of 95% of the dietary reference value as satisfactory.

The results of these transpositions are shown in the tables on the following pages.

Table 5: Results of the transposition of Scenario C2 to men over 65 years of age

			Men >65 years of age, Target weight 65.1 kg (BMI = 22 kg/m²)		
Nutrients	**Unit**	**Intakes in Scenario C2**	*Calculated target values,* PRI or AI	**Intakes in Scenario C2** adjusted to the calculated target calorie credit	**% of target values, PRI or AI, achieved (red if less than 95%)**
Energy intake	kcal	2470	2308	2308	-
Proteins	g	123.5	65.1	115.4	177.3
EPA + DHA	mg	500	500	467.2	93.4
Linoleic acid	mg	12.4	10.3	11.5	112.5
α-linolenic acid	mg	2.74	2.6	2.56	100.0
Fibre (AI)	g	30	30	28	93.4
(acceptable value)	-	-	25	-	112
Vitamin A*	µg	944	750	882.1	117.6
Vitamin *B1*	*mg*	1.4	1	1.3	138.5
Vitamin B2	mg	2.1	1.6	2	122.6
Vitamin B3**	mg	28.2	15.5	26.3	170.2
Vitamin B5	mg	7.4	5.8	6.9	119.2
Vitamin B6	mg	2.6	1.7	2.4	142.9
Vitamin B9***	µg	520	330	485.9	147.2
Vitamin B12	µg	6.7	4	6.3	156.5
Vitamin C	mg	193	110	180.3	163.9
Vitamin D	µg	4.3	15	4	26.8
Vitamin E	mg	15.0	10.5	14	133.5
Calcium	mg	1170	950	1093.3	115.1
Copper	mg	2.3	1.6	2.1	134.3
Iron	mg	14	11	13.1	118.9
Iodine	µg	150	150	140.2	93.4
Magnesium	mg	444	420	414.9	98.8
Manganese	mg	5.6	2.8	5.2	186.9
Phosphorus	mg	1761	550	1645.5	299.2
Selenium	µg	90	70	84.1	120.1
Zinc	mg	14	14	13.1	93.4

* Retinol equivalent (RE): retinol (µg) + 1/12 x β-carotene (µg)
** Niacin equivalent (NE): niacin (mg) + 1/60 dietary tryptophan (mg)
*** Dietary folate equivalent (DFE): dietary folate (µg) + 1.7 x folic acid (µg)

Example reading of the results regarding the percentage of the target reference values achieved (PRI, AI or values calculated according to energy intake or weight):
If men over 65 years of age consume the quantities of foods recommended in the C2 scenario defined for adults, relative to the proportion of their calorie credit estimated on the basis of a BMI of 22 kg/m² (i.e. 2308 kcal instead of 2470 kcal in the C2 scenario for adults), then they are only achieving 93.4% of the PRI for EPA+DHA, which is less than 95% and therefore regarded as unsatisfactory.

Table 6: Results of the transposition of Scenario B2 to women aged 51 and over

			Women aged 51 to 59 years Target weight 57 kg (BMI = 22 kg/m²)			Women aged 60 to 65 years Target weight 57.7 kg (BMI = 22 kg/m²)			Women >65 years of age Target weight 55.6 kg (BMI = 22 kg/m²)		
Nutrients	**Unit**	**Intakes in Scenario B2**	*Calculated target values* PRI or AI	**Intakes in Scenario B2** adjusted to reflect the calculated target calorie credit	**% of target values, PRI or AI, achieved (red if less than 95%)**	*Calculated target values* PRI or AI	**Intakes in Scenario B2** adjusted to reflect the calculated target calorie credit	**% of target values, PRI or AI, achieved (red if less than 95%)**	*Calculated target values* PRI or AI	**Intakes in Scenario B2** adjusted to reflect the calculated target calorie credit	**% of target values, PRI or AI, achieved (red if less than 95%)**
Energy intake	kcal	2039	2057	2057	-	1928	1928	-	1878	1878	-
Proteins	g	86.7	47.3	87.4	184.7	47.9	81.9	171	55.6	79.8	143.5
EPA + DHA	mg	500	500	504.3	100.9	500	472.7	94.5	500	460.5	92.1
Linoleic acid	mg	11.3	9.1	11.4	125	8.6	10.7	125	8.3	10.4	125
α-linolenic acid	mg	2.27	2.3	2.29	100	2.1	2.14	100	2.09	2.09	100
Fibre (AI)	g	26	30	26.2	87.3	30	24.6	82	30	23.9	79.6
(acceptable value)	-	-	25	-	104.9	25	-	98.3	25	-	95.8
Vitamin A*	µg	822	650	829.1	127.6	650	777.1	119.6	650	757	116.5
Vitamin B1	mg	1.2	0.86	1.2	140.9	0.81	1.1	140.9	0.79	1.1	140.9
Vitamin B2	mg	2	1.6	2	123.4	1.6	1.9	115.7	1.6	1.8	112.7
Vitamin B3**	mg	17.9	13.8	18.1	131.4	12.9	17	131.4	12.6	16.5	131.4
Vitamin B5	mg	5.9	4.7	6	126.6	4.7	5.6	118.7	4.7	5.4	115.6
Vitamin B6	mg	2.1	1.6	2.1	132.4	1.6	2	124.1	1.6	1.9	120.9
Vitamin B9***	µg	379	330	382.3	115.8	330	358.3	108.6	330	349	105.8
Vitamin B12	µg	6.5	4	6.6	163.9	4.0	6.1	153.6	4	6.0	149.7
Vitamin C	mg	110	110	111	100.9	110	104	94.5	110	101.3	92.1
Vitamin D	µg	3.4	15	3.4	22.9	15	3.2	21.4	15.0	3.1	20.9
Vitamin E	mg	14	9.9	14.1	142.6	9.9	13.2	133.7	9.9	12.9	130.2
Ca	mg	1058	950	1067.2	112.3	950	1000.3	105.3	950	974.4	102.6
Cu	mg	2	1.3	2	155.2	1.3	1.9	145.4	1.3	1.8	141.7
Iron	mg	11	11	11.1	100.9	11	10.4	94.5	11	10.1	92.1
Iodine	µg	150	150	151.3	100.9	150	141.8	94.5	150	138.1	92.1
Mg	mg	378	360	381.3	105.9	360	357.4	99.3	360	348.1	96.7
Mn	mg	4.6	2.5	4.6	185.6	2.5	4.3	174	2.5	4.2	169.5
P	mg	1526	550	1539.2	279.9	550	1442.7	262.3	550	1405.4	255.5
Se	µg	83	70	83.7	119.6	70	78.5	112.1	70	76.4	109.2
Zn	mg	11	11	11.1	100.9	11	10.4	94.5	11	10.1	92.1

* Retinol equivalent (RE): retinol (µg) + 1/12 x β-carotene (µg)
** Niacin equivalent (NE): niacin (mg) + 1/60 dietary tryptophan (mg)
*** Dietary folate equivalent (DFE): dietary folate (µg) + 1.7 x folic acid (µg)

The following conclusions emerge from these transpositions:

In all the sub-populations considered:

- the protein intakes proposed by transposing the results of scenarios B2 and C2 can fully achieve the dietary reference value;
- the PRI for vitamin D is not achieved;
- the AI for fibre of 30 g/d is not achieved.

In men over 65 years of age:

- the dietary guidelines defined for adult men enable almost all the dietary reference values to be achieved, except for EPA/DHA, iodine and zinc, where intakes only reach 90-95% of the DRVs;
- assuming that the AI value for fibre of 25 g/d is acceptable for elderly men, transposition of the adult male scenario is largely able to achieve the dietary reference value.

In women:

- postmenopausal women aged 51-59 years: transposition of the results from the B2 optimisation scenario for adult women shows that all the dietary reference values are achieved, with the exception of vitamin D and fibre (if the AI is at 30 g/d);
- from the age of 60, intakes of EPA/DHA, vitamin C, iron, iodine and zinc only reach 90-95% of the dietary reference values;
- for all women: assuming that the AI value for fibre of 25 g/d is acceptable for women aged 51 and over, the transpositions enable this objective to be achieved even for women over 65.

On completion of this analysis, the CES on "Human nutrition" found that the dietary reference values for EPA, DHA, vitamin C, iron, iodine and zinc were still not met to an adequate degree when applying the dietary guidelines for adults in general to these populations.

The CES identified two ways to overcome this inadequate coverage of the dietary reference values for these nutrients.

The first is to promote the consumption of food groups rich in EPA, DHA, vitamin C, iron, iodine and zinc. The CES identified the food subgroups that are simultaneously vectors of several of these nutrients, in order to propose a limited number of adaptations to the guidelines. The analysis of the contributions made by the food subgroups in scenarios B2 and C2 to achieving the adult dietary reference values suggested that:

- "vegetables" and "fresh fruits" are good vectors of vitamin C, iron and, to a lesser extent, zinc;
- "oily fish" and "other fish, molluscs and crustaceans" are good vectors of iodine, EPA, DHA and, to a lesser extent, zinc;
- wholegrain cereal products, i.e. "wholegrain bread and bread products" and "other wholegrain starches", are good vectors of iron and zinc.

The second suggests that it may, however, be possible to achieve the dietary reference values for the nutrients mentioned above by authorising higher dietary intakes through an increase in the average energy requirement, which in turn is enabled by an increase in the level of physical activity (Annex 2).

Indeed, with a PAL of 1.75 (instead of 1.63 as reported in INCA 3), transposing Scenario C2 to men over 65 years of age would result in a TEI of 2477 kcal (instead of 2308 kcal for a PAL of 1.63), which could entirely (>100%) achieve all the dietary reference values including those for EPA, DHA, iodine and zinc.

For women aged 60 to 65 years, a PAL of 1.73 would increase the TEI to 2046 kcal (instead of 1928 kcal with a PAL of 1.63) to entirely (>100%) achieve all the dietary reference values for nutrients, including those for EPA, DHA, vitamin C, iron, iodine and zinc, while maintaining the AI reference value for fibre at 25 g/day. For women over 65 years of age, a PAL of 1.77 would increase the TEI to 2040 kcal (instead of 1878 kcal with a PAL of 1.63) and achieve all the dietary reference values, including those for EPA, DHA, vitamin C, iron, iodine and zinc.

The increase in PAL from 1.63 to 1.77 corresponds to an increase in energy expenditure of less than 10% and can be achieved by following ANSES's guidelines on physical activity (Anses 2016d).

Conclusion

The analysis of the data on the transpositions carried out in this opinion encourages women from menopause onwards and men over 65 years of age to follow the dietary recommendations defined for adult women and men by ANSES in 2016. However, for both these populations, the dietary reference value for vitamin D is not achieved by diet alone, which is already the case for the general adult population.

For postmenopausal women under 60 years of age, the adult guidelines can be applied as they stand, as they meet the nutritional goals for all nutrients.

On the other hand, for women over 60 and men over 65 years of age, these recommendations require slight adjustments due to the decrease in resting energy expenditure.

If physical activity levels are increased, particularly by reducing sedentary behaviour and following ANSES's recommendations on physical activity (Anses 2016d), energy intakes equivalent to those of adults can be maintained to achieve the reference values for all nutrients.

If the level of physical activity is unchanged, energy intake should be reduced. Therefore, since the adult dietary guidelines have been kept for the elderly, maintaining a balanced energy budget requires a slight decrease in serving size compared to adults. This then results in the dietary reference values for some nutrients not being met.

For women over 60 years of age, the dietary reference values for EPA, DHA, vitamin C, iron, iodine and zinc are not met. In the worst cases, intakes are only 92% of the DRVs (for women over 65 years of age).

For men over 65 years of age, the transposition does not enable intakes to reach more than 93% of the dietary reference values for EPA, DHA, iodine and zinc.

The CES on "Human nutrition" therefore proposes that serving sizes of some food subgroups that are vectors of these nutrients should remain similar to those of adults. This concerns:

- "vegetables" and "fresh fruits", which are vectors of vitamin C, iron and, to a lesser extent, zinc;
- "oily fish" and "other fish, molluscs and crustaceans", as vectors of iodine, EPA, DHA and, to a lesser extent, zinc;
- wholegrain cereal products, i.e. "wholegrain bread and bread products" and "other wholegrain starches", which are vectors of iron and zinc.

The foods consumed within each group mentioned above should be varied.

3.4. Recommendations of the CES and discussion

3.4.1. Foods at risk for the study population

The main diseases or complications related to foodborne pathogens that can occur in the elderly are as follows:

- listeriosis;
- thrombotic microangiopathy associated with enterohaemorrhagic *E. coli*;
- bacteraemia following infection with *Salmonella* or *Campylobacter*;
- yersiniosis caused by *Yersinia pseudotuberculosis*;
- severe dehydration associated with acute bacterial or viral gastroenteritis.

The analysis by the CES Biorisk, provided in Annex 3, presents general measures to prevent microbiological risks and foods to be avoided in order to reduce the risk of infection in the elderly:

- cooked delicatessen meat products requiring cold storage (e.g. rillettes, pâtés, jellied products);
- all raw or undercooked meats;
- raw milk and cheeses made from raw milk (with the exception of hard pressed cheeses such as gruyère or comté);
- raw eggs and products containing raw or undercooked eggs;
- raw fish (sushi, sashimi, taramasalata), smoked fish;
- shelled crustaceans sold cooked and requiring cold storage.

3.4.2. Analysis of consumption data for selected nutrients from the INCA 3 study for the study population

The INCA 3 study was conducted from February 2014 to September 2015 throughout metropolitan France (excluding Corsica) with a representative sample of the French population (Anses 2017).

A total of 5855 individuals, broken down into 2698 children from birth to age 17 and 3157 adults between the ages of 18 and 79, participated in the study. Among these individuals, 1993 children and 2121 adults detailed their food consumption.

ANSES's Methodology and Studies Unit (UME), which was in charge of the INCA 3 study, provided the CES on "Human nutrition" with average and median data on observed intakes for nutrients that achieved less than 95% of the dietary reference values in the results of the scenario transpositions carried out previously in this opinion. For this analysis, the nutrients for which dietary reference values were not reached by the transpositions carried out previously were the same for both women aged 60-65 years and women over 65 years of age. As a result, only one age group was considered for women (60-79 years) (Annex 4).

The UME informed the CES on "Human nutrition" that analyses carried out using the available consumption database are currently based on consumption observed in the short term from the two or three days of data collection. The average indicator, which is a central parameter, can be regarded as robust. However, the dispersion indicators (standard deviation and percentiles) are under- or overestimated. The median, although a central parameter, may also be under- or overestimated with consumption observed over a limited number of days. However, in the absence of a robust dispersion indicator, it can be used to give a simplified description of the distribution of intakes around the reference values. The CES decided to use the median for the subsequent analyses. These focused on nutrients for which the dietary reference values were not reached on completion of the transposition work.

The nutrient intake data presented in Annex 4 correspond to reported consumption for a median energy intake level of 2185 kcal/day for men and 1640 kcal/day for women.

Analysis of these data showed that, among women over 60 years of age and men over 65 years of age, the median intakes observed in the INCA 3 study were significantly lower than the PRIs for total energy intake, EPA, DHA and zinc. The CES concluded that these intakes were generally inadequate in this population.

For women over 60 years of age, median intakes of vitamin C, iron and iodine were also lower than the dietary reference values. The CES concluded that intakes were generally inadequate in this population.

For men over 65 years of age, on the other hand, the median iodine intake was equal to the dietary reference value. The CES concluded that this intake was generally adequate in this population.

Concerning physical activity

The data from INCA 3 on physical activity levels identified a high prevalence of relatively low physical activity levels among women and men over 65 years of age. Beyond the age of 65, a small number of them (5.9% of men and 3.4% of women) nevertheless manage to maintain a relatively high level of physical activity (Annex 5).

The INCA 3 report mentioned that 73% of adults aged 65-79 years had a moderate to high level of sedentarity (respectively from 3 to 7 hours, or more than 7 hours spent in front of a screen).

Conclusion:

The analysis of INCA 3 data indicated that iodine (in women), EPA, DHA, iron, zinc and vitamin C appear to be consumed in inadequate amounts by women over 60 and men over 65 years of age.

The INCA 3 study also indicated that the level of physical activity among the elderly is generally low.

3.5. Conclusion of the CES

In view of the data from epidemiological studies, the CES on "Human nutrition" concludes that there is no need to propose dietary guidelines different from those proposed for adults, for the populations targeted in this opinion.

On the basis of the results from transposing the scenarios from the food consumption optimisation tool for the adult population to postmenopausal women and elderly men, the CES concludes that:

(1) the dietary guidelines defined for adults enable most of the dietary reference values to be achieved for the populations studied;

(2) some adaptations are necessary to meet all the dietary reference values.

The CES considers that an increase in physical activity level makes it possible to maintain energy intakes equivalent to those of adults in general and therefore to achieve all the dietary reference values. It therefore emphasises the importance of following the recommendations on physical activity (Anses 2016d) for all elderly people.

If the level of physical activity is unchanged or insufficiently increased, the CES points out that energy intake, and therefore serving sizes, should be reduced compared to those of the general adult population, in order to maintain a balanced energy budget. In these conditions, the objective of

achieving dietary reference values for EPA, DHA, vitamin C, iron, iodine and zinc justifies not reducing too much the serving sizes of certain food subgroups that are vectors of these nutrients. In this respect, the CES has identified the following subgroups as being particularly beneficial:

- "vegetables" and "fresh fruits", which are vectors of vitamin C, iron and, to a lesser extent, zinc;
- "oily fish" and "other fish, molluscs and crustaceans", as vectors of iodine, EPA, DHA and, to a lesser extent, zinc;
- wholegrain cereal products, i.e. "wholemeal bread and bread products" and "other wholegrain starches", which are vectors of iron and zinc.

4. AGENCY CONCLUSIONS AND RECOMMENDATIONS

The French Agency for Food, Environmental and Occupational Health & Safety adopts the conclusions and recommendations of the CES on "Human nutrition".

This work supplements the Agency's work in formulating dietary guidelines for different types of populations: the adult population, children from birth to three years of age, children from four to 17 years of age, and pregnant and breastfeeding women. It may be further supplemented by work carried out for populations with dietary restrictions such as vegetarians or vegans.

This work does not incorporate any economic, social or environmental considerations, only nutritional risk considerations and recommendations for the prevention of foodborne microbiological risks. It does not take into account the variability of nutritional compositions or levels of contaminants and pesticide residues according to crop varieties, production systems, storage and processing conditions, preparation methods, etc.

In order to carry out this expert appraisal within the time available, to verify its working hypothesis the CES on "Human nutrition" chose to use the dietary reference values updated by EFSA in 2017, except when ANSES had issued a recommendation more suited to the French population concerned. The choice of dietary reference values for the population of postmenopausal women and men over 65 years of age in France will be consolidated by ANSES in a forthcoming expert appraisal.

For this population, the expert appraisal also drew on a literature review of the epidemiological links between the consumption of food groups, as characterised when updating the PNNS dietary guidelines for the adult population, and diseases specific to ageing (sarcopenia, cognitive disorders, age-related macular degeneration and bone health). This analysis of the epidemiological links suggests that there is no evidence warranting a significant change in the consumption guidelines for the food groups defined by ANSES in 2016.

The transposition to postmenopausal women and men over 65 years of the dietary guidelines published by ANSES in 2016 for the general adult population, which were developed using nutritional compositions weighted on the basis of adult consumption, validated the assumption, adopted by other national agencies, that the dietary guidelines for these populations are very similar to those for adults in general. The guidelines intended for the adult population, as defined by ANSES in 2016, can therefore meet all the nutritional requirements of postmenopausal women under 60 years of age.

On the other hand, due to the lower energy expenditure observed among men and women over 60 years of age, the decrease in the energy envelope and therefore in the amounts of foods consumed required qualitative adjustments. Specifically, to ensure that the requirements are met for EPA, DHA, vitamin C, iron, iodine and zinc in people over 60 years of age, the CES recommends that the consumption guidelines for the "oily fish", "other fish, molluscs and crustaceans", "fruits and vegetables" and "wholegrain cereal products" groups remain the same as those proposed by ANSES in 2016.

In addition, this expert appraisal offers an original solution with an increase, even slight, in energy expenditure, which would naturally result from a reduction in sedentary time and an increase in the level of physical activity as a whole. This solution would make it easier to meet nutritional requirements as part of a maintained energy balance. It would also contribute to protecting the health of elderly people through the known effects of physical activity on a large number of non-communicable diseases and, more specifically, on diseases associated with ageing.

ANSES reiterates the recommendations it made as part of its expert appraisal on physical activity for all populations and therefore recommends facilitating access to various types of physical activity complementary to daily activity for elderly people, by including them in the nutritional care programmes for the most isolated (meals on wheels, nursing homes, etc.).

Data on nutrient intakes currently observed in France for postmenopausal women and men over 65 years of age (INCA 3 study) confirm the poor coverage of iodine requirements in women over 60 years of age, and of EPA, DHA, iron, zinc and vitamin C in women over 60 years of age and men over 65 years of age. They also indicate that a large proportion of people over 65 years of age have a low physical activity level and high sedentary time. Just as with the general adult population, it is crucial for elderly people to give joint consideration to dietary recommendations, physical activity and reducing sedentary time.

Dr Roger Genet

KEYWORDS

Programme national nutrition santé, risque santé, nutrition, consommation alimentaire, nutriment, référence nutritionnelles, repères alimentaires, personnes âgées, ménopause, activité physique

French National Nutrition and Health Programme, health risk, nutrition, food intake, nutrient, dietary reference value, food-based dietary guidelines, elderly people, menopause, physical activity, sedentariness

GLOSSARY

Dietary recommendation: a recommendation on consumption of a food or food group to achieve a dietary guideline level.

Dietary reference value: a reference value for a nutrient. These may include the average requirement (AR), population reference intake (PRI), adequate intake (AI), reference intake range (IR) or upper intake level (UL).

Dietary guideline: the level of consumption of a food or food group or other dietary consumption characteristic that is beneficial to health.

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ANNEX 1 PRESENTATION OF PARTICIPANTS

PREAMBLE: The expert members of the Expert Committees and Working Groups or designated rapporteurs are all appointed in a personal capacity, *intuitu personae*, and do not represent their parent organisation.

RAPPORTEURS

Ms Marie-Christine BOUTRON-RUAULT – Research Director (CESP Inserm) – Specialities: nutritional epidemiology and cancer, digestive system

Ms Emmanuelle KESSE-GUYOT – Research Director (INRA, UMR Inserm U1153/INRA U1125/CNAM/University of Paris 13) – Specialities: epidemiology, nutrition and pathologies, nutrition and public health

Ms Anne-Sophie ROUSSEAU – University Lecturer (University of Nice Sophia Antipolis) – Specialities: nutrition and physical activity, bioavailability, oxidative stress

Mr Stéphane WALRAND – University Professor-Hospital Practitioner (University of Clermont Auvergne – Gabriel Montpied University Hospital in Clermont-Ferrand) – Specialities: pathophysiology, protein metabolism, amino acids, vitamin D, fatty acids

EXPERT COMMITTEE

- CES on "Human nutrition" – 2015-2018

Chair

Mr François MARIOTTI – Professor (AgroParisTech) – Specialities: metabolism of proteins, amino acids, nutritional requirements and recommendations, postprandial metabolism, cardiometabolic risk

Members

Ms Catherine ATLAN – University Lecturer-Hospital Practitioner – Doctor (Luxembourg Hospital Centre) – Specialities: endocrinology, metabolic diseases and nutrition

Ms Catherine BENNETAU-PELISSERO – Professor (Bordeaux Sciences Agro) – Specialities: phyto-oestrogens, isoflavones, endocrine disruptors, bone health

Ms Marie-Christine BOUTRON-RUAULT – Research Director (CESP Inserm) – Specialities: nutritional epidemiology and cancer, digestive system

Mr Jean-Louis BRESSON – University Professor-Hospital Practitioner (AP-HP Necker Hospital – Sick Children, Centre for Clinical Investigation 0901) – Specialities: epidemiology, immunology, infant nutrition, pregnant women and proteins

Mr Olivier BRUYERE – University Professor (University of Liège) – Specialities: epidemiology, public health, osteoporosis

Ms Blandine de LAUZON-GUILLAIN – Research Director (INRA, CRESS, Villejuif) – Specialities: epidemiology, infant nutrition, nutrition of pregnant and breastfeeding women, public health

Ms Anne GALINIER – University Lecturer – Hospital Practitioner (Paul Sabatier University – Toulouse University Hospital) – Specialities: metabolism of adipose tissue/obesity, pathophysiology

Mr Jean-François HUNEAU – Professor (AgroParisTech) – Speciality: human nutrition

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- CES on Assessment of the biological risks in foods (BIORISK)

Chair

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Members

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ANSES PARTICIPATION

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HEARINGS WITH EXTERNAL EXPERTS

French Society for Geriatrics and Gerontology

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ANNEX 2 RESULTS OF PAL SIMULATIONS ENABLING INTAKES TO REACH 95% OR 100% OF THE DIETARY REFERENCE VALUES, PARTICULARLY FOR NUTRIENTS WHERE INTAKES WERE IDENTIFIED AS BEING LESS THAN 95% OF THE DRVS WHEN TRANSPOSING SCENARIOS FROM ADULTS TO THE ELDERLY POPULATIONS STUDIED

Population	Selected PAL able to achieve at least 95% of the dietary reference values for limiting nutrients* (excluding Vitamin D**)	Selected PAL able to achieve 100% of the dietary reference values for limiting nutrients* (excluding Vitamin D**)
Women aged 60 to 65 years	1.64	1.73
≥ 65 years	1.69	1.77
Men ≥ 65 years	1.66	1.75

Reminders:
* Nutrients for which intakes achieved less than 95% of the dietary reference values in the results of the transpositions from the adult scenarios were:

- in men over 65 years of age: EPA, DHA, iodine, zinc.
- in women over 60 years of age: EPA, DHA, vitamin C, iron, iodine and zinc.

** The PRI for vitamin D was not achieved by scenarios B2 and C2 in adults due to an extremely protective target value and the fact that it is impossible to take an estimate of endogenous synthesis into account.
This lack of coverage is therefore reflected in the transpositions of the scenarios to elderly adults.

ANNEX 3 ANALYSIS AND CONCLUSIONS OF THE CES BIORISK ON RECOMMENDATIONS FOR THE PREVENTION OF FOODBORNE MICROBIOLOGICAL RISKS FOR SPECIFIC POPULATIONS

The prevention of foodborne diseases by consumers requires three types of measures (ANSES, 2015, 2014, 2013):

- prevention of cross-contamination: hand-washing, cleaning of surfaces, equipment and utensils, separation of raw and cooked food;
- application of specific measures to inactivate micro-organisms or prevent them from multiplying: refrigeration, freezing, cooking, decontamination;
- the exclusion of some foods for certain categories of the population.

1. Recommendations on prevention intended for the general population

Measures enabling consumers to prevent and control the main foodborne microbial hazards are described in the ANSES biological hazard sheets and summarised in Table 1.

Table 1: Main measures enabling consumers to prevent foodborne microbiological risks

Foods concerned	Main recommendations to consumers
All	○ Wash hands (after going to the toilet, before and during food preparation, before eating, after contact with animals, etc.). ○ People with gastroenteritis symptoms should avoid preparing meals for others. ○ Regularly clean work surfaces, equipment and utensils. ○ Refrigerator hygiene: surfaces should be cleaned whenever food has soiled them. ○ Comply with the cold chain: maintain a maximum temperature of 4°C in the coldest part of the refrigerator and check the seal on its doors. ○ Comply with the UBD for packaged products and rapidly consume (within three days of purchase) retail foods sold without a stated UBD. ○ Quickly refrigerate cooked dishes (resting time at room temperature <2h). ○ Separate raw and cooked foods: - use a separate cutting board for raw meat and fish, - dishes and utensils used in the seasoning of raw meat or fish should be cleaned before being reused for cooked foods.
Meat and meat products	Cook poultry and red meat thoroughly (>70°C internal temperature).
Milk and dairy products	Infant formula: - Comply with the rules on preparation and storage of feeding bottles: ○ reduce the time between preparation and consumption to no more than one hour if the product is at room temperature, and 30 minutes if it has been heated, ○ store reconstituted meals/bottles at 4°C and for 48 hours at most. - Preferably use sterile formula in liquid form for infants most susceptible to infection.
Eggs and egg products	Home-made uncooked egg-based preparations (mayonnaise, creams, chocolate mousse, pastries, etc.) should be prepared as close as possible to the time of consumption, kept cool and consumed within 24 hours.
Seafood and freshwater products	Fish - Cook fish thoroughly (65°C). - For lovers of raw fish (sushi, fillets, marinades, carpaccio, etc.): freeze for 7 days in a domestic freezer, gut and clean caught fish rapidly. Shellfish - Avoid consuming shellfish that do not come from authorised and inspected areas of production, or cook them for a prolonged period. - Consume live bivalve shellfish and raw seafood within two hours of being fished/picked or taken out of the refrigerator.
Plants	- Wash fresh produce (fruits, vegetables and herbs) thoroughly, cook foods if washing conditions cannot be applied due to a lack of drinking water. - In countries with low levels of hygiene: avoid consumption of unpasteurised fresh fruit juices.

2. Additional recommendations for susceptible populations

Certain categories of the population are more likely than average to develop symptoms, severe forms or complications of a foodborne infectious disease after exposure to a hazard. These include infants, young children, the elderly, pregnant women, immunocompromised individuals and those suffering from chronic diseases.
These susceptible populations are characterised by an immune system deficiency that may be physiological (in the case of infants, young children, the elderly, pregnant women) or related to a chronic disease or immunosuppressive treatment.
The main infections associated with the populations considered in this request are presented in Table 2.

Table 2: Main diseases or complications that may occur in the elderly

Susceptible population group	Diseases or complications related to foodborne pathogens
The elderly	Listeriosis. Thrombotic microangiopathy associated with enterohaemorrhagic *E. coli*. Bacteraemia following infection with *Salmonella* or *Campylobacter*. Yersiniosis caused by *Yersinia pseudotuberculosis*. Severe dehydration associated with acute bacterial or viral acute gastroenteritis.

The exclusion of some foods by susceptible populations reduces the risk of infection. The main foods to be avoided are shown in Table 3.

Table 3: List of foods to be avoided by the elderly

Population categories	Foods to be avoided
The elderly	Cooked delicatessen meat products requiring cold storage (e.g. rillettes, pâtés, jellied products). All raw or undercooked meats. Raw milk and cheeses made from raw milk (with the exception of hard pressed cheeses such as gruyère or comté). Raw eggs and products containing raw or undercooked eggs. Raw fish (sushi, sashimi, taramasalata), smoked fish. Shelled crustaceans sold cooked and requiring cold storage.

List of expert appraisals consulted

- Foodborne biological hazard data sheets https://www.anses.fr/en/content/microbiological-hazards-files
- ANSES Opinion of 18 December 2015 on a draft decree pursuant to Article L. 214-1 of the French Consumer Code and concerning the labelling of raw milk intended to be provided for direct consumption by the final consumer https://www.anses.fr/fr/system/files/BIORISK2015SA0114.pdf
- ANSES Opinion and Report of 14 October 2015 relating to consumer information on prevention of foodborne microbiological risks – Volume 2: Assessment of the effectiveness of communication strategies. https://www.anses.fr/fr/system/files/BIORISK2012sa0118Ra-02.pdf
- ANSES Opinion and Report of 9 May 2014 relating to consumer information on prevention of foodborne microbiological hazards – Volume 1: Prioritisation of the hazard-food combinations and review of information measures https://www.anses.fr/fr/system/files/BIORISK2012sa0118Ra-01.pdf
- ANSES Opinion of 7 February 2013 on the request to re-assess seafood products posing a risk for pregnant women in the PNNS guide "Guide to nutrition during and after pregnancy" https://www.anses.fr/fr/system/files/BIORISK2012sa0102.pdf
- ANSES Opinion of 8 October 2013 on prevention of foodborne microbiological risks by consumers at home: main measures adopted https://www.anses.fr/fr/system/files/BIORISK2012sa0005.pdf
- Data sheet on foodborne biological hazards: "Domestic hygiene" – October 2013. https://www.anses.fr/fr/system/files/MIC2012sa0005Fi.pdf
- AFSSA. December 2005. Report Toxoplasmosis: state of knowledge and dietary risk assessment: report of the AFSSA "*Toxoplasma gondii*" Working Group. https://www.anses.fr/fr/system/files/MIC-Ra-Toxoplasmose.pdf
- AFSSA. July 2005. Report on the hygiene recommendations for the preparation and storage of infant feeding bottles. https://www.anses.fr/fr/system/files/MIC-Ra-BIB.pdf

- **Recommendations by hazard considered (source: biological hazard data sheets)**

Name	Susceptible population group	Main foods concerned	Recommendations for consumers	Data sheet version date
Bacteria, toxins or metabolites				
***Campylobacter* spp.**	Young children, the elderly, immunocompromised individuals	Inadequately cooked poultry meat, vegetables contaminated during preparation (cross-contamination), raw milk	- Basic hygiene rules - Cook poultry and red meat sufficiently (>65°C) - Separate raw and cooked foods: o Use a separate cutting board for raw meat o The dishes and utensils used for seasoning should be cleaned before being reused for cooked meat	Revision 2018
Enterohaemorrhagic *E. coli* (EHEC)	Young children, the elderly	Inadequately cooked minced beef, unpasteurised dairy products, fresh produce (lettuce, spinach; sprouted seeds) unpasteurised products of plant origin (apple juice), contaminated water	– Basic hygiene rules – Thorough washing of produce (fruits and vegetables and herbs), peeling if possible – **For young children and the elderly:** o **cook minced meat and minced meat products thoroughly** o **do not consume raw milk and cheeses made from raw milk**	Revision 2018
Listeria monocytogenes	People with haematological cancers, people infected with HIV, organ transplant patients, people with kidney or liver failure, pregnant women, people with inflammatory diseases (Crohn's disease, rheumatoid arthritis, etc.) or non-haematological cancers, people over 65 years of age without other underlying conditions, diabetics (type 1 or 2) and people with heart disease.	All major food categories that allow the growth of *Listeria monocytogenes*	– Basic hygiene rules. – Refrigerator hygiene: whenever food has soiled surfaces, they should be cleaned immediately. Do not place unwrapped food directly on the shelves. – Compliance with the cold chain: the refrigerator must be set at no more than +4°C. – Store leftovers for no more than 3 days, and for foods to be consumed hot, heat to an internal temperature of more than +70°C. – Compliance with the use-by dates (UBD) for packaged products and rapid consumption of foods cut to order. – **Pregnant women and other sensitive populations** are advised to avoid foods such as certain cooked delicatessen meat products, soft cheeses with a surface mould (such as camembert or brie) or washed rind (such as munster or pont l'évêque), especially if they are made from raw milk, cheeses sold grated, raw or undercooked meat, raw shellfish, raw fish (sushi, sashimi, taramasalata), smoked fish and shelled crustaceans sold cooked.	Revision 2018

Name	Susceptible population group	Main foods concerned	Recommendations for consumers	Data sheet version date
***Salmonella* spp.**	Infants, the elderly, subjects suffering from malnutrition, achlorhydria, hypochlorhydria or a neoplastic disease, or following an antacid treatment, broad-spectrum antibiotherapy or immunosuppressor treatment.	Raw eggs and products made with raw eggs, meat (beef, pork, poultry), dairy products (raw or slightly heat-treated milk)	– Basic hygiene rules – Thorough cooking of meat – Specific measures concerning eggs and preparations containing raw eggs: ○ Eggs should be stored at a stable temperature to avoid condensation on their surface. Under no circumstances should eggs be washed before storage. ○ Uncooked egg-based preparations (mayonnaise, creams, chocolate mousse, pastries, etc.) should be consumed immediately after preparation or kept cool and consumed within 24 hours. **The elderly, immunocompromised people, young children and pregnant women should not eat raw or undercooked eggs**	Revision 2018
Yersinia enterocolitica* / *Y. pseudotuberculosis	*Y. enterocolitica*: children under 10 years of age *Y. pseudotuberculosis*: people over 60 years of age Subjects with iron overload, cirrhosis, diabetes and immunosuppression are predisposed to develop a severe deep-rooted form or sepsis	Pork, raw milk, fresh produce, mixed salads	– Basic hygiene rules – Cook pork thoroughly – Wash vegetables thoroughly – Infected people should avoid handling food	May 2017

Parasites				
Entamoeba histolytica/E. dispar	People over 60 years of age or those with hypokalaemia (insufficient potassium concentration in the blood)	Water, fresh produce	– Basic hygiene rules. – Wash vegetables thoroughly; cook food if washing conditions cannot be applied due to a lack of drinking water. – In endemic regions, consume bottled spring water or mineral water, otherwise boiled (10 min) or microfiltered water.	Revision 2018
***Trichinella* spp.**	The elderly Pregnant women	Raw or undercooked pork, wild boar or game meat (bear, warthog, etc.)	– Do not eat pork or wild boar meat that has not been officially inspected. If in doubt, cook the meat thoroughly. – For hunters and travellers abroad, do not consume raw or undercooked meat that has not been inspected.	Revision 2018

ANNEX 4 ANALYSIS OF AVERAGE AND MEDIAN INTAKES REPORTED IN THE INCA 3 STUDY FOR NUTRIENTS FOR WHICH THE DIETARY REFERENCE VALUES WERE NOT REACHED BY THE RESULTS OF THE TRANSPOSITIONS IN WOMEN 60-79 YEARS OF AGE AND MEN 65-79 YEARS OF AGE

Nutrients not easily covered by the transposition of scenario C2 to the population	**Intakes from the INCA 3 report Men aged 65 to 79 (n=312)**				DRV adopted (**PRI in bold** or AI)	% of coverage of DRVs at the average value	% of coverage of DRVs at the median value
	Unit	Average	Standard deviation	Median			
Total Energy Intake	kcal/d	2212.7	811.9	**2185.2**	**2308**	**95.9**	**94.7**
EPA	mg/d	134.0	195.0	**65.3**	**EPA+DHA=500**	**65.9**	**27.2**
DHA	mg/d	195.3	302.1	**70.5**			
Vitamin D*	µg	3.4	2.7	**2.9**	**15**	**22.7**	**19.3**
Iodine	µg	157.7	69.2	**151.2**	150	**105.1**	**100.8**
Zinc	mg	10.1	4.1	**9.5**	**14**	**72.1**	**67.9**

Nutrients not easily covered by the transposition of scenario B2 to the population	**Intakes from a Scientific & Technical Support Note on INCA 3 data Postmenopausal women aged 60 to 79 years (n=423)**				DRV adopted (**PRI in bold** or AI)	% of coverage of DRVs at the average value	% of coverage of DRVs at the median value
	Unit	Average	Standard deviation	Median			
Total Energy Intake	kcal/d	1705.0	700.4	**1640.4**	**1877.8**	**90.8**	**87.4**
EPA	mg/d	122.9	212.2	**50.6**	**EPA+DHA=500**	**60.1**	**24.8**
DHA	mg/d	177.5	306.8	**73.5**			
Vitamin C	mg	93.2	64.1	**81.6**	**110**	**84.7**	**74.2**
Vitamin D *	µg	3.1	2.2	**2.8**	**15**	**20.7**	**18.7**
Iron	mg	8.7	4.1	**8.5**	**11**	**79.1**	**77.3**
Iodine	µg	144.7	74.9	**136.6**	150	**96.5**	**91.1**
Zinc	mg	7.9	3.7	**7.3**	**11**	**71.8**	**66.4**

** The PRI for vitamin D was chosen assuming zero endogenous synthesis (by exposure to the sun). This conservative hypothesis was selected when it was not possible to estimate the level of endogenous synthesis, as this varies greatly according to individuals, the time spent outdoors, and the latitude where the individual lives, and potentially decreases with advancing age. It is therefore particularly difficult to meet this requirement by food alone.

Value ≥ 100% DRV
95 ≤ Value < 100% PRI
Value < 95% PRI

ANNEX 5 DISTRIBUTION OF PALS REPORTED IN INCA 3 BY GENDER, AGE AND PHYSICAL ACTIVITY LEVEL

	Men (%)			Women (%)		
PAL reported in INCA 3	Low (1.49)	Moderate (1.63)	High (1.78)	Low (1.49)	Moderate (1.63)	High (1.78)
18-44 years	28.2	46.9	25	51	39.4	9.6
45-64 years	24.6	63.3	12.1	42.4	51.4	6.2
65-79 years	31.8	62.2	5.9	42.7	53.9	3.4

To measure the physical activity level (PAL) of adults aged 18 to 79, an adapted version of the Recent Physical Activity Questionnaire (RPAQ) was used (Golubic *et al.* 2014). This questionnaire is structured in three parts: (1) activities in the home, (2) commuting and work activities, and (3) domestic and leisure activities, including sports. It provides information on the frequency and duration of the different activities carried out over the previous four weeks.
The PAL is defined in one of three classes: low, moderate and high. The thresholds between classes have been chosen to correspond to WHO recommendations, as far as possible and according to available data. Depending on their metabolic equivalent task (MET), all RPAQ activities are classified as "moderate physical activity" (3 to 5.99 METs) or "vigorous physical activity" (≥ 6 METs). This was used to assess the frequency and duration of moderate and vigorous activities, and thus the total number of METs expended during these activities.
The PAL is defined as moderate for:
- at least 3 days with vigorous physical activity for at least 25 min/day on average or,
- at least 5 days with moderate physical activity for at least 30 min/day on average or,
- at least 5 days with moderate or vigorous physical activity, until a minimum of 600 MET-minutes per week is reached.

The PAL is defined as high for:
- at least 3 days with vigorous physical activity, until a minimum of 1500 MET-minutes per week is reached or,
- at least one session of moderate or vigorous physical activity a day, until a minimum of 3000 MET-minutes per week is reached.

The PAL is defined as low for any other situation.

In order to avoid underestimating the PAL, it was not calculated for individuals whose questionnaire data were only partially completed.