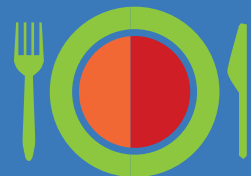
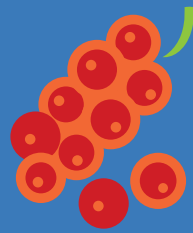
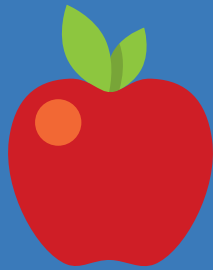




World Health
Organization

REGIONAL OFFICE FOR Europe

Good Maternal Nutrition The best start in life



Abstract

This publication presents a summary of the most recent evidence on maternal nutrition, the prevention of obesity and noncommunicable disease. It provides an overview and explores what national recommendations for nutrition, physical activity and weight gain during pregnancy are in place in the Member States of the WHO European Region. The publication concludes with a summary of some possible national-level opportunities for action, exploring how to promote nutrition and health throughout the life-course, ensure optimal diet-related fetal development and reduce the impact of morbidity and risk factors attributed to noncommunicable disease by improving maternal nutritional health.

Keywords

MATERNAL NUTRITIONAL PHYSIOLOGICAL PHENOMENA
MATERNAL WELFARE
INFANT WELFARE
NUTRITION POLICY
HEALTH PROMOTION

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Abbreviations

BFHI	Baby-friendly Hospital Initiative
BMI	body mass index
CIMCI	.....	Community Integrated Management of Childhood Illness
CVD	.....	cardiovascular diseases
GDM	.....	gestational diabetes mellitus
GWG	.....	gestational weight gain
EGWG	.....	excessive gestational weight gain
IDDs	.....	iodine deficiency disorders
IMCI	.....	Integrated Management of Childhood Illness
IoM	.....	Institute of Medicine of the National Academy of Sciences of the United States of America
NCDs	.....	noncommunicable diseases
NGO	.....	nongovernmental organization
NTD	.....	neural tube defect
RNI	.....	recommended nutrient intake
T2DM	.....	type II diabetes mellitus
UNICEF	.....	United Nations Children's Fund
UNIMMAP	.....	UNICEF/WHO/United Nations University multiple micronutrient supplement for pregnant and lactating women

Foreword

Good maternal nutrition – the best start in life

Nutrition has never been as high on the international public health agenda as it is today. The adoption of the Sustainable Development Goals and the United Nations' proclamation of a Decade of Action on Nutrition (2016–2025) signal that strong action is required relating to food and nutrition. In addition, the report of the Commission on Ending Childhood Obesity underlines how important it is for the WHO European Region to review current practices and promote policies and actions to improve maternal, infant and young child nutrition across the Region.

When adopting the European Region Food and Nutrition Action Plan 2015–2020, WHO European Region Member States acknowledged the importance of addressing aspects of early nutrition as a particularly powerful means of tackling the double burden of malnutrition. Commitments to reduce health inequalities and improve maternal, infant and young child health have been made by Member States and their national governments in a series of political documents at both regional and global levels.

This report on good maternal nutrition highlights the importance of protecting and promoting public health through the improved nutrition and well-being of women of reproductive age, especially during the preconception, pregnancy and postpartum periods. It covers different aspects of recent evidence and existing national recommendations, underlining opportunities for action on maternal nutritional health in the context of Health 2020.

Pre-pregnancy, maternal and infant nutritional status varies across population groups according to demographic and socioeconomic factors. Poor maternal nutritional conditions at the earliest stages of the life-course, during fetal development and early life, can induce both short-term and longer lasting effects; in particular, an increased risk of noncommunicable diseases and obesity throughout the life-course. The importance of the intergenerational impact of nutrition leads to new policy challenges and raises critical questions about protecting and promoting public health through maternal and infant nutrition. This report has been developed to provide a European overview on existing national recommendations on nutrition, physical activity and weight gain during pregnancy and the postpartum period, as well as infant and young child nutrition recommendations and supportive measures. It is intended for use by European Member States, in particular policy-makers from health and welfare authorities at local and national levels, health care providers and professionals, civil society organizations, and researchers.

The WHO Regional Office for Europe has been working in recent years with Member States to devise options that could reduce health inequalities and improve maternal, infant and young child health. Good maternal nutrition – the best start in life shows that progress is being made, but much work remains to be done. The commitments made by Member States can be realized through investment in cost-effective and sustainable health promotion measures from the earliest stages of the life-course, thereby achieving positive impacts on health and reducing inequalities in health across the next generations.

Zsuzsanna Jakab
WHO Regional Director for Europe

Foreword

First steps in tackling obesity and chronic disease

The importance of good nutrition in the early development of children has been recognized for many decades. While it has been generally accepted that a pregnant woman would prioritize the needs of the fetus and sacrifice her own nutrient reserves to ensure its optimum development, it is also known that poor nutritional conditions before and during pregnancy can induce short-term and lasting changes in the size, composition and metabolic responsiveness of the offspring.

Epidemiological analyses and animal studies have shown that these nutritional influences early in life can influence the responsiveness of the body to the nutritional environment much later in life. The nutritional well-being of women as they conceive affects not only the development of the fetus but also the genetic organization of the future metabolic responsiveness of the child and, later, the adult. This area of epigenetics has become one of the fastest growing and most complex areas of biological science.

Women who are overweight when entering pregnancy or who gain excess weight during pregnancy may well be establishing an intergenerational amplification of the obesity epidemic. There is no doubt that a mother's nutritional status affects her child as an infant; it also affects that child's risk of obesity and related chronic disease as an adult.

This important development in the understanding of the intergenerational impact of nutrition leads to new policy challenges. The present report raises critical questions for protecting and promoting public health through maternal and infant nutrition. The current epidemics of obesity, diabetes and related chronic diseases are of increasing concern for national health authorities and for WHO, with international agreement to arrest and then reduce the prevalence of obesity and diabetes across the globe. With the establishment of WHO's Commission to End Childhood Obesity, it is particularly timely for the WHO European Region to review current practices and promote policies to improve maternal and childhood nutrition across the Region.

The World Obesity Federation fully supports this initiative and the work of WHO in confronting this important public health challenge.

Professor Philip James, Past President
Dr Tim Lobstein, Director of Policy
World Obesity Federation, London, United Kingdom



Executive summary

This publication has been developed in three parts, providing: (i) a systematized review of the most recent evidence on maternal nutrition, the prevention of obesity and noncommunicable diseases; (ii) a review of existing national recommendations for nutrition, physical activity and weight gain during pregnancy in Member States of the WHO European Region; and (iii) possible opportunities for actions at national levels on how to promote nutrition and diet-related health throughout the life-course, ensure optimal fetal development and reduce the impact of morbidity and risk factors attributed to diet-related noncommunicable disease, by improving maternal nutritional health.

Part I. Maternal nutrition, prevention of obesity and noncommunicable diseases (NCDs): recent evidence

Noncommunicable diseases are the leading cause of death and disability in the WHO European Region. Unhealthy diets and physical inactivity are major modifiable risk factors for NCDs and obesity, and effective health interventions are urgently required to support behavioural changes in dietary and physical activity patterns. Evidence suggests, however, that the propensity to develop NCDs and obesity may be markedly influenced during fetal development and infancy, and these factors may in part explain the observed correlation between health inequalities and NCDs. If health inequalities in the Region are to be tackled and the burden on national health services reduced, the proper emphasis on population-wide measures with specific interventions that reach those most in need will require in turn a renewed emphasis on specific public health measures that have an universal impact.

This systematized literature review presents the evidence that maternal nutritional status during fetal development and infancy influence growth and development by inducing changes in fetal epigenetic programming for the responsiveness to environmental factors that affect intergenerational chronic disease susceptibility. Maternal overweight and obesity, excessive gestational weight gain, gestational diabetes mellitus and multiple micronutrient deficiencies trigger detrimental effects in utero and increase the risk of fetal congenital anomalies and obstetric complications.

These findings highlight the urgent need to reduce levels of obesity and diet-related NCDs, starting with strategies to optimize the nutritional status of reproductive-age women. When women enter pregnancy with poor eating habits and limited micronutrient reserves they are at risk of excessive gestational weight gain, along with gestational diabetes. The evidence suggests that interventions that improve maternal nutritional status are among the most effective and sustainable means of achieving positive impacts on health and reducing inequalities in health across the next generations.

The importance of maternal nutrition in the earliest stages of life is clear. There is a need for accepted guidelines that can be used internationally to inform best practices and improve maternal nutritional status. These are needed to support governments in their efforts to prevent maternal obesity and the associated multiple micronutrient deficiencies of pregnancy; reduce the risk of adverse pregnancy outcomes; support appropriate early feeding practices; and prevent subsequent development of NCDs.

Part II. Situational analysis of national recommendations for maternal, newborn and infant nutrition: results of a survey of national recommendations

During 2014 the WHO Regional Office for Europe survey of national recommendations for nutrition, physical

activity and weight gain during pregnancy was sent to the WHO country offices' national professional officers directly involved with nutrition, antenatal and postpartum care in the 53 Member States of the WHO European Region. The survey was designed to obtain information about national recommendations concerning nutrition and physical activity advice during the preconception period, during pregnancy and provided after birth, during lactation, for neonates, during infancy and concerning young children's nutritional status.

A total of 51 of the 53 Member States in the Region participated in the survey. Responses show that not all Member States have fully adopted and incorporated WHO's existing recommendations (see Table 1). The findings also indicate wide variations between Member States in terms of their development of high-quality standards for maternal, infant and young child health.

Table 1. Percentage of WHO European Region Member States with recommendations in place to promote maternal and infant nutritional health

RECOMMENDATIONS	%
Nutrition	79
- During preconception	55
- During pregnancy	77
- During postpartum and lactation	62
- For at-risk groups	45
Physical activity	36
- During preconception	25
- During pregnancy	34
- Postpartum and during lactation	25
- For at-risk groups	17
Gestational weight gain	68
- Based on pre-pregnancy body mass index	40
Newborn, infant and young child nutrition	79
- Exclusive breastfeeding for the first 6 months	72
- Continued breastfeeding, up to 1 year	36
- Timely introduction of appropriate complementary foods at 6 months	66
- National recommended nutrient intake	60
- Protective maternity legislation	91
- The International Code of Marketing of Breast-milk Substitutes adopted into law	62
- Baby-friendly Hospital Initiative implemented	70
- Integrated Management of Childhood Illness implemented	38
Prevention of obesity and diet-related diseases in primary health care services dealing with maternal and infant health	59

Furthermore, the data suggest gaps between policy recommendations and their effective implementation. This may be attributed to a range of barriers, such as: overstretched health care professionals; inadequate resources; lack of consistency in information provided within different health services; inadequate training of health care professionals; and lack of consistency between national recommendations from health providers and information provided from other sources. Hence, the majority of Member States requested support from the WHO Regional Office for Europe on how best to support maternal, infant and young child nutritional health.

Based on the results of the survey, four priorities were identified, including the need to:

- **develop and regularly update recommendations for national use**, based on the latest scientific evidence and harmonized with the WHO recommendations, promoting a life-course, health-in-all-policies, intersectoral and human rights-based approach;

- **reduce health inequalities throughout the Region through improved maternal and infant nutritional status**, including improving the policies implemented nationally as well as the consistency of advice which women and families receive from health services (and other sources);
- **ensure capacity-building** for health professionals dealing with maternal and young child health (including nutrition and physical activity) as a continuing process; and
- **support Member States' requests for action** on how to improve maternal health most effectively through measures which improve dietary and physical activity patterns.

Part III. Opportunities for action on maternal, newborn and infant nutritional health in the context of Health 2020

Commitments have been made by national governments to reduce health inequalities and improve maternal, infant and young child health. These commitments will only be realized through investment in cost-effective and sustainable health promotion measures at the start of the life-course. This includes a range of intersectoral changes, which help to reduce health inequalities and include comprehensive social and economic, as well as health and nutrition policies and services, while ensuring equivalent access to support and advice across the socioeconomic spectrum and embedding these policies within national health services.

Part III is based on the results of the survey of national recommendations for nutrition, physical activity and weight gain during pregnancy carried out by the WHO Regional Office for Europe. It describes possible opportunities for consideration at national level on how to ensure optimum fetal development with reduced maternal morbidity and lower risk factors attributed to poor diet and physical inactivity.

PART I

Maternal nutrition,
prevention of
obesity and
noncommunicable
diseases (NCDs):
recent evidence

1

Introduction to Part I

NCDs are the leading cause of death and disability within the WHO European Region and worldwide, with prevalence reaching epidemic levels [1]. Obesity, unhealthy diets and physical inactivity are major modifiable risk factors for NCDs and the need for public health interventions to tackle these is being increasingly recognized [1–5].

Recent epidemiological and experimental studies suggest that the propensity to obesity and diet-related NCDs may be programmed during fetal development and early infancy, and that this susceptibility is partially determined by maternal nutritional status before and during pregnancy [6–9]. Epigenetics is the study of modified gene function, which cannot be explained by altered nucleotide sequence alone. Modifications of metabolic gene expression include short-term histone methylation, acetylation, phosphorylation, ubiquitination and longer-term DNA silencing as a result of DNA methylation [8,10,11]. Epigenetic changes respond to in-utero environmental conditions and can induce permanent alterations to the metabolic system's structure and function [11–15], and thereby increase susceptibility to chronic diseases [11,16,17]. Changes in gene expression, which are induced by suboptimal maternal nutrition, are referred to as nutritional epigenetic changes. Suboptimal maternal nutrition – especially during embryogenesis, at which point extensive epigenetic reprogramming takes place [13] – plays a key role in nutritional epigenetic changes [17–20]. The molecular mechanisms by which in-utero nutritional status affects metabolic programming are emerging [6,8,21–26] and may have implications for policy and the need to consider a life-course approach¹ to preventing obesity and diet-related NCDs [8,26–32].

The main purpose of Part I of this report is to give the results of a systematized literature review² that explores, documents and summarizes the available epidemiological and experimental evidence on how maternal nutritional status before and during pregnancy affects the pathogenesis of obesity and diet-related NCDs in adult offspring, along with a brief discussion of the implications for social and health policies and services.

¹ A life-course approach does not simply involve taking a longitudinal perspective; it is based on the recognition that adult health and illness are rooted in health and experiences in previous stages of the life-course. It starts by addressing maternal nutritional status and health before and during gestation and continues with appropriate newborn, infant and young child feeding practices, including promotion, protection and support of breastfeeding. Actions to encourage healthy diets continue throughout childhood, adolescence, adulthood, and ageing. The approach reflects economic, social, environmental, biomedical and other relevant factors that influence health.

² A systematized review attempts to include elements of a systematic review process, while coming short of a full systematic review. A systematized review is typically narrative, exploring what is known together with the uncertainties around the findings [33].

2

Methods

2.1 Search strategy

Relevant publications were identified through a series of electronic searches carried out on the databases PubMed and GIFT. References cited in the reviewed articles were also searched manually to yield additional relevant publications. Published and unpublished grey literature was also reviewed for a better understanding of the current guidelines and recommendations related to maternal health.

2.2 Eligibility criteria

The inclusion criteria included relevant peer-reviewed scientific articles. No restrictions were imposed for particular populations, species, countries or study designs. After initial reviewing, articles published between January 2010 and June 2014 were included in the review. Systematic literature reviews published between June 2014 and July 2015 were also included. The exclusion criteria included (i) insufficient detail provided on the methods applied in the original research; (ii) inappropriate sample size for the study population; and (iii) publication in a language other than English, German or Spanish.

2.3 Search terms

Various combinations were used which included keywords denoting the influence of maternal, preconceptional and gestational nutrition on metabolic programming or offspring risk of developing obesity and NCDs. The databases were searched using the following key words: [matern* OR pre-pregnan* OR preconception* OR perinatal OR prenatal OR gestation* OR foetal OR fetal] AND [environment* OR nutrition OR diet OR nutrient* OR calorie* OR fat OR protein* OR carbohydrate* OR sugar OR fibre OR trans fat OR micronutrient* OR vitamin* OR minerals OR antioxidants] AND [diabetes OR weight gain OR weight loss] AND [programming OR metabolic memor*] AND [risk factor* OR offspring* OR neonate OR infant* OR noncommunicable disease* OR diabetes mellitus OR cardiovascular disease* OR metabolic syndrome OR cancer OR osteoporosis OR respiratory disease* OR renal disease* OR obes* OR overweight] AND [epigenetic*].

Chapter 3 presents the findings from the systematized literature review [33].

3

Results

3.1 Nutritional programming and intergenerational effects

The majority of published studies addressing metabolic programming of diet-related NCDs, and the underlying mechanisms, have focused on undernutrition.³ Maternal low-protein intake and nutrient restrictions are associated with the nutritional epigenetic programming of obesity [9,12,23–25,27,36–47]. However, the global obesity and NCD epidemics, together with the intergenerational characteristics and public health implications, have prompted a number of epigenetic studies to investigate the impact of maternal overnutrition⁴ and obesity [7,30,16,47].

A study by Cooper et al. [10] on the effects of nutritional differences in umbilical cord blood DNA provides evidence of the importance of periconceptual micronutrient status in human epigenetics. The alterations in gene expression may be gender specific and affected by further lifelong nutritional conditions [10,16]. Moreover, epigenetic changes contribute to an intergenerational effect of programmed obesity and clustering of metabolic risk factors through mother–offspring inheritance, independent of additional environmental insults [48].

Experimental animal studies and observational studies in humans suggest that epigenetic changes induced by maternal nutritional status have a potential programming role. The means by which suboptimal fetal nutrition may programme obesity susceptibility and NCD pathogenesis by epigenetic mechanisms is a topic of considerable interest [10,16,49]. However, to what extent epigenetics affect the early programming of NCDs is not yet clear [21,22,50] and the identification of specific epigenetic markers may offer an effective tool for targeting the processes involved in long-term susceptibility to chronic diseases [7,11,21,22,49].

3.1.1 Developmental origins of health and disease

The hypothesis that adult-onset NCDs have their origins in the early stages of human growth was proposed by Hales and Barker [51] and is known as the “developmental origins of health and disease” hypothesis. Through numerous trials across a number of species (including primate, sheep, pig, guinea pig, mouse and rat), animal models demonstrated a causal relationship between early suboptimal nutrition and later metabolic risk factors. However, the mechanisms involved are still emerging [7,8,21–24].

³ Undernutrition can be defined as a poor anthropometric status, which is a consequence of inadequate food intake and frequent infection, often leading to deficiencies in nutrient reserves, body compositional changes as well as deficiencies in macro- and micronutrients [34,35].

⁴ Overnutrition is a consequence of excess intake of energy leading to overweight and obesity [34].

In-utero nutritional deprivation or excess can lead to fetal adaptations of the metabolic pathways critical for tissue function and survival in a postnatal environment [18,24,25,30]. When early fetal undernutrition is combined with postnatal nutritional abundance, the response to intrauterine suboptimal nutrition may be irreversible and consist of partial resetting of the metabolic homeostasis and endocrine systems, as well as down-regulation of growth (the so-called thrifty genotype) [12,23,30,52]. The increased long-term vulnerability to an obesogenic environment may induce a pathological response (Fig. 3.1) [7,23,30,42,47,53–57]. The mismatch between pre- and postnatal nutritional environments may partly determine the characteristics and severity of the programmed response and susceptibility to preventable NCDs [8,12,17,18,24,25,54].

Several experimental studies in animals and observational studies in humans have found a U-shaped relationship between maternal dietary intake and phenotypic adaptations in the offspring [12,15,18,23,42,52]. They show that both in-utero nutrient deprivation and excess alter normal growth patterns and result in an increased risk of obesity, type II diabetes mellitus (T2DM), and metabolic disorders in offspring [12,15,18,23,42,52].

An association between poor fetal growth, early accelerated postnatal so-called catch-up growth in offspring and later development of NCDs has been found in several human studies [6,9,29,58]. Such NCDs include obesity [7,11,52,59], metabolic dysfunction [18,24,52,59], insulin sensitivity [12,52,59], T2DM [11,23,59], cardiovascular disorders [7,11,24,60] and renal disorders [49, 55]. The imbalance between pre- and postnatal nutritional environments may accelerate abnormal postnatal growth and the associated increased risk of obesity and NCDs [7,52]. Similarly, it has been suggested that the obesity epidemic observed in many developing countries may be a result of poor in-utero nutrition, combined with subsequent exposure to obesogenic environments [7,8].

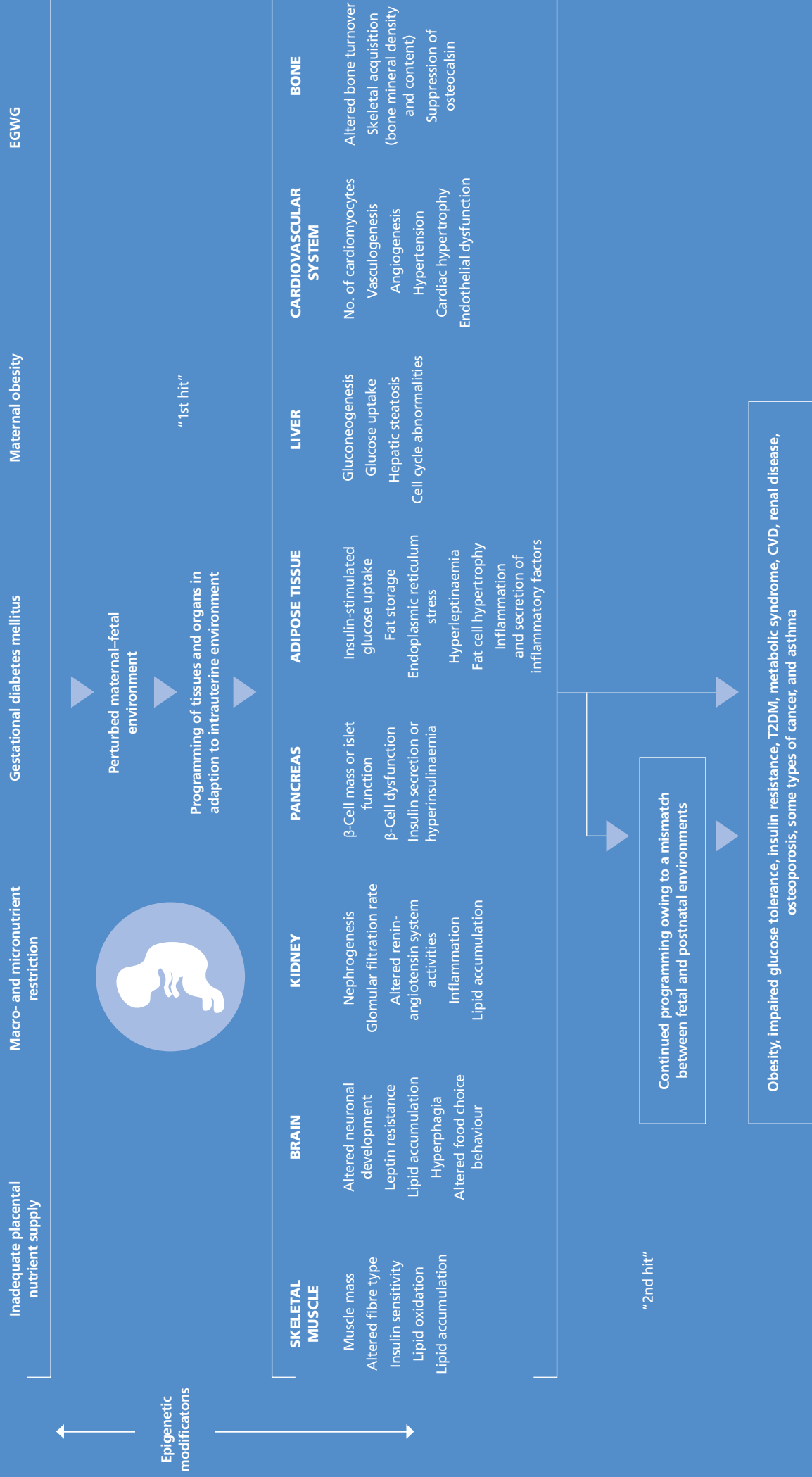
3.2 Maternal nutritional status before and during pregnancy

The fetus is dependent on the range of micronutrients circulating in the mother's blood supply for optimal development [28,47,61]. This is the time when early cell division is occurring in the embryo and the appropriate trajectory of fetal cell division and fetal growth is being established. The maternal–fetal interface (the placenta) plays a crucial role in growth, proliferation and differentiation of cells and its size is influenced by changes in the nutritional environment at different stages of gestation [22,62]. Both animal and human studies support the suggestion that the timing of the nutritional insult plays a pivotal role [9,12,14,20,43,52]. The pre- and early postnatal phases are the periods during which changes to nutritional status may have the most detrimental impact [7,8,15,20,63]. Furthermore, a large evidence base confirms that direct effects of maternal nutritional status on offspring adult health can occur [12,23–25,42,51], if birth weight and intrauterine growth restriction are assumed as proxy indicators for maternal nutrient supply [15,28,61].

There is a strong association between low birth weight and intrauterine growth restriction, and later: insulin metabolism; T2DM; central adiposity; abnormal lipid metabolism; obesity; hypertension; cardiovascular diseases (CVD); increased risk of death from ischaemic heart disease; and renal disease [12,18,23,24,28,52,55,59,62]. The relationship between poor early growth and the development of T2DM is robust in a wide range of populations and in many ethnic groups but it is unclear whether the ethnic differences in genetics are involved, or rather their current or previous nutritional state [18]. In some populations there is a correlation between decreasing incidence of adult T2DM and their corresponding increases in birth weight, although only until an optimum birth weight is reached and not beyond [23,62].

However, several studies suggest that using low birth weight and intrauterine growth restriction as surrogates for poor early nutrition may be inappropriate [6,8,10,12,23,30]. Evidence suggests that programming may be induced by even mild or moderate intrauterine poor nutrition and may confer an increased risk of NCDs, without neonates exhibiting birth weights below or above what is considered to be normal [23,30,35]. Indeed, birth weight alone is probably a poor indicator of optimum development [9,59]; birth weight appears to be a predictor of fat-free mass rather than fat mass and thus warrants further investigation, as the organ proportions of lean tissue achieved by the end of pregnancy may also be important [64,65].

Fig. 3.1. Nutritional stressors involved in metabolic programming of obesity and NCDs



Sources: adapted from Koletzko et al. [7]; Martin-Gronert & Ozanne [24]; Li, Sloboda & Vickers [30]; Devin & Boussein [42]; Warner & Ozanne [47]; Knudson [54]; Fainberg, Budge & Symonds [55]; Viljakainen et al. [56]; Palinski et al. [57].

Extensive epidemiological research suggests that suboptimal maternal nutrition may be playing a key role in the global obesity and NCD epidemics, through its intergenerational effects [7,12,14,18,27,28,47]. Targeted studies are needed in order to investigate the effects of both pre-pregnancy and gestational suboptimal nutrition on the offspring's subsequent susceptibility to obesity and NCDs. It is especially important to determine fetal development specific to the timing of the insult in different ethnic groups and across the sexes, in order to identify feasible interventions to reduce the impact of adverse fetal programming [7,8,14,27,59,65–67].

More information on undernutrition can be found in the annexes to this report (see in particular Annex 1).

3.2.1 Overweight, obesity and co-morbidities

In the WHO European Region, overweight and obesity are responsible for up to 20% of mortality and for around 10% of the total disease burden, which between 1990 and 2010 increased by two fifths, especially in women of reproductive age [68,69]. The prevalence of obesity is rising, and rising fastest in low socioeconomic groups. The countries with higher income inequality have higher levels of obesity, and a strong relationship exists between obesity and low socioeconomic status, especially in women of reproductive age [69]. There is an increasing association with deprivation as obesity classification increases. Heslehurst et al. [70] found that, compared with non-overweight women, the risk of residing in areas of greatest deprivation for obese women with body mass index (BMI) 30.0–34.9 increased approximately twofold and for obese women with BMI >50 approximately fivefold [70].

As the number of overweight and obese women entering pregnancy has increased [70–72], pregnancy-related complications are seen as important women's health issues [43,44,73,74]. Maternal obesity before and after conception increases the risk of a wide range of pregnancy-related complications [32]. Pre-pregnancy overweight and obesity are associated with impaired fertility, risk of preterm birth, co-morbidities and mortality [73]. It is also associated with an increased risk of gestational hypertension and diabetes [14,67], which are strongly correlated with large-for-gestational-age infants (macrosomia)⁵ [68,73,75] and can alter the offspring's glucose and lipid metabolism [18,30,43,44,75] and induce hypertension [44]. Investigations show an association between pre-pregnancy BMI and the offspring's increased risk of: abdominal or generalized obesity across infancy and childhood, into adolescence and adulthood [44,76–79]; related metabolic disorders [18,80]; and asthma in predisposed children [81].

In a rodent model, Zambrano et al. [75] found evidence that some harmful programming effects may be partially reversible through dietary interventions to improve maternal weight before pregnancy. On the other hand, among non-overweight women, Diouf et al. [82] established that preconception weight loss is positively associated with giving birth to small-for-gestational-age infants.

Epidemiological studies in humans suggest that obesity during pregnancy is associated with pregnancy-related complications [32], including: gestational hypertension; pre-eclampsia; gestational diabetes mellitus (GDM) [83,84]; postpartum haemorrhage and oxidative stress [83]; low birth weight [74]; as well as large-for-gestational-age infants (macrosomia) [68,74,75]; a higher incidence of congenital anomalies [14,44]; and increased risk of the offspring developing adult obesity [32,43,44,81,85], metabolic complications [25,43], and possibly asthma [14]. In addition, a large case-control study suggests that obesity (BMI \geq 30) before and during pregnancy may be related to risk of the offspring developing type I diabetes mellitus [86].

A number of experimental animal studies show that obesity during pregnancy promotes insulin resistance, impaired glucose tolerance, endothelial cell dysfunction, hypertension, hyperphagia and increased adiposity in offspring [43,47], which extends into adulthood [64]. Increased adiposity, glucose intolerance and altered appetite regulation are observed in the offspring with even mild maternal overeating [30]. Higher insulin levels, lactational failure, neonatal infection and maternal care practices are also proposed to negatively affect the offspring's energy balance and propensity to adiposity [30], implying that factors soon after giving birth can also modify epigenetic programming. One study in rodents found that the inflammation and oxidative stress

⁵ Macrosomia is birth weight > 4000g, regardless of the fetal gestational age and is associated with adverse programming effects [32,43].

induced by maternal obesity (and/or a western diet)⁶ played a central role in the development of obesity in the offspring. A reduction in the offspring's obesity levels was observed following the administration of antioxidants to restore oxidative balance [88].

3.2.2 Weight gain during pregnancy

Although adverse effects are associated with both high and low gestational weight gain (GWG), there is no WHO guidance at global or European levels, nor any consensus on the amount of weight an obese pregnant woman should gain [45,89,90]. Moreover, in many European countries, weight gain during pregnancy is not always routinely monitored [44,90–92], despite several studies that suggest that pregnancy-related complications are more likely to occur in obese women who gain excess weight during pregnancy [82,84]. The likelihood of adult obesity developing in their offspring increases by eight percent with every kilogram of maternal GWG [93].

Excessive gestational weight gain⁷ (EGWG) is associated with multiple maternal and offspring short- and long-term complications [28,76,94], including: maternal postpartum excess weight retention with a 2–3 times higher risk of subsequent obesity; neonatal hypoglycaemia; GDM [35,44,45,76,95]; and both small-for-gestational-age infants and macrosomic infants [17,23,45,96].

A prospective cohort study in the United Kingdom demonstrated that GWG above the revised Institute of Medicine (IoM) of the US National Academy of Sciences recommendations [97] is associated with increased adiposity and CVD risk factors in offspring [76]. Fraser et al. suggest that the timing of GWG is important, so that GWG from week 0 to week 14 was associated with an incremental increase in offspring adiposity, whereas GWG between week 14 and week 36 was associated with increased adiposity only when weight gain exceeded 500g/week [76]. Interestingly, CVD risk increased in association with increasing GWG between week 14 and week 36 [76]. Cohort and observational studies in obese women suggest that a GWG even lower than recommended by the IoM [97] can have positive effects on pregnancy outcomes [43,44,98,99]. However, these results should be interpreted with caution and the potential long-term adverse outcomes of very low GWG in obese women still remain to be investigated [99].

A systematic review and meta-analysis suggest that dietary intervention during pregnancy is safe and potentially cost-effective in limiting GWG, improving maternal and child health and reducing the risk of GDM, gestational hypertension, pre-eclampsia, preterm birth [100], intrauterine death [101] and metabolic disorders [102,103]. Another study argues that any adverse effects were limited to a few cases of extreme weight reduction or highly controversial forms of dieting [101].

Evidence suggests that behavioural change programmes (dietary and/or physical activity) can prevent EGGW [102–111]. Sixteen behavioural techniques described by Gardner et al. [111] were used in 11 different interventions. The most commonly used counselling techniques included: encouraging expectant mothers to monitor their own behaviour (eight trials); providing skilled feedback to the expectant mother on her performance (six trials); and helping her to set her own behavioural change goals (five trials) [111]. However, some interventions were effective and some were ineffective in limiting EGGW, so as yet no clear patterns have emerged relating to which approaches can be recommended as good practice. The behavioural change techniques that were effective in limiting EGGW included: mothers receiving information on the consequences of different maternal behaviours; provision of instructions on where and when to change behaviour; goal-setting for both behavioural change and GWG outcome; regular review of goals and self-monitoring; help to identify barriers to facilitate problem-solving; rewarding successful behaviour; and/or giving skilled feedback and motivational counselling [111].

3.2.3 GDM

The risk of developing GDM (one of the most common obesity-related pregnancy complications) increases significantly with increases in pre-pregnancy BMI [44,112–115]. Compared with non-overweight women, the

⁶ The “western” dietary profile refers to an increased intake of energy-dense foods that are high in fat, sugar, refined grains and salt [87].

⁷ To gain more weight during pregnancy than what is recommended.

risk of GDM in overweight women (BMI 25.0–29.9) increased more than twofold and in obese women (BMI 30.0–34.9) and severely obese women (BMI 35.0–39.9), approximately 3.5- and 8.5-fold, respectively [94,112]. The presence of GDM increases the risk of either restricted or excess fetal growth (macrosomia), fetal adiposity [18,43,67,98,116], predisposition to obesity throughout life [117], impaired glucose tolerance, T2DM, and metabolic disorders [8,14,18,24,67,94,118] in the infant. The risk of macrosomia decreases with improved glycaemic control in women with GDM [7], although follow-up studies suggest no long-term positive effect on the offspring's BMI at around six to nine years of age [119].

A cohort study showed that women with GDM had 5.5 times higher risk of delivering macrosomic infants than non-diabetic, non-glycosuric mothers [120]. An association appears to exist between GDM and maternal BMI, where offspring are at increased risk of developing central or general adiposity [115]. Moreover, more recent randomized controlled trials suggest a causal link between mothers' poor glycaemic control and the birth of macrosomic infants (with increased adiposity) [44].

However, the degree to which childhood obesity is influenced by in-utero exposure to GDM is unknown [116]. The "Exploring perinatal outcomes among children" study (cited in Crume et al. [116]) suggests that exposure to maternal GDM increases the risk of offspring developing adult obesity through an altered growth trajectory in children aged over 26 months, and that increased growth velocity of BMI in late childhood may, in part, be mediated by in-utero overnutrition (together with a genetic predisposition) [116]. Hunt et al. [67] demonstrated that the presence of GDM in different populations results in different complications. For example, the incidence of GDM is higher in black obese women compared with white obese women in the United States of America. Moreover, the negative outcomes start at lower BMI levels for black women (BMI >28) compared with white women (BMI >34) [67].

Studies suggest that appropriate management of GDM and obesity during pregnancy can significantly improve maternal health and the short- and long-term health of offspring [29,96,121]. Although no robust conclusions can be drawn, several trials suggest that diets high in unprocessed whole grains, fruits, vegetables and pulses – in combination with regular physical activity – are appropriate for reducing the risk of GDM and related adverse outcomes in obese pregnant women [32,100].

3.2.4 Excess energy intake during pregnancy

Animal studies suggest that, independent of maternal obesity, a high-fat diet and excess energy intake during pregnancy can adversely affect placental structure and/or function and may permanently alter offspring physiology [30] to promote adiposity, adult hyperinsulinaemia, hyperleptinaemia, and increase the risk of T2DM and CVD [15,18,23,30,46,47,53]. It is unclear if this increased risk is caused by excessive intake of energy or specific macronutrients (fats, protein and/or carbohydrates) [18,23], or possibly combined energy excess, along with macronutrient and micronutrient imbalances [19,42].

Evidence suggests that programming of taste preferences may occur in utero [30,43,47]: in animal models, offspring show a preference for high-fat, sugary and salty foods if an experimental so-called junk-food⁸ [25] or high-fat diet [30] forms the basis of the maternal diet. Offspring hyperphagia is associated with maternal diets high in sugar but not high in fat or low in carbohydrates [43]. Results from a human trial suggest that exposure to foods or beverages high in sugar content in early gestation in overweight/obese women may independently increase the risk of macrosomia [31]. Another study suggests that a combination of pre-pregnancy overweight/obesity and a gestational junk-food diet may also increase the risk of macrosomia [122].

3.2.5 Low intake of omega fatty acids during pregnancy

Since the 1960s, the intake of n-3 fatty acids has decreased while n-6 fatty acids have increased [46]. Experimental studies in animals suggest that n-3 fatty acids reduce the risk of macrosomia by lowering hyperlipidemia levels and restoring antioxidant status and immune function [94]. Beneficial effects of n-3 fatty

⁸ Junk-food comprises foods that are both energy dense and micronutrient poor [122].

acids in humans have also been observed in relation to: pre-eclampsia; placental weight; cognitive development of offspring; and promotion of linear growth up to 18 months of age in offspring of primigravida women [17,123].

Conversely, a high intake of n-6 fatty acids has, in animal studies, been associated with adverse effects on appetite regulation and energy metabolism in offspring [46]. However, any influence of dietary fatty acid intake during pregnancy on the risk of NCDs in humans remains to be determined [46,123,124].

3.2.6 Maternal obesity combined with multiple micronutrient deficiency

It may seem paradoxical, but pregnant women who are obese (with overnutrition from excess energy intake) may simultaneously have multiple nutrient deficiencies (with undernutrition from intake of micronutrient-poor foods) [125,126]. Micronutrient deficiency and overweight or obesity are likely to overlap, and this conjunction may exacerbate the rise in transgenerational NCDs. The hazards of a combination of obesity together with multiple micronutrient deficiency may lead to serious long-term health and societal consequences, through transgenerational transmission [125,126]. Annex 2 describes maternal micronutrient deficiency in more detail.

Iron deficiency leads to anaemias, including iron-deficiency anaemia,⁹ and can have serious consequences for both mothers and infants [61,127–132]. One of the most prevalent causes of anaemia is iron deficiency, which may be combined with deficiencies of folate, vitamin B12, riboflavin and/or vitamin A [127]. Anaemia during preconception and early gestation is associated with impaired fetal development, preterm delivery and low birth weight [128–130]. Systemic iron deficiency and hypoferraemia are observed more in obese women compared with women of healthy body weight [133].

Delayed umbilical cord clamping until at least one minute after birth (or after cessation of cord pulsation) can help prevent iron deficiency in neonates [131,132]. Neonates who undergo late umbilical cord clamping have significantly higher levels of haemoglobin compared with neonates who undergo umbilical cord clamping too early, and their ferritin levels remain higher until six months of age [131,132].

Folate and other B vitamins¹⁰ play an important role in the regulation of energy metabolism, help to alleviate insulin resistance and are essential for human growth, including nerve and brain development. Folate deficiency is associated with anaemia and neural tube defects (NTDs), intrauterine growth restriction and other fetal malformations, preterm delivery and low birth weight. NTDs are among the most common congenital anomalies contributing to infant mortality and serious disability [17, 127,134,135]. Studies demonstrate that periconceptual folic acid supplementation can prevent 46% of NTDs [135]. Folic acid and vitamin B12 play a key part in the generation of the carbon pool in metabolism and this pool is crucial for cellular growth and *de novo* nucleotide synthesis.

Folate deficiency has also been suggested as a risk factor for CVD [136]. Folate and other B vitamins are involved in homocysteine and bone turnover, and it is suggested that homocysteine may promote atherosclerosis (fatty deposits in blood vessels) by damaging the lining of arteries and promoting blood clots. However, a causal link has not yet been established [136]. Homocysteine levels are influenced by both genetic and dietary folic acid, vitamins B6 and B12 and higher circulating vitamin concentrations relate to lower concentrations of homocysteine [136].

Obese pregnant women are at increased risk of **vitamin D** deficiency compared with women with healthy body weight. Obesity reduces the bioavailability of vitamin D and, in one study, over half of the obese women were vitamin D deficient. It is also suggested that adipose tissue has its own requirements for Vitamin D (a fat-soluble vitamin) and in pregnancy vitamin D is drawn from maternal reserves [137]. The higher the maternal adipose tissues stores, the greater the vitamin D requirements seem to be.

⁹ A haemoglobin level of <110g/L.

¹⁰ Thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), biotin (B7), folic acid or folate (B9), and cobalamin (B12).

Maternal vitamin D status helps regulate fetal skeletal development, and deficiency may affect the offspring's bone trajectory and result in long-term bone disorders, such as osteoporosis [138], irrespective of the offspring's postnatal nutritional status [55]. However, results from one birth cohort demonstrated no effect on bone mass at 20 years of age where supplements were given to preterm infants just after birth [139]. Vitamin D deficiency is also associated with pre-eclampsia, preterm birth, and small-for-gestational-age babies [138,140,141].

It is unlikely that just one deficiency exists in isolation. A range of **multiple micronutrient deficiencies** may coexist in the obese, especially in those of low socioeconomic status [125] (Annex 3). The causes of most micronutrient deficiencies during pregnancy and obesity may be similar in most cases; that is, with poor diets and reduced intakes and/or absorption of several micronutrients, in combination with an increased demand for and sequestration of fat-soluble vitamins by excess adipose tissue. A range of studies showed that the higher the BMI, the greater may be the risk of the presence of multiple micronutrient deficiencies [142,143], including: iron, folate, iodine, zinc and vitamins A, β -carotene, B12, C and D. Brain development and growth is particularly vulnerable during early pregnancy to low intakes of folate and iodine, and can be harmed by excessive vitamin A intake, and alcohol.

4

Discussion and implications for public health policy

Although the underlying biological mechanisms leading to offspring obesity and NCDs are not yet well understood, the evidence indicates that important developmental windows occur during the pre- and neonatal periods of life (the first 1000 days). Maternal nutrition appears critical to the offspring's susceptibility to obesity and diet-related NCDs. The evidence suggests that nutritional insults during pregnancy induce fetal adaptations, presumably to improve immediate and longer-term survival. These adaptations in fetal development may become irreversible through metabolic programming and epigenetic mechanisms. While studies of undernourishment in pregnancy indicate a raised risk of abdominal obesity, diabetes and CVD in the offspring, increasing evidence, as discussed earlier, indicates that obesity (and its co-morbidities) during pregnancy increases the risk of transgenerational transmission, which may further contribute to the growing obesity and NCD epidemics.

Parental obesity has long been identified as a strong risk factor for transgenerational obesity. A 2009 survey of children in Scotland [144,145] found that children of parents with normal body weight showed weight distributions very similar to those found among children two decades earlier (21% of children overweight or obese compared with 15% in the 1980s), while the children of obese parents showed much higher levels (44% overweight or obese), especially the children (57% obese) of morbidly obese parents [146]. Both genetic predisposition and home environments (especially family eating behaviour and dietary patterns) may partly explain these strong transgenerational associations [147].

Malnutrition (both maternal and paternal) – that is, overlapping overnutrition from excess energy intake and undernutrition from lack of micronutrients – is an increasing public health concern with serious consequences for society. In particular, obese women of reproductive age in low socioeconomic groups are at risk. This in turn increases the risk of health inequities, which are liable to be transferred from generation to generation [148]. Pre-pregnancy, pregnancy, infancy and early childhood are all critical periods for interventions to prevent inequalities associated with the presence of overlapping obesity and micronutrient deficiencies. National authorities therefore need to implement appropriate strategies, tailored to meet the needs of vulnerable groups. Obesity with overlapping micronutrient deficiencies costs national authorities billions every year, through illness, sick days and lost productivity [149]. Given the increase in maternal obesity, pregnancy can be considered an appropriate time to target health-related behavioural changes in diet and physical activity. Strategies are therefore urgently recommended to reduce the prevalence of maternal obesity and coexisting micronutrient deficiencies across the social gradient.

While the attention given to reducing undernutrition and low birth weight has resulted in considerable success worldwide, the rise in maternal overweight combined with multiple micronutrient deficiencies raises a range of new health problems for maternal and infant health services. Although more investigation is needed, the evidence suggests that public health and nutrition interventions designed to empower adults (especially women) of reproductive age, along with societal policy-making can result in transgenerational health benefits combined with a reduction in health inequalities.

Focused public health measures are required to improve women's nutritional status during the preconception and postpartum periods. Authorities should consider national approaches to ensure the best protection policies¹¹ with supportive environments¹² to facilitate healthy eating patterns and physical activity among future parents – especially for those most at risk of the combined problem of over- and undernutrition that comes from inappropriate diets and little or no exercise: major environmental changes are needed to help them to make healthy dietary and activity choices easily. National guidelines (in all local languages) are essential to ensure consistent information is readily available and understandable on a population basis. However, governments also need to support this through their actions and not to consider this simply the responsibility of the individual. For example, societal and other policies should become a priority, as well as prenatal strategies designed to empower women to start pregnancy at a healthy body weight by eating a healthy diet and being physically active.

Recognizing that many pregnancies are unintended [168], public health policies and primary health care services have a key role in supporting and empowering overweight or obese pregnant women to prevent them from EGWG. However, before this happens there is a need for clear national policies on weight control and the avoidance of EGWG [90,92], which involves ensuring better services are available for women prior to pregnancy, including monitoring weight gain, diet and physical activity advice, establishing support for women in achieving and maintaining a healthy body weight during and after pregnancy. Effective partnerships between maternal, public health and social services to manage diet, physical activity and weight throughout the reproductive cycle are essential, with great emphasis required on returning women to their pre-pregnancy weight during the first year after pregnancy. These partnerships can be achieved through leadership from ministries of health, alongside other governmental authorities.

Moreover, primary health care professionals should be trained to better anticipate pregnancy in young women, and to help those who become pregnant to manage their obesity, GWG and GDM through appropriate dietary advice and physical activity interventions [169]. This is likely to prove cost-effective by limiting the immediate pregnancy-related health complications [170–173], as well as by making a significant contribution to the long-term reduction of obesity and NCDs in the population.

Evidence on the importance of preconception nutritional status indicates a pressing need to ensure adequate and optimum nutritional intakes for all teenagers and women of reproductive age, especially those in lower socioeconomic groups. Waiting until a woman realizes she is pregnant is too late: she needs to be in good nutritional health already, and appropriate body weight should be promoted through a variety of public health measures. Moreover, attention needs to be placed on the importance of healthy food and meals with an optimum nutritional content, to prevent both under- and overnutrition. Services that tackle obesity and NCD prevention need to be integrated with those that tackle micronutrient deficiency. Other important strategies include: early feeding practices, with controls on nursery provision of appropriate food and play time; school-based food and nutrition programmes; interventions to adjust the national price and availability of healthy foods in everyday life; and the prevention of marketing strategies which undermine the consumption of healthy diets. Multisectoral interventions implemented simultaneously are likely to prove cost-effective in terms of long-term health outcomes.

¹¹ For example: paid maternity leave [150,151], adhering to the International Code of Marketing of Breast-milk Substitutes [152–155], food access and availability (e.g. pricing policies [156–163]), food composition and labelling regulations [164].

¹² For example: training of primary health care professionals to ensure consistent information is given to families and those providing food and developing physical activity facilities within communities [165]; maternity services and facilities, such as the Baby-friendly Hospital Initiative (BFHI) [166]; and food services within public institutions, which can ensure that nutrition standards are implemented in early childhood education services, schools and maternity services [167].

4.1 Limitations

It is acknowledged that there are several limitations to this review. Firstly, NCDs evolve and become evident over many years and the risk of bias due to confounding factors is therefore appreciable in the existing evidence base [49]. The magnitude of the effects of specific nutrients and their complex interactions involved in the epigenetic programming of NCDs and the specific underlying cellular and molecular mechanisms require additional analyses and longitudinal investigation [13,21,30,49,52]. Epidemiological findings have been criticized for being correlational, rather than showing true causation [52], with concepts mainly originating from animal models. Without the ideal data on interventions among human populations, the evidence should be interpreted with caution, but recognizing that the failure to act may in itself carry a heavy penalty [23,49].

In addition, women who enter pregnancy overweight or obese will often remain so throughout pregnancy, with an increased risk of glucose intolerance during gestation. Therefore, it is difficult to separate the impact of exposure to preconceptual obesity versus exposure during any other subsequent stage of pregnancy, or the impact of different degrees of GWG. To date, few studies have investigated the stage-specific effects of maternal obesity during pregnancy [43]. Moreover, the effects of maternal obesity cannot be adequately separated from the oversupply of specific nutrients as part of the energy imbalance during pregnancy in most studies; animal models generally employ obesogenic diets (high in fat and carbohydrate or high in fat alone) throughout pregnancy, to maintain excess weight gain [14]. As discussed previously, macro- and/or micronutrient imbalances may have additional negative effects on pregnancy-related outcomes independent of maternal obesity and thereby potentially confound the results of studies on the effects of maternal obesity or GWG [14,17,18,23,31,46,53,102,174].

Also, the assessment of dietary intake during pregnancy is often limited to a single survey at a single point in time [175,176]. Such surveys cannot assess the effects of the timing of a nutritional insult. Additional, large-scale, sufficiently powered, controlled trials and follow-up studies are therefore needed, which employ appropriate biomarkers for metabolic programming to provide – where possible – a focus on potential markers of long-term effects throughout the entire human life-course [31].

Furthermore, the overlapping contributions from familial behaviour, genetics and gestational obesity in determining the risk of obesity in offspring, together with the difficulty in designing experimental models to differentiate their separate effects, means that it is not yet possible to quantify the benefits for the offspring of interventions which focus on managing maternal weight and weight gain during pregnancy. Controlled intervention studies of sufficient size to test the effect of managing weight during pregnancy are in their early stages, with few outcomes currently available. However, two studies of over 5000 overweight or obese women in Australia and the United Kingdom found a lower incidence of high birth weight among those infants born to women who had been given lifestyle counselling during pregnancy, compared with standard care [177–179].

Finally, it is important to acknowledge the limitations in relation to the type of review, selected electronic databases and the short search inclusion period.

PART II

Situational analysis
of national
recommendations
for maternal,
newborn and infant
nutrition: results of
a survey of national
recommendations

5

Introduction to Part II

NCDs are the leading cause of death and disability worldwide, with prevalence rates at epidemic levels [1]. Of the six WHO regions, the European Region suffers most from NCDs, which account for approximately 86% of its premature deaths and 77% of its disease burden [180]. Unhealthy diets and physical inactivity are major modifiable risk factors for NCDs and obesity, and the need for public health interventions to tackle these is increasingly recognized [1,2–5,149].

Evidence suggests that susceptibility to NCDs and obesity may have its origin in the early stages of human growth, during fetal development, which is heavily influenced by maternal nutritional status and the neonatal period [51,85,93,94,97]. Therefore, one approach to reducing preventable, diet-related NCDs and their risk factors is to improve the nutritional status¹³ of women of reproductive age [148,181–183]. Pre-pregnancy and maternal nutritional status varies across population groups (different demographic and socioeconomic groups). In order to improve the health inequalities related to maternal nutritional status and to “give **every** child the best start to life” [181, p.16] the principle of proportionate universalism¹⁴ has been developed. This concept of reducing the socioeconomic gradient of inequalities can be applied within national health services, with special attention given to the services and health promotion interventions during the early stages of the life cycle, including preconception, and maternal, newborn, infant and young child health (Fig. 5.1). To do this effectively, however, requires innovative work, with initiatives to identify and rapidly help the more disadvantaged women in society.

The objective of this chapter of the report is to present results of the survey of national recommendations for nutrition, physical activity and weight gain during pregnancy, undertaken by the WHO Regional Office for Europe during 2014. The purpose of the survey was to identify how many Member States have national policies on maternal, newborn and infant nutritional health, along with the extent to which these reflect previously adopted resolutions¹⁵ at regional and global levels. Based on the findings, recommendations to reduce the negative impacts of preventable early-origin, diet-related NCDs and malnutrition are proposed in Part III of this report.

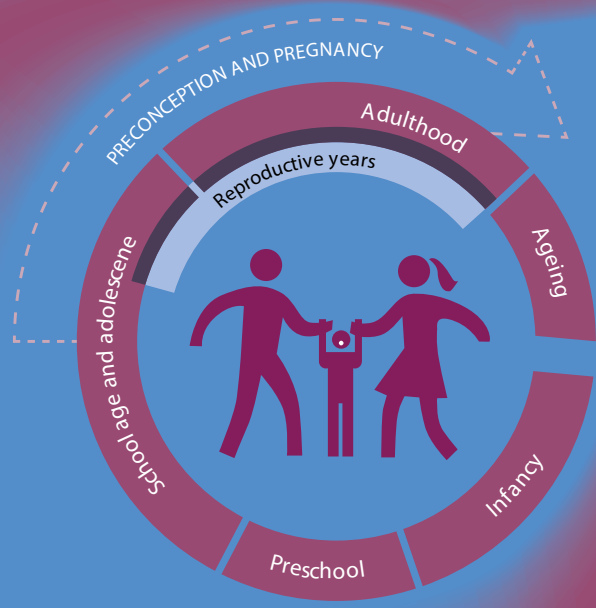
¹³ Nutritional status is an indication of the condition of the human body, considered in relation to the body's dietary needs (levels of nutrients). It can be assessed using biochemical indicators and anthropometry.

¹⁴ Proportionate universalism describes actions which aim “to reduce the steepness of the social gradient in health”; such actions “must be universal, but with a scale and intensity that is proportionate to the level of disadvantage” [181, p.15].

¹⁵ These include the global targets (2025) [184], the *Global action plan for the prevention and control of noncommunicable diseases 2013–2020* [5], the *Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020* [185], *Health 2020: a European policy framework supporting action across government and society for health and well-being* [186], the global reproductive health strategy [187], the European Food and Nutrition Action Plan 2015–2020 [188], *Investing in children: child and adolescent health strategy for Europe 2015–2025* [189], and the *Comprehensive implementation plan on maternal, infant and young child nutrition* [190].

Fig. 5.1. Improving nutrition throughout the life-course, with a special focus on the reproductive years and infancy

SUPPORTIVE ENVIRONMENTAL CONDITIONS	PRECONCEPTION	PREGNANCY	POSTPARTUM
<ul style="list-style-type: none"> - Appropriate provision of health care services for optimum nutrition for maternal and infant health - Appropriate education of health professionals on diet-related issues - Specific guidance on clinical care pathways to manage and prevent underweight, overweight and obesity - Incorporation of e-health with shared access among the different groups of health care professionals 	<ul style="list-style-type: none"> - Dietary advice - Physical activity advice - Weight optimization for women with a BMI ≤ 18.5 or ≥ 25.0 - Assessment of micronutrient status 	<ul style="list-style-type: none"> - Dietary advice - Physical activity advice - Assessment of micronutrient status - Appropriate GWG - Appropriate education of future parents (antenatal classes) 	<ul style="list-style-type: none"> - Dietary advice - Physical activity advice - Weight optimization advice for women (BMI ≤ 18.5 or ≥ 25.0) - Support for exclusive breastfeeding for the first 6 months - Assessment of micronutrient status



- SUPPORTIVE ENVIRONMENTAL CONDITIONS**
- Maternity leave and return-to-work legislation that protects exclusive breastfeeding for the first 6 months
 - BFHI and similar support from primary health care and community services
 - Integrated Management of Childhood Illness
 - The International Code of Marketing of Breast-milk Substitutes and related World Health Assembly resolutions
 - Control on marketing of inappropriate complementary foods and on children's exposure to marketing of foods and non-alcoholic beverages

- NEWBORN, INFANT AND YOUNG CHILD**
- Umbilical cord clamping once pulsation stops, to ensure newborn receives optimum iron stores
 - Early initiation of breastfeeding within the first hour of birth
 - Breastfeeding "on demand" during the stay in maternity care services and continued at home
 - Exclusive breastfeeding for the first 6 months of life
 - Continued breastfeeding up to 2 years of age or beyond
 - Timely introduction of appropriate and safe complementary foods from 6 months of age
 - Assessment of micronutrient status from 6 months of age

Sources: adapted from *Essential nutrition actions. Improving maternal, newborn, infant and young child health and nutrition* [191] and *Preconception care: maximizing the gains for maternal and child health* [192, p.1].

6

Methods

6.1 Overview

During March 2014 a questionnaire was sent out to WHO country offices' national professional officers directly involved with nutrition, antenatal and postpartum care in the 53 Member States of the WHO European Region. A list of countries that participated in the survey can be found in Annex 4. The questionnaire was available for completion online or as a downloadable document. The data were collected between March and September 2014.

6.2 Questionnaire design

The questionnaire (see Annex 5) was designed to obtain information about national recommendations concerning nutrition and physical activity during the preconception period, pregnancy and after giving birth, as well as newborn, infant and young child nutritional status. The questions were designed to explore national actions and capacity within the following areas.

1. Questions on **nutrition during preconception, pregnancy and postpartum** were designed to explore the existence or availability of: national dietary recommendations and recommended nutrient intakes (RNIs); bodies responsible for their implementation and review; and training of health care professionals who deliver these recommendations.
2. **Appropriate weight gain during pregnancy** was explored through questions on the existence of: national recommendations; bodies responsible for their development and implementation; criteria for optimum BMI; and GWG monitoring and advice.
3. Questions on **physical activity during preconception, pregnancy and postpartum** were designed to explore the existence of national recommendations and bodies responsible for their implementation and review.
4. **Newborn, infant and young child nutrition**-related questions concentrated on the existence and description of national recommendations; bodies responsible for their implementation; training of health care professionals who deliver the recommendations, together with supportive legislation and services.

-
5. Questions on **maternal and young child health care services to prevent obesity** were included, focusing on which services exist within routine primary health care.
 6. **Future plans and policies** were explored through questions about what support is needed, for example from the WHO Regional Office for Europe, in order to improve nutritional status during preconception and for maternal, newborn, infant and young child nutritional health.

The set of 46 questions (see Annex 5) – seeking both individual and multiple-choice answers – was developed, pilot tested and revised during February 2014. In the online questionnaire, each question had to be answered consecutively and all were available in English or Russian, to facilitate better completion in all Member States in the Region.

6.3 Response rate

Fifty-one out of the 53 (96%) Member States in the Region responded to the survey. See Annex 6 for a selection of summarized results from various countries of the Region.

6.4 Analysis

When the questionnaire was completed in document format, the data were transferred and entered into the online version manually. Data were automatically extracted from the online platform *SurveyGizmo* using Microsoft Excel®. Data cleaning was carried out to ensure consistency with responses within a question and its sub-questions. For all analyses, the denominator used was the total number of Member States in the Region (53), thus the percentages should be interpreted as “percentage reporting out of all the Member States”. Member States that did not respond to some questions or that responded “No” were identified separately and coded as “No information available”.

7

Results and discussion

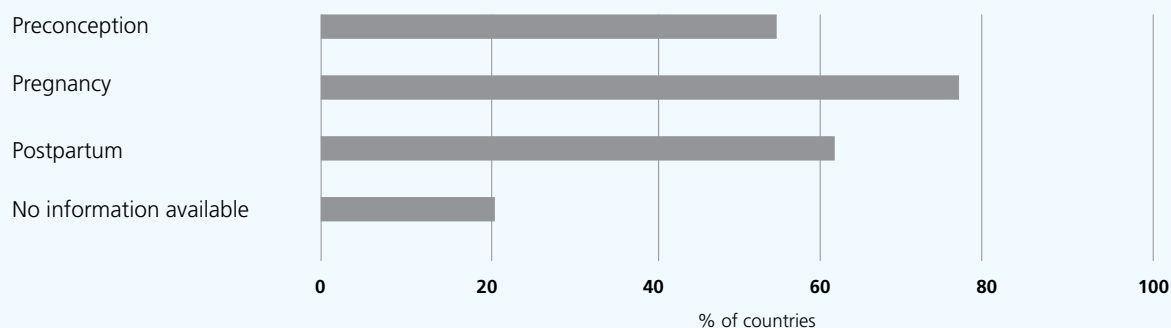
7.1 Maternal nutrition

A healthy diet during pregnancy and lactation is essential for good nutritional health [191]. Maternal malnutrition is reported in the Region, including undernutrition, overnutrition and micronutrient deficiencies [176,193–197]. The protective effect of prenatal micronutrient stores in promoting fetal growth and preventing mortality is well established [17,18,198,199]. Poor nutrition during gestation can undermine normal in-utero development (see Part I). Evidence suggests that public health nutrition interventions targeted at adolescent girls and reproductive-age women will result in positive health effects across the generations that follow.

7.1.1 Existence of recommendations

Among the countries participating in the survey, only 29 countries (55%) reported that they have national recommendations relating to preconception, while 41 (77%) and 33 (62%) reported having recommendations related to pregnancy and the postpartum period, respectively (Fig. 7.1). No information was available from 11 countries.

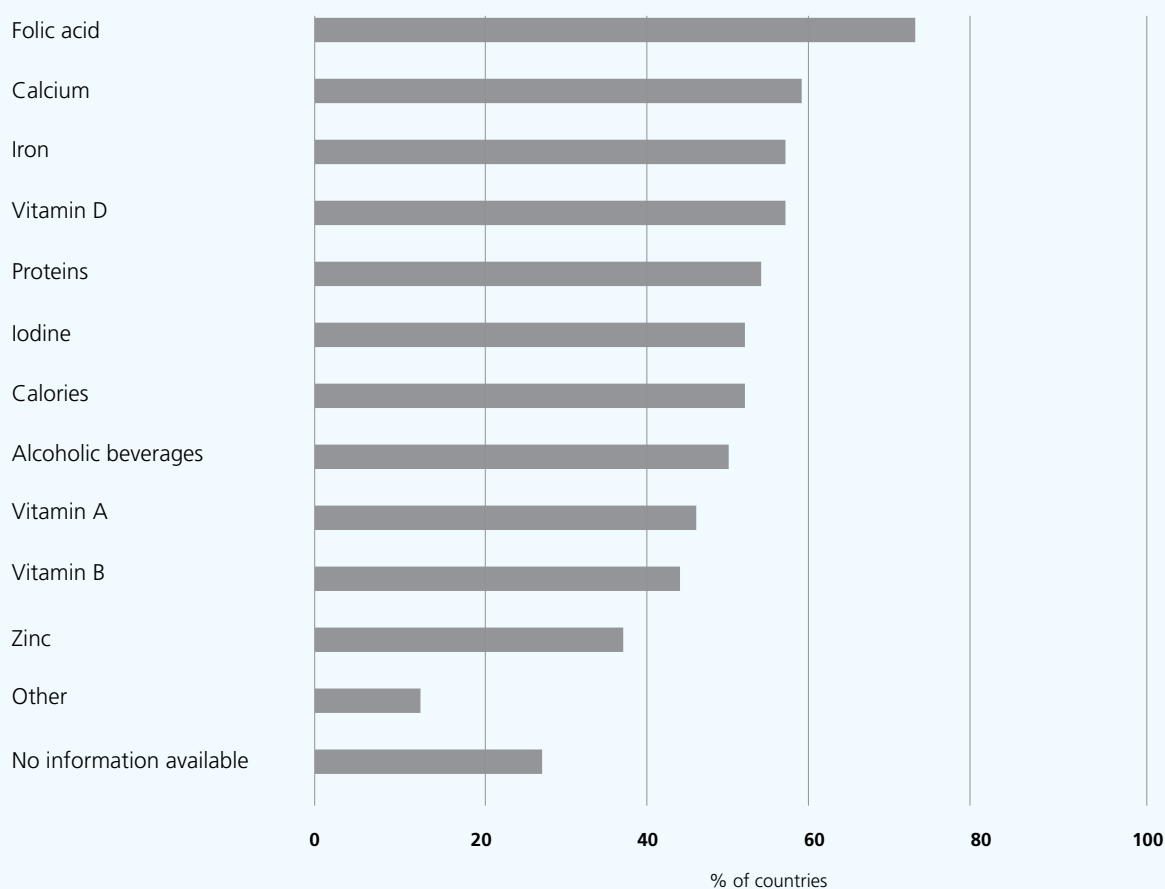
Fig. 7.1. National recommendations on nutrition for women of reproductive age



National RNIs¹⁶ for pregnant and lactating women exist in 38 countries (72%) (Fig. 7.2). Folic acid, calcium, iron and vitamin D were most frequently mentioned in relation to pregnancy and lactation. Some Member States also reported specific recommendations for vitamin C, vitamin E and magnesium.

¹⁶ RNI is the daily dietary intake level of a nutrient sufficient to meet the nutrient requirements of nearly all apparently healthy individuals in an age- and sex-specific population group.

Fig. 7.2. National recommendations on energy and nutrient intakes for pregnant and lactating women or those in the postpartum period



In respect of specific micronutrient intakes, there were variations between countries and the WHO recommendations (Table 7.1).

Table 7.1. Daily recommended micronutrient intakes for pregnant and lactating women

MICRONUTRIENT	WHO	MEMBER STATES*
Vitamin A µg	800.0	600.0–1500.0
Thiamine (vitamin B1) mg	1.4	1.0–1.7
Riboflavin (vitamin B2) mg	1.4	1.4–2.0
Niacin (vitamin B3) mg	18.0	16.0–20.0
Vitamin B6 mg	1.9	1.4–2.3
Vitamin B12 µg	2.6	2.0–4.0
Vitamin C mg	55.0	50.0–110.0
Vitamin D µg	5.0	5.0–25.0
Vitamin E mg	15.0	10.0
Folic acid µg	600.0	300.0–600.0
Iron mg	27.0	9.0–50.0
Zinc mg	10.0	7.3–25.0
Copper mg	1.15	1.0–1.3
Selenium µg	30.0	60.0–70.0
Iodine µg	250.0	100.0–290.0
Calcium g	1.5–2.0	0.3–1.4

*Range of the lowest and highest values reported.

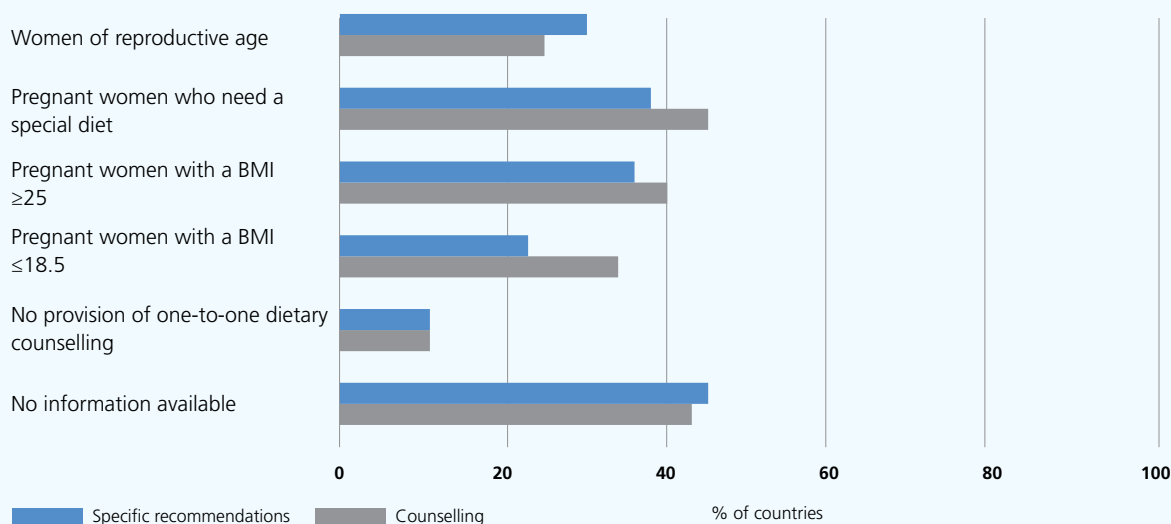
Sources: *Essential nutrition actions. Improving maternal, newborn, infant and young child health and nutrition* [191, p.46]; *Global recommendations on physical activity for health* [200, p.1].

7.1.2 Recommendations for special cases

Maternal obesity, maternal undernutrition and GDM are all associated with pregnancy-related complications and negative health outcomes for offspring (see Part I). This document refers to pregnant women who are obese, undernourished, or suffering from GDM as so-called at-risk groups.

Specific dietary recommendations and nutrition counselling for at-risk groups are provided by a number of countries (Fig. 7.3); 23 (43%) said that they provide specific dietary recommendations and, to some extent, additional nutrition counselling for at-risk groups is available; another 24 countries (45%) did not respond (Fig. 7.3). A total of 20 countries (38%) have specific recommendations for pregnant women who need a special diet (e.g. women suffering from GDM, or vegetarians) and 24 countries (45%) said they provide nutrition counselling; 19 countries (36%) have recommendations for overweight and obese pregnant women and 21 countries (40%) provide counselling; 12 countries (23%) have recommendations for pregnant women who are underweight and 18 countries (34%) provide them with counselling; 16 countries (30%) have recommendations for all women of reproductive age and 13 countries (25%) of these provide counselling. Six countries (11%) reported having neither recommendations nor providing specific services for at-risk groups.

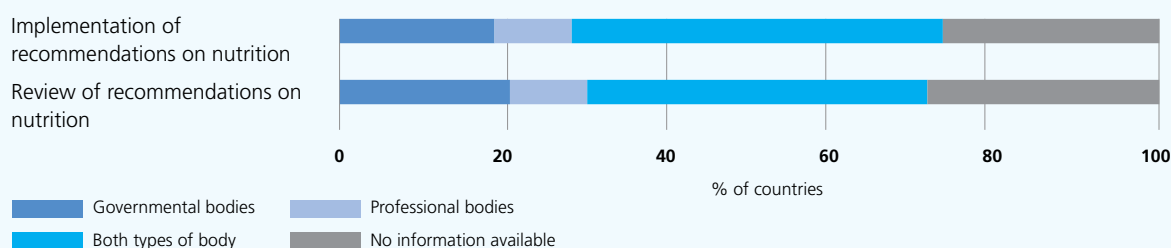
Fig. 7.3. Specific dietary recommendations and nutrition counselling for at-risk groups



7.1.3 National capacity

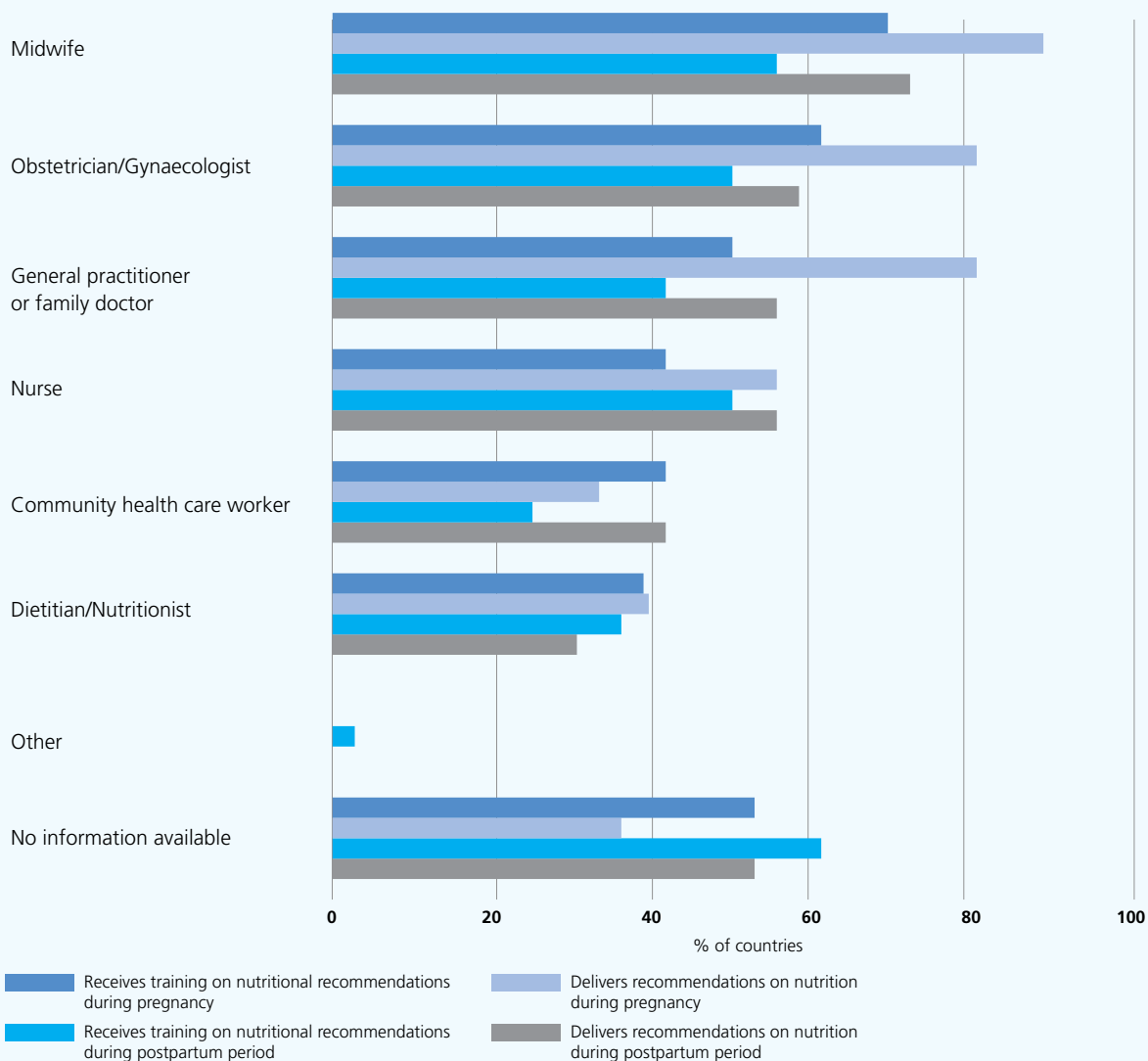
Approximately one fifth of the countries surveyed (10 countries; 19%) reported that their governmental authorities alone are responsible for the implementation of recommendations, while governments and professional bodies are jointly responsible in more than two fifths of countries (24 countries; 45%) (Fig. 7.4). Similarly, reviewing the recommendations is a governmental responsibility in 11 countries (21%) and a joint responsibility in 22 countries (42%). A total of five countries (9%) rely solely on professional bodies.

Fig. 7.4. Governmental authorities and professional bodies responsible for the implementation and review of national recommendations



The health care professionals reported as being responsible for providing national nutrition recommendations during pregnancy are: midwives (60%), obstetricians/gynaecologists (55%) and general practitioners (55%). For recommendations provided during postpartum, these professionals are: midwives (49%), obstetricians/gynaecologists (40%), general practitioners (38%) and nurses (38%) (Fig. 7.5). However, it appears that their training in nutrition may be inadequate and the only group that appear to receive adequate training are the dietitians/nutritionists.

Fig. 7.5. Health care professionals receiving training about delivering national recommendations on nutrition during pregnancy and the postpartum period

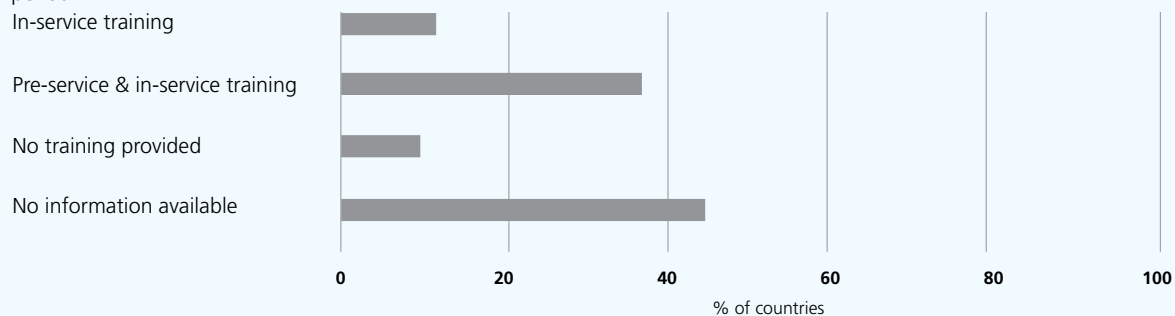


The survey found that training on national recommendations on nutrition during pregnancy was provided in 26 countries (49%) (Fig. 7.6). This training is performed as: in-service training in six countries (11%), and both pre- and in-service training in 19 countries (36%). Five Member States reported not providing any training for health care professionals and a further 23 countries did not provide any information.

7.2 Physical activity

Regular and adequate levels of physical activity are fundamental to the maintenance of energy balance and optimum weight, as well as having significant health benefits [201]. All bodily movements produced by skeletal muscles are considered as physical activity, including walking, household work, manual labour and sports. Being physically active throughout the life-course is essential, as physical inactivity has been identified as a modifiable leading risk factor for morbidity (including NCDs and obesity) and premature mortality [201].

Fig. 7.6. Training for health care professionals on nutritional recommendations during pregnancy and the postpartum period

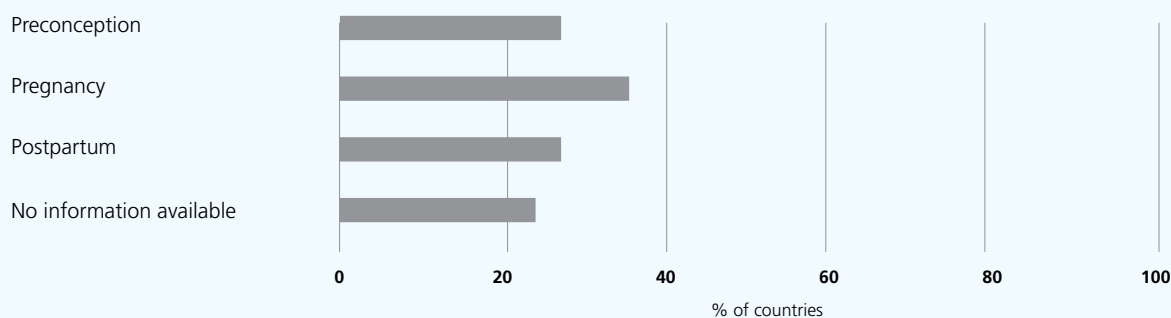


7.2.1 Existence of recommendations

National recommendations on physical activity during the reproductive years have, to some extent, been adopted by more than one third of Member States in the WHO European Region (19 countries; 36%). Recommendations on physical activity are provided for the preconception and/or postpartum periods by around one quarter of Member States (14 countries; 26%), while more than one third (18 countries; 34%) have physical activity recommendations for pregnancy (Fig. 7.7). A total of 22 countries (42%) do not provide physical activity recommendations and another 12 countries did not provide any information.

Few countries gave details of the content of the national physical activity recommendations: only one country refers to WHO's global physical activity recommendations (which encourage 150 minutes of moderate-to-vigorous activity per week) [201], while others recommended 30 minutes of physical activity per day during the reproductive years.

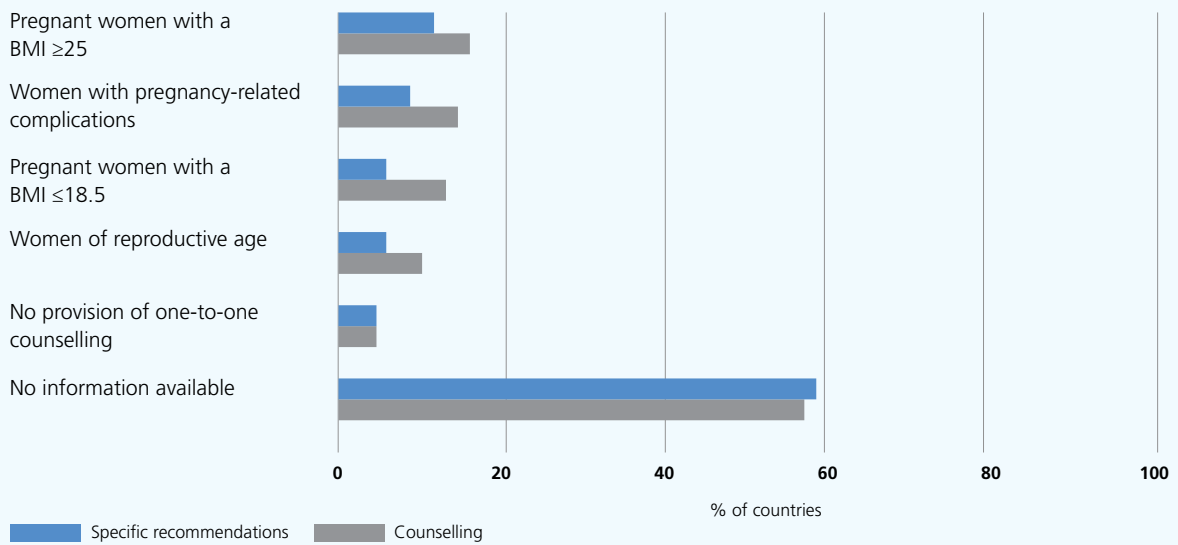
Fig. 7.7. National recommendations on physical activity for women of reproductive age



7.2.2 Recommendations for special cases

In addition to its direct health benefits, physical activity is often included in weight-optimization interventions and therefore is of significance for at-risk groups, e.g. pregnant women with a BMI ≥ 25 . However, few Member States in the Region appear to consider this (Fig. 7.8), since only one fifth of the countries – 11 countries (21%) and 10 countries (19%), respectively – provide any specific physical activity recommendations or physical activity counselling for at-risk groups. For example, for pregnant women with a BMI ≥ 25 , specific physical activity recommendations exist in only eight countries and physical activity counselling is provided in 11 countries. Four countries have physical activity recommendations for pregnant women with a BMI ≤ 18.5 and nine countries provide counselling (Fig. 7.8). Three countries reported not providing any services related to increasing levels of physical activity and the majority of countries (40) provided no information, which could suggest that these services are unavailable.

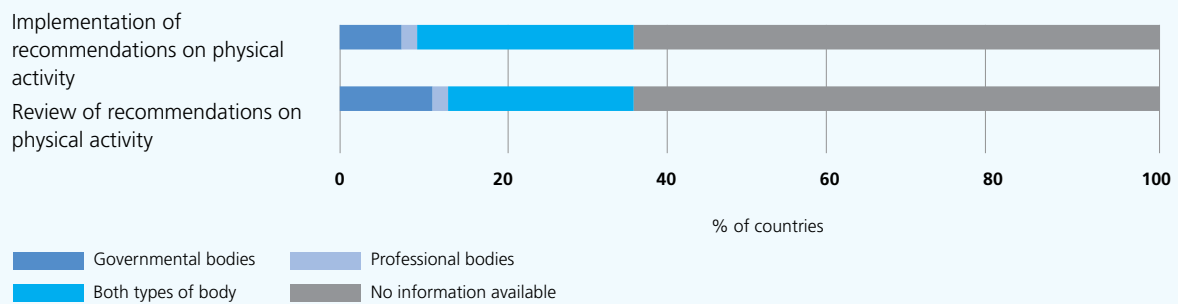
Fig. 7.8. Physical activity recommendations and counselling for special cases during preconception and pregnancy



7.2.3 National capacity

In those countries which have physical activity recommendations for pregnancy and the postpartum period, the responsibility for their implementation (14 countries; 26%) and review (12 countries; 23%) is undertaken jointly by both governmental authorities and professional bodies (Fig. 7.9). Few rely on governmental authorities alone for implementation (four countries) or review (six countries), while one country relies solely on professional bodies. No information was provided by 34 countries.

Fig. 7.9. Bodies responsible for the implementation and review of national physical activity recommendations during pregnancy and the postpartum period

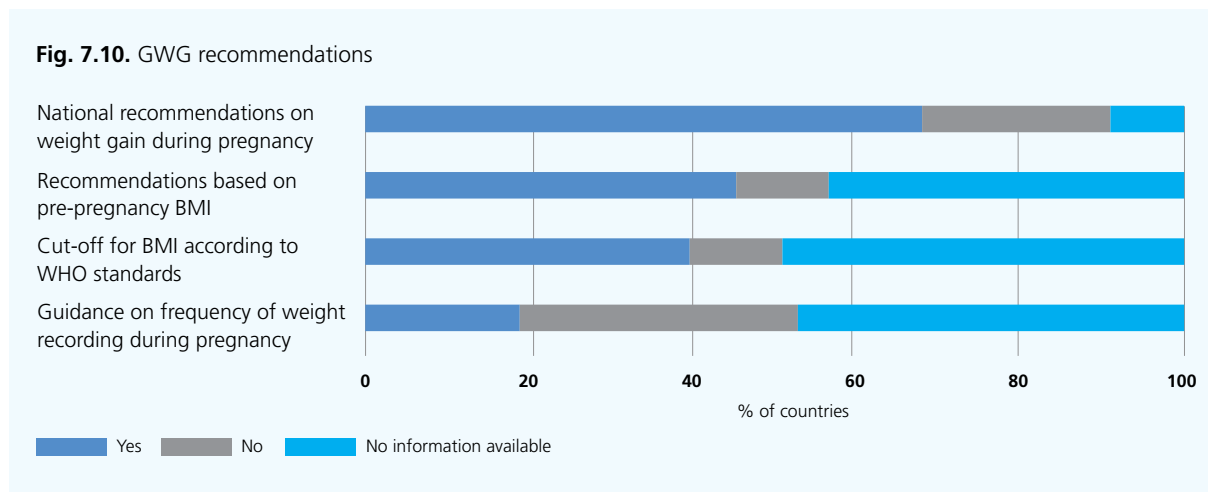


7.3 Appropriate weight gain during pregnancy

Pre-pregnancy BMI and weight gain during pregnancy are independent risk factors for the health of both the mother and her offspring [85,93,97,202,203]. Adverse effects are associated with both high and low GWG, including: a wide range of maternal and fetal complications and the offspring's health and development; increased susceptibility to childhood obesity; and the development of NCDs in adulthood [94,97,204]. Evidence suggests that over half of European and American women gain more weight during pregnancy than recommended [43,205].

7.3.1 Existence of recommendations for GWG

Two thirds of the countries (36 countries; 68%) reported the existence of national recommendations on appropriate weight gain during pregnancy. Around one fifth of the countries (12 countries; 23%) do not have GWG recommendations and five countries did not respond (Fig. 7.10).



Of the 36 countries with recommendations, two thirds (24 countries) reported that the recommendations are based on pre-pregnancy BMI for singleton pregnancies, and 21 countries include cut-offs for BMI according to WHO standards¹⁷ (Fig. 7.10). 13 of these countries base their recommendations on the latest (2009) IoM report (Table 7.2), while four of those 13 countries reported modifying IoM guidance [97]. Six countries reported not using BMI cut-offs according to WHO standards. Furthermore, three countries said they have different recommendations for each obese class.

Table 7.2. IoM recommendations for GWG, 2009

WEIGHT CATEGORY	BMI (kg/m ²)	RANGE OF TOTAL GWG (kg)
Underweight	< 18.50	13–18
Normal weight	18.50–24.99	10–15
Overweight	≥ 25.00	8–10
Obese	≥ 30.00	6–9

Note. Based on WHO cut-offs for BMI.
Source: Rasmussen & Yaktine [97, p.2].

One country reported using the earlier IoM recommendations from 1990 [207], while the remainder did not specify any source for their recommendations.

Only one fifth of the countries (10 countries; 19%) recommend that health care staff record and monitor GWG. A total of 10 countries specify that weight monitoring should take place at each antenatal visit and seven countries emphasized the importance of monitoring the GWG of women with a BMI ≥25 (and/or presenting EGWG).

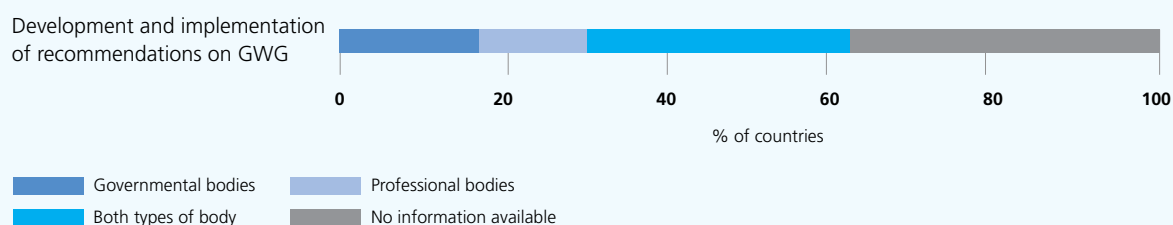
7.3.2 National capacity

A total of 17 countries (32%) develop and implement GWG recommendations jointly with governmental authorities and professional bodies (Fig. 7.11). Governmental authorities are solely responsible for recommendations in nine countries and professional bodies are solely responsible in another seven countries.

¹⁷ The WHO international classification of adult obesity according to BMI is BMI ≥30.00; obese class I is BMI 30.00–34.99; obese class II is BMI 35.00–39.99; and obese class III is BMI ≥40.00, while overweight refers to those who are at BMI 25 or greater [206].

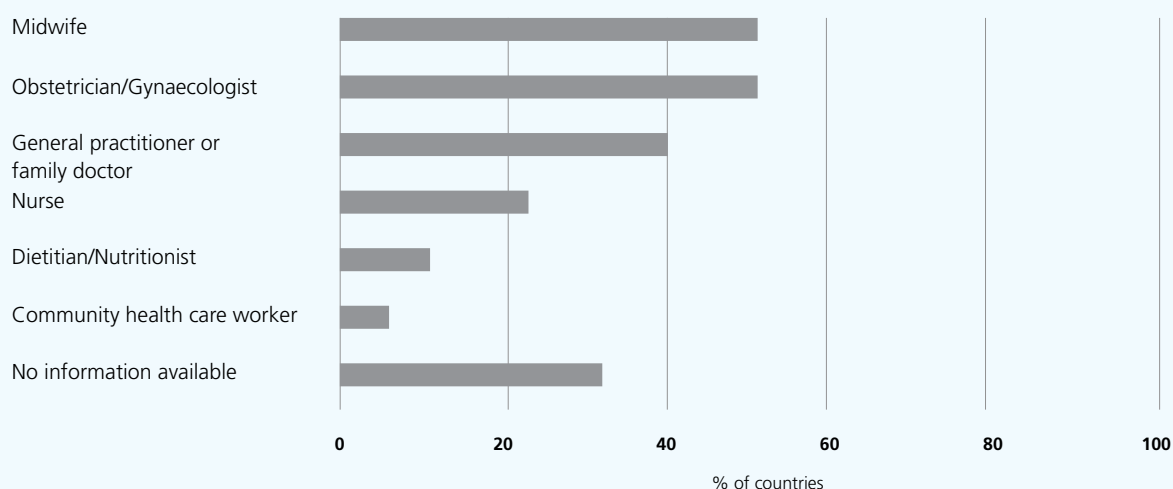
Information concerning responsibility for development and/or implementation of GWG recommendations was not provided by 20 countries (38%).

Fig. 7.11. Bodies responsible for the development and implementation of recommendations on GWG



The health care professionals responsible for recording and monitoring GWG (Fig. 7.12) are: midwives (51%), obstetricians/gynaecologists (51%), general practitioners (40%) and nurses (23%). In some countries, dietitians/nutritionists (11%) and community health care workers (6%) were also reported to be involved.

Fig. 7.12. Health care professionals responsible for recording and monitoring weight during pregnancy



7.4 Newborn, infant and young child nutrition

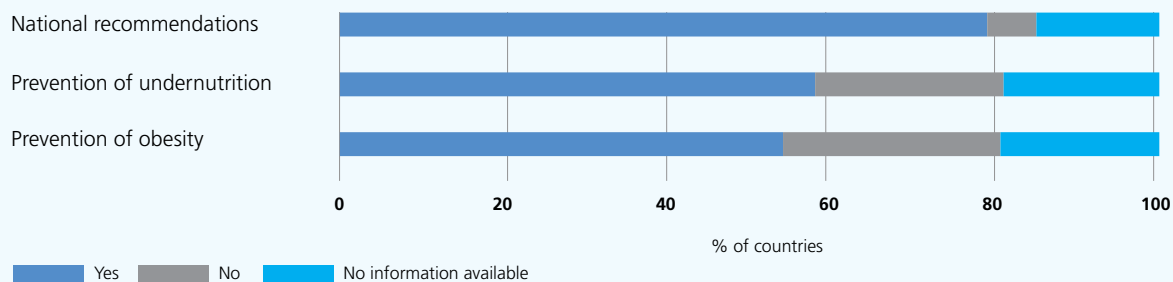
The WHO Regional Office for Europe supports Member States to develop policies and implement initiatives that promote health throughout the life-course [185–190]. Efforts to protect, promote and support the best start in life are essential to decrease health inequities within and between Member States.

7.4.1 Existence of recommendations for newborn, infant and young child nutrition

Among the 53 countries in the Region, 42 Member States (79%) have national recommendations on newborn, infant and young child nutrition (Fig. 7.13). Three countries reported not having these and information was unavailable from another eight countries. National recommendations on newborn, infant and young child nutrition included prevention of undernutrition (31 countries; 58%) and prevention of obesity (29 countries; 55%) (Fig. 7.13).

A healthy start for all neonates and infants is critical to ensure their healthy growth and development. WHO recommends [129,130,191,192]:

Fig. 7.13. National recommendations on newborn, infant and young child nutrition, including the prevention of obesity and undernutrition

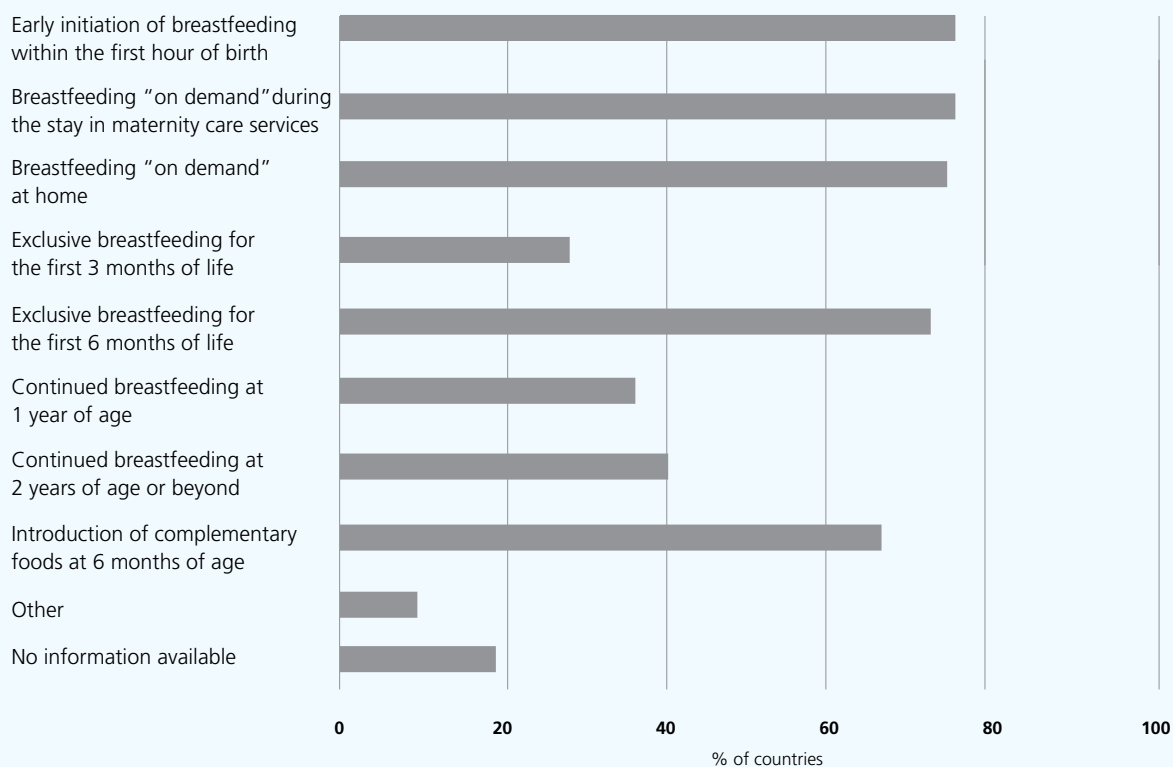


- clamping the umbilical cord only **after** pulsation has stopped;¹⁸
- initiation of breastfeeding within the first hour of birth, along with skin-to-skin contact;
- so-called on-demand breastfeeding;
- exclusive breastfeeding from birth until six months of age; and
- continued breastfeeding up to two years of age; along with timely introduction of appropriate complementary feeding at six months of age.

Nearly four fifths of Member States in the Region (42 countries; 79%) have, to some extent, incorporated the WHO recommendations on newborn, infant and young child nutrition into their national recommendations (Fig. 7.14).

Out of the six WHO regions, the European Region has the lowest rates of exclusive breastfeeding at six months of age [208,209] and is far from reaching the global nutrition targets for 2025 [184,207]. High rates of exclusive breastfeeding for the first six months of life leads to savings in health care costs and is associated with benefits

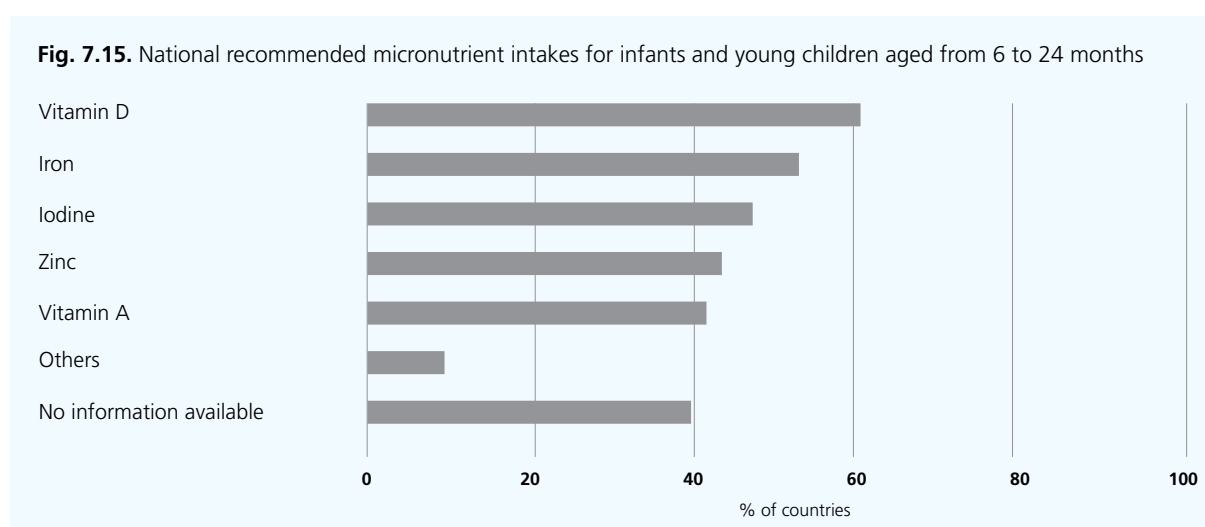
Fig. 7.14. National recommendations on newborn, infant and young child nutrition



¹⁸ This is to ensure optimum iron stores in the infant until six months of age.

to the mother, child and society in general [210,211]. Three quarters of the countries (40 countries; 75%) recommend early initiation of breastfeeding within one hour of birth and thereafter breastfeeding on demand in maternity facilities and to be continued when discharged (Fig. 7.14). Almost three quarters of the countries (38 countries; 72%) recommend exclusive breastfeeding for the first six months of life, whereas around one quarter (15 countries; 28%) appear to recommend exclusive breastfeeding for only three months. Almost 40% (19 countries) recommend continued breastfeeding up to one year of age and another 40% (21 countries) recommend continued breastfeeding up to two years of age (Fig. 7.14). Timely introduction of complementary foods is recommended from the age of six months by two thirds of countries (35 countries; 66%) (Fig. 7.14). In contrast, five countries appear to recommend the introduction of complementary foods as early as from the age of four months and 10 countries (19%) provided no information on infant feeding recommendations.

WHO's recommended micronutrient intake for infants and young children aged from six to 24 months is presented in Table 7.3 [191]. Nearly two thirds of Member States in the WHO European Region (32 countries; 60%) have (to some extent) incorporated WHO's recommendations into their national RNIs (Fig. 7.15). No information on national RNIs was provided by 21 countries (40%) (Fig. 7.15).



Some variation exists between the countries' own RNIs and WHO's RNIs, as shown in Table 7.3.

TABLE 7.3. WHO micronutrient intake recommendations for infants and young children aged from 6 to 24 months

MICRONUTRIENT	WHO	MEMBER STATES*
Vitamin A µg	400.0	300.0–600.0
Thiamine (vitamin B1) mg	0.5	0.3
Riboflavin (vitamin B2) mg	0.5	0.4
Niacin (vitamin B3) mg	6.0	5.0
Vitamin B6 mg	0.5	0.3
Vitamin B12 µg	0.9	0.5
Vitamin C mg	30.0	50.0
Vitamin D µg	5.0	5.0–10.0
Vitamin E mg	5.0	10.0
Folic acid µg	150.0	50.0
Iron mg	10.0	7.0–12.5
Zinc mg	4.1	2.0–11.0
Copper mg	0.56	0.30
Selenium µg	17.0	12.0
Iodine µg	90.0	50.0–130.0

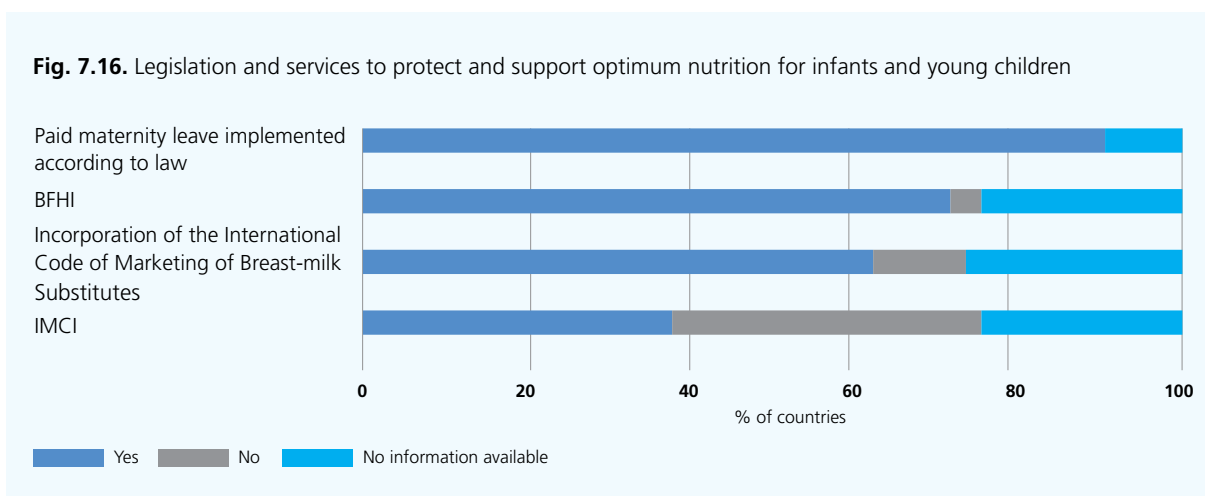
*Range of the lowest and highest values reported.

Source: *Essential nutrition actions. Improving maternal, newborn, infant and young child health and nutrition* [191, p.37].

7.4.2 Supportive environmental conditions

Implementation of the International Code of Marketing of Breast-milk Substitutes¹⁹ [152,153] into national legislation, as well as regulations on entitlements to paid maternity leave²⁰ and return-to-work regulations, are essential to support exclusive breastfeeding for the first six months and so ensure the best start in life. These protective instruments, along with supportive services, such as WHO/United Nations Children's Fund (UNICEF)-certified baby-friendly hospitals [166] and community (and primary health care) initiatives,²¹ are key interventions to reduce health inequalities right from the start of life [179,191].

Over 90% of Member States in the WHO European Region (48 countries) reported having incorporated some form of legislation and/or supportive services: legislation on paid (fully/partially) maternity leave (48 countries); incorporation (fully/partially) of the Code into national law (33 countries); implementation of BFHIs (37 countries); and/or Integrated Management of Childhood Illness (IMCI) (20 countries) (Fig. 7.16).



Over three quarters of Member States in the Region (41 countries; 77%) reported having fully paid maternity leave, while maternity leave is only partially paid in another seven countries (13%) (Fig. 7.17). A total of 12 countries (23%) provide both fully and partially paid maternity leave. In 13 countries (25%) fully paid maternity leave is available for 26 weeks (six months) or more. For paternity leave (Fig. 7.17): 15 countries (28%) have fully paid paternity leave adopted into national legislation, while only partially paid leave is possible in a further 8 countries (15%). Five countries (9%) provide both fully and partially paid paternity leave. A total of 13 countries reported that both maternity and paternity leave can be used simultaneously.

WHO Member States adopted the Code in 1981 [152] and additional relevant resolutions have since been adopted. The Code restricts marketing of all breastmilk substitutes, including follow-on formula, and protects breastfeeding in order to “contribute to the provision of safe and adequate nutrition for infants” [152, p.8]. The Code is, in some part, implemented into national legislation by 33 countries (62%) in the WHO European Region: only 19 countries appear to have implemented the Code completely, and 14 partially (Fig. 7.18).

¹⁹ The Code [152] and all subsequent relevant World Health Assembly resolutions [153] regulate the marketing of breastmilk substitutes to protect the provision of appropriate nutrition for infants by regulating practices which need to encourage rather than discourage breastfeeding. The Code ensures access to unbiased information and so enables parents to make decisions about infant feeding, free from commercial pressures. Member States are recommended to: translate the Code into national law; enforce it; monitor violations; and act on violations through sanctions. The Code includes 10 important provisions, which are summarized in *A guide for health workers* [154]. Although the EU Directive (2006/141/EC) [155] does not encompass the Code in its entirety, because it is adopted as a minimum requirement within the EU, national monitoring can – in addition to the Directive’s provisions – cover the Code’s provisions too.

²⁰ Maternity leave can exist and coexist in the following three forms: fully paid, partially paid and voluntary (unpaid). The same applies to paternity leave. Paid maternity leave is funded by social insurance or public funds and is a well-recognized core requirement for the health and socioeconomic protection of mothers and their infants. Research indicates that paid maternity leave improves breastfeeding initiation rates, duration and continuation [150]. In addition, no negative impact on productivity is observed and substantial benefits for business (including small and medium-sized businesses) are also evident [151].

²¹ The BFHI was launched in 1991 [166] and has been augmented to support both mother and baby in a wider range of settings, including: leadership; counselling via local services; and training for all who assist in home births.

Fig. 7.17. Parental leave

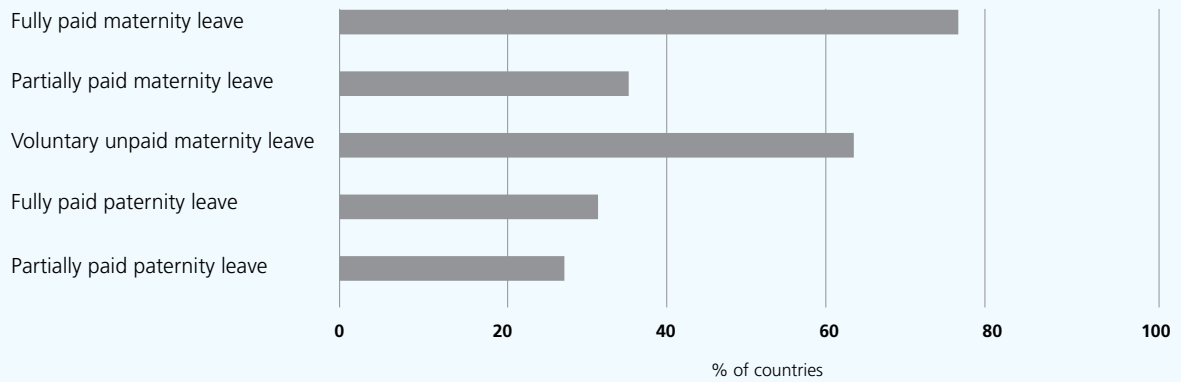
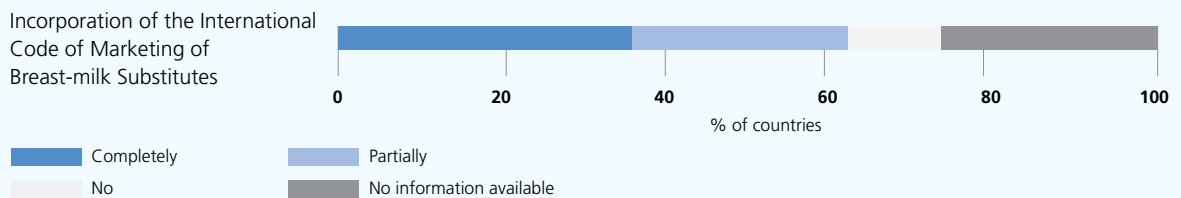


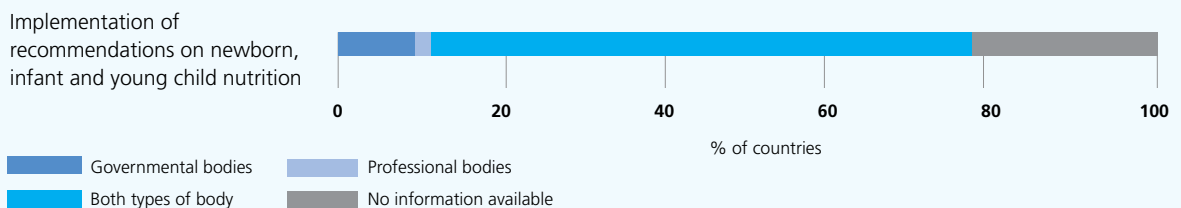
Fig. 7.18. Adoption of the International Code of Marketing of Breast-milk Substitutes into national legislation



7.4.3 National capacity

In two thirds of Member States in the Region (35 countries; 66%) both governmental authorities and professional bodies are responsible for the development and implementation of national recommendations on newborn, infant and young child nutrition (Fig. 7.19). In five countries, governmental authorities alone are responsible and in one country professional bodies alone are responsible for such activity.

Fig. 7.19. Bodies responsible for the implementation of national recommendations on newborn, infant and young child nutrition



The health care professionals responsible for delivering the infant feeding recommendations are: paediatricians (64%), nurses (53%), general practitioners (47%), midwives (42%), community health care workers (21%), and obstetricians/gynaecologists (17%) (see Fig. 7.20). In some countries nutritionists/dietitians (15%) are responsible. Training for health care professionals in infant feeding is provided in less than half of the Member States, except for paediatricians (60%): nurses (49%), general practitioners (47%), nutritionists/dietitians (23%) and obstetricians/gynaecologists (21%).

More than half (28) of the Member States in the WHO European Region provide both pre-service and in-service training on the national recommendations on infant and young child nutrition (Fig. 7.21). In most of the remainder of the countries, only pre-service or in-service training is provided. Three countries reported that no training is provided and 12 countries were unable to provide information.

Fig. 7.20. Health care professionals receiving training on delivering national recommendations on newborn, infant and young child nutrition

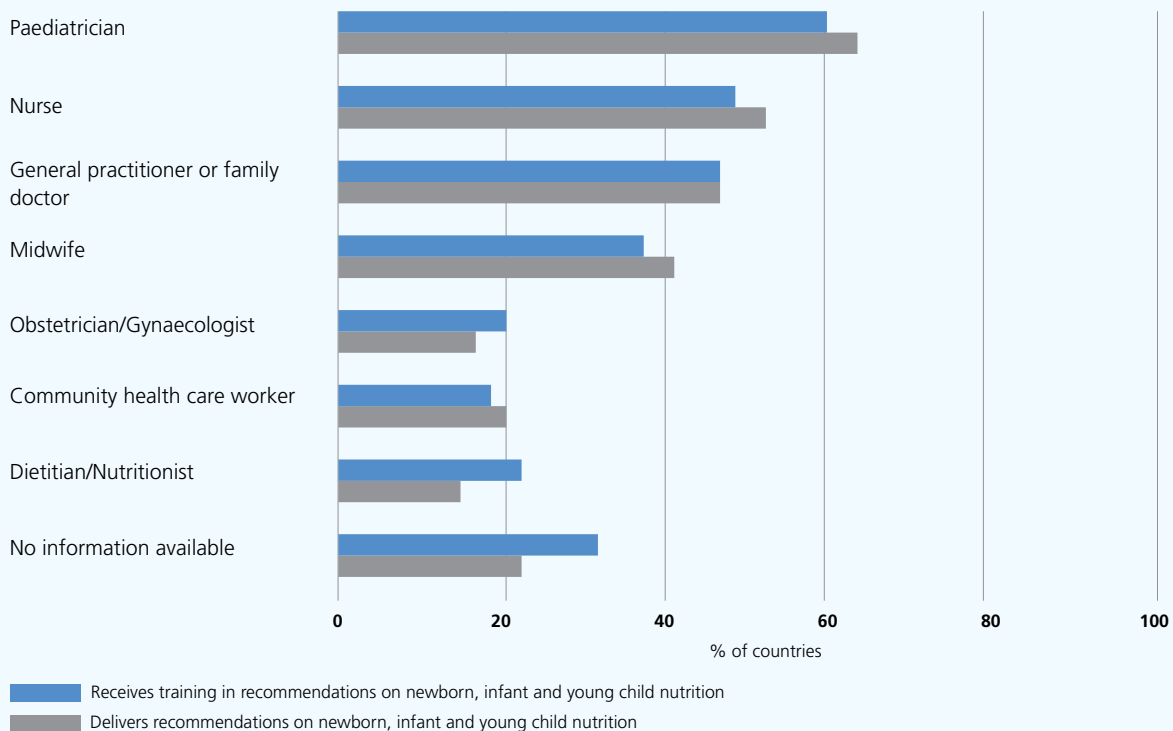
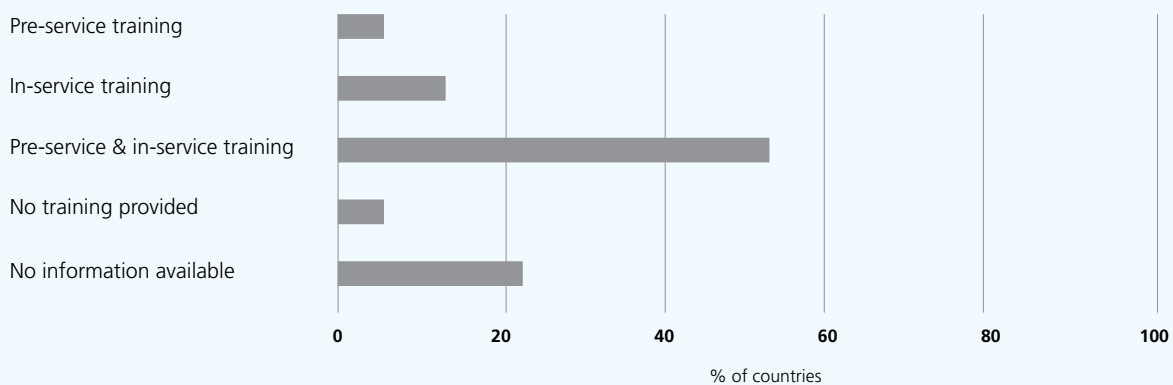


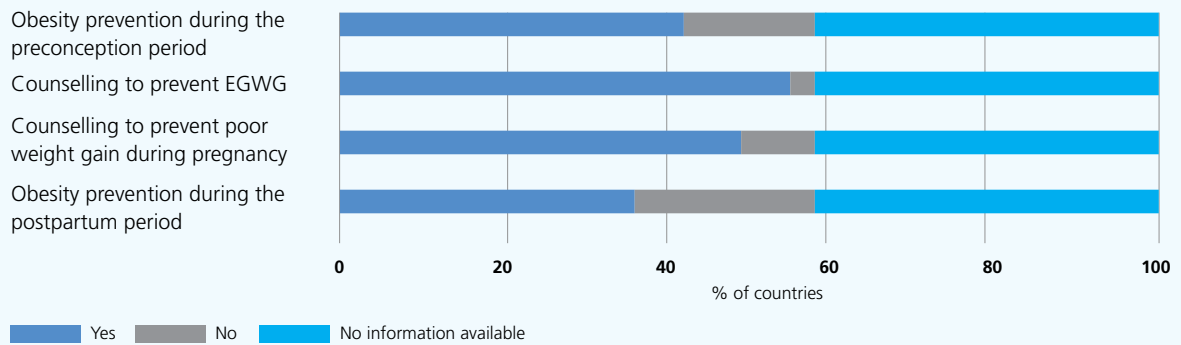
Fig. 7.21. Training of health care professionals related to national recommendations on newborn, infant and young child nutrition



7.5 Health care services for prevention of obesity and diet-related diseases

Unhealthy diets and physical inactivity are major modifiable risk factors for NCDs and obesity [1–5,149]. Professional guidance from health care staff can be helpful in preventing these conditions, by promoting foods such as vegetables, fruit, fish and rich sources of iron during the reproductive years. Over two thirds of Member States in the WHO European Region (31 countries; 59%) reported having implemented health promotion and disease prevention measures for pregnant women and those in the postpartum period as part of their routine primary health care services: 19 countries implement obesity-prevention initiatives during the postpartum period; 22 countries implement obesity prevention initiatives during preconception; 29 countries report providing counselling against EGWG; and 26 countries provide counselling to prevent poor GWG (Fig. 7.22). Considering the number of countries that did not report any information on counselling against both EGWG and poor GWG, this issue may need further attention by WHO and its Member States.

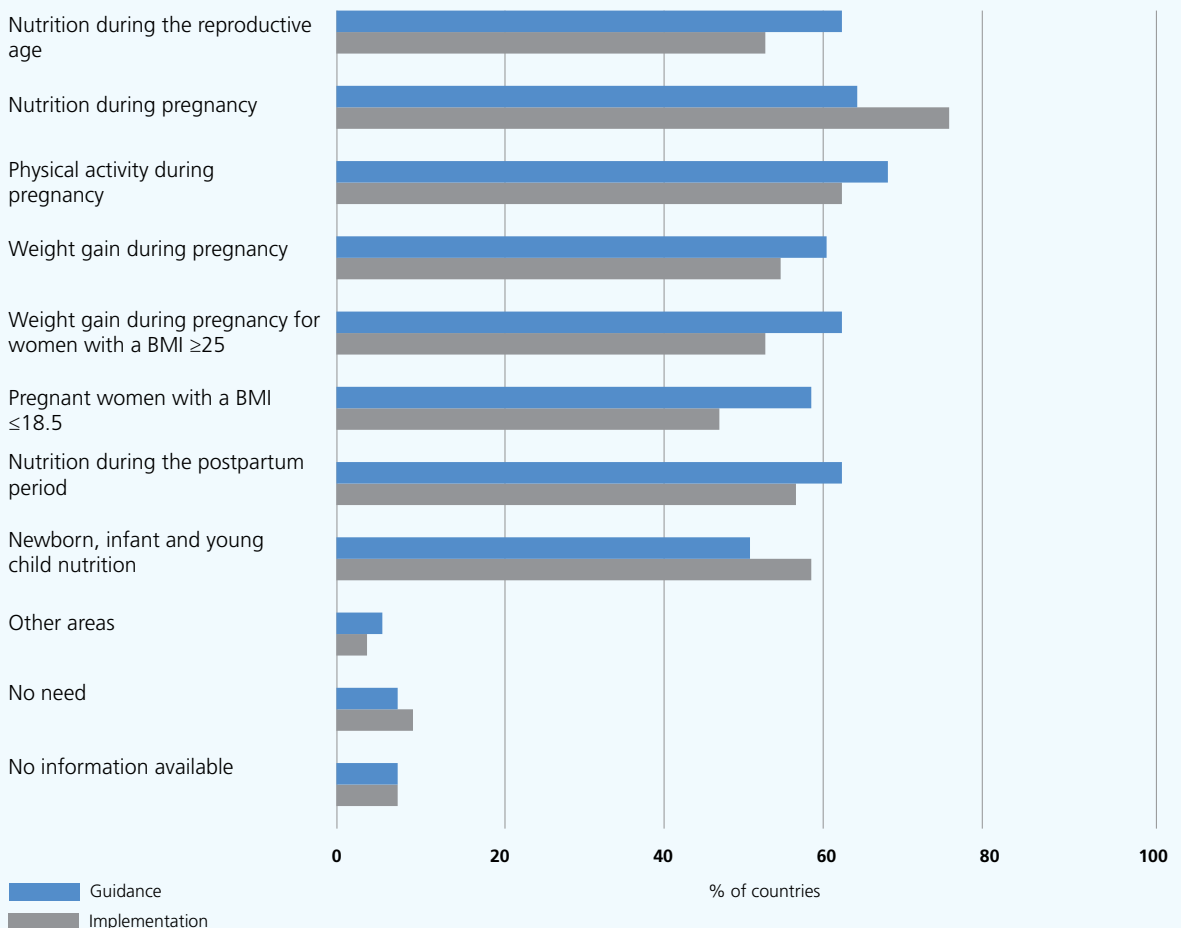
Fig. 7.22. Prevention of obesity and diet-related diseases within routine primary health care for mothers, neonates and infants



7.6 Support for future maternal and young child health policies

Nearly three quarters of Member States in the WHO European Region requested guidance from the Regional Office on specific issues, including: development and review of existing national guidelines (45 countries; 85%); and improved implementation of national guidelines (44 countries). Only five countries reported no need for support and another four countries did not provide any information on this matter (Fig. 7.23).

Fig. 7.23. Areas in which further support was requested by Member States from the WHO Regional Office for Europe



The need for guidelines and technical assistance in improving implementation of national guidelines related to healthy eating, physical activity and weight gain during pregnancy are among the top priorities requested by the Member States participating in the survey. Specific topics requested included physical activity during pregnancy (36 countries; 68%); nutrition during the reproductive age (33 countries; 62%), pregnancy (34 countries; 64%), lactation/postpartum (33 countries; 62%); and newborn, infant and young child nutrition (27 countries, 51%). A further 31 countries (58%) requested further guidance for maternal undernutrition (Fig. 7.23).

In addition, countries asked for more guidance on: optimum physical activity levels for young children; nutrition for adolescents and pregnant working women; obesity during pregnancy; better implementation among at-risk groups, including women suffering GDM; and capacity-building and training of health care professionals on how to improve the implementation of the recommendations. A total of 48 countries (91%) reported that an e-health approach – with shared access among health care professionals – could be useful, while three countries reported that their current systems work well.

8

Conclusion

A total of 51 of the 53 Member States in the WHO European Region participated in this survey. Responses show that not all Member States have fully adopted and incorporated WHO's recommendations (see Table 1 in the executive summary). The findings indicate wide variations between Member States in their development of high-quality standards for maternal, infant and young child health. Furthermore, the data imply that there are gaps between existing policy and effective implementation. This may be owing to a range of barriers faced by health care professionals when wishing to provide future parents with advice on healthy eating and physical activity [212]. Such barriers include: overstretched health care professionals; inadequate resources; lack of consistency in information provided; inadequate training of health care professionals; and lack of consistency between national health services' recommendations and other information sources. Hence, the majority of the Member States in the Region requested additional support from the Regional Office in relation to maternal and young child nutritional health improvements.

Commitments have been made by national governments to undertake public health actions to reduce health inequalities and improve maternal, infant and young child health through a series of political documents at regional and global levels.²² Improvement of maternal and child health, reducing the burden of NCDs and the need to take steps to tackle existing risk factors are serious challenges for Member States of the WHO European Region. Investment is needed in sustainable and cost-effective health promotion measures from the earliest stages of the life-course. This includes tackling increasing health inequalities through the development of comprehensive health and nutrition policies and services, by implementing proportionate universalism²³ within health services provision. Improving the nutritional health status of women of reproductive age, neonates, infants and young children could form part of a wider strategy to improve health and development of children and prevent obesity and diet-related NCDs in adults. This requires a broad set of public health and nutrition measures that ensure the intake of foods low in salt, fat and sugar, such as vegetables, fruit, fish, and iron-rich sources, during the preconception period and throughout pregnancy.

Based on the findings of the survey, various priorities were identified, including those listed here.

²² These include *Health 2020: a European policy framework supporting action across government and society for health and well-being* [186], the *Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020* [185], the *European Food and Nutrition Action Plan 2015–2020* [188], *Investing in children: the European child and adolescent health strategy 2015–2020* [189]; and, adopted by the World Health Assembly, the *Global strategy for infant and young child feeding* [213]; the *global reproductive health strategy (2004)* [187]; the *Global action plan for the prevention and control of noncommunicable diseases 2013–2020* [5], and the *global nutrition targets for 2025* [184].

²³ Proportionate universalism describes actions which aim “to reduce the steepness of the social gradient in health”; such actions “must be universal, but with a scale and intensity that is proportionate to the level of disadvantage” [181, p.15].

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- **Development and regular updating of recommendations for national use** are needed, harmonized with WHO recommendations to promote a life-course, health-in-all-policies, intersectoral, evidence-based and human rights-centred approach.
 - **Consistency of advice should be improved and the need to tackle maternal and infant nutrition and to reduce growing inequalities throughout the WHO European Region should be raised as priorities.** The wide discrepancies and lack of consistency in national recommendations within and between Member States indicate the need for action.
 - **Capacity-building** should be encouraged and ensured, as a continuing process. There is a clear need for active and systematic collaboration between health care service providers, professionals and government authorities. This includes the need to promote greater intersectoral and multidisciplinary integration in order to improve health outcomes through the provision of competent, culturally sensitive, and evidence-based services. Health care professionals require new competencies to meet changing health needs. It is important to provide both pre-service and in-service training, as well as making better use of communication and technology to share best practices.
 - **Member States' many requests for action** should be supported and the Regional Office needs to respond to questions regarding how most effectively to improve maternal health through measures which improve dietary and physical activity patterns.

Based on the findings and the priority actions identified, Part III's discussion of the opportunities for action on maternal, newborn and infant nutritional health in the context of Health 2020, has been developed to inspire and encourage Member States in the Region to optimize fetal development and reduce preventable early origin diet-related NCDs and malnutrition – along with corresponding health inequalities – from the start of life.

PART III

Opportunities for
action on maternal,
newborn and infant
nutritional health
in the context of
Health 2020

9

Introduction to Part III

These opportunities for action on maternal nutritional health in the context of *Health 2020* have been prepared as a result of the WHO Regional Office for Europe 2014 review of maternal nutrition, obesity and NCDs (recent evidence, see Part I) and the survey of national recommendations for nutrition, physical activity and weight gain during pregnancy. This document supports the implementation of WHO policies and World Health Assembly resolutions already adopted by Member States, including *Health 2020: a European policy framework supporting action across government and society for health and well-being* [186], the *Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020* [185], the *European Food and Nutrition Action Plan 2015–2020* [188], *Investing in children: the European child and adolescent health strategy 2015–2020* [189] and the *Global strategy for infant and young-child feeding 2003* [213], the *global reproductive health strategy (2004)* [187]; the *Global action plan for the prevention and control of noncommunicable diseases 2013–2020* [5], and the *global nutrition targets for 2025* [184].

This publication is intended for use by WHO European Member States, in particular: policy-advisers in local and regional health and welfare authorities, health care providers and professionals, civil-society organizations, and researchers.

The main messages are to be adopted on a voluntary basis and according to the national context.

- For **policy-advisers**, it is important to remember that maternal nutritional health can be improved if cross-government linkages address the underlying causes of health inequalities. A reduction in sociodemographic disparities in maternal health will transfer benefits (cognitive, mental and physical) to the next generations, with overall better population health and cost savings for societies.
- Often there are gaps between national policy development and its effective implementation. **Health care providers and professionals** could benefit from consistent guidance, adequate training based on the latest scientific evidence, and evaluations of their effectiveness at translating evidence to practice in promoting healthy eating, physical activity and appropriate GWG, especially when counselling low-income mothers. Their professional societies also have a responsibility to engage with communities and policy-makers to improve maternal health, which in all societies is recognized as important but where practical proposals for improvements are rare.

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- **Civil society (e.g. communities, families, nongovernmental organizations (NGOs))** can support citizens to exercise their rights to protect, support and promote their own health and that of their community. Citizens' groups can help with agenda-setting for commitments, conventions and resolutions adopted by the United Nations General Assembly, as well as resolutions adopted by WHO's European and global governing bodies, which need to be translated into intersectoral policies in order to help the whole community, including the most disadvantaged. Establishing good media relationships and links to local and central government is important.
 - **Researchers** should be encouraged to research which approaches best reduce the marginalization and exclusion suffered by women of low socioeconomic status when they encounter the health care system. There is evidence to suggest that some forms of maternal and child health services can improve access rates of mothers of low socioeconomic status and their acceptance of advice and help, thereby reducing transgenerational health inequalities. More research is needed into the prevalence of overlapping obesity and multiple micronutrient deficiencies. Evidence on the best way to overcome barriers to guideline implementation is also needed in this context. Policy briefings – using research findings to inform policy-makers – are important.

The WHO Regional Office for Europe supports Member States to improve maternal, newborn, infant and young child nutritional health, and provides technical advice to:

- advocate for improved maternal, infant and young child nutrition at the highest national and international levels;
- develop national standards, guidelines and recommendations to improve maternal, newborn, infant and young child nutritional status;
- develop, review and update evidence-based guidance related to maternal, newborn and infant nutritional health;
- provide training materials to help build national capacity related to maternal, newborn and infant nutritional health; and
- inform on how to improve surveillance, monitoring and evaluation systems of nutritional health.

10

Development and implementation of national guidelines on maternal nutritional health

10.1 The need for development and updating of national guidelines

Pregnancy is a unique window of opportunity to engage with women and their families, as it is a time of intense contact with health care services and professionals for what is ultimately a healthy reason. Pregnant women are generally more motivated to make changes to their eating and physical activity habits for the benefit of their infants and themselves. However, there appears to be a lack of national guidance on maternal nutritional health. The survey conducted in the WHO European Region (see Part II), to which 51 of 53 Member States responded, found that:

- 10 countries did not have nutritional recommendations for pregnant women;
- 18 countries did not have nutritional recommendations for postpartum/lactating women;
- 32 countries did not have physical activity recommendations for pregnant women;
- 37 countries did not have physical activity recommendations for postpartum/lactating women;
- 12 countries did not have guidelines for weight gain during pregnancy;
- 24 countries (out of 36) with guidelines for weight gain during pregnancy based them on pre-pregnancy BMI for singleton pregnancies;
- 13 countries based their guidelines for weight gain during pregnancy on the 2009 IoM guidance [97]; and
- 10 countries recommended that health practitioners record and monitor weight gain throughout pregnancy.

Improvement and reduction of inequalities during pregnancy offers the opportunity to improve national health and prevent health inequalities in the future [148]. However, maternal health inequalities appear to be increasing, possibly because the least-deprived women are able to implement improvements at a faster rate than those who are most deprived [214]. In response, public services need to be adjusted so that, along with the focus on usual obstetrical risk factors and complications, high-risk women in households of low socioeconomic status are also offered enhanced or specific services which help to combat and limit the effect of inequity.

10.2 Suggestions for policy-advisers at national level

- Gender equality should be promoted and women empowered using legislation and rights-based commitments, including health-in-all-policies and life-course approaches in national policies and strategies within health and other sectors, such as social and employment policies, food and agriculture, education, welfare and financial policies.
- A multisectoral, interdisciplinary expert group should be established, which is responsible for ensuring the development and review of national policies, strategies, recommendations, guidelines and programmes on nutrition, physical activity and weight gain for pregnant and postpartum/lactating women. These should be based on WHO's and the latest national and international scientific evidence.
- The correct conditions should be created for the national expert group to develop and monitor evidence-informed national policies, implemented through locally adapted guidelines. All women, regardless of their socioeconomic status, should be guaranteed access to good-quality maternal, infant, child and young child health care services, whereby appropriate advice on healthy eating and physical activity is freely available and appropriate links to other government supportive services can be made.
- National examples of good practice should be shared when developing, implementing and updating national policies, strategies, guidelines and programmes.
- The support of experts should be enlisted, using the best available high-quality evidence that is most relevant for the Member State concerned, in order to update national guidelines and recommendations on food and nutrition and physical activity that are suitable for women during preconception, pregnancy and postpartum/lactation.
- An intersectoral approach should be taken that tackles the underlying determinants of poor nutrition and health inequity in order to stimulate the development and implementation of guidelines outside the health care sector, for example fully paid maternity leave and breastfeeding in public spaces [148].
- A supportive environment should be created that will enable mothers, families and other caregivers to make it easy to make informed, healthy choices; for example, through legislation protecting and enforcing the rights of working women to breastfeed exclusively for six months (through paid maternity leave, job protection and breastfeeding breaks with suitable local facilities).
- Prenatal, childbirth and postnatal care should be made available and maternity services should carry out all 10 steps recommended by the BFHI in full [166,215].
- Legislative, regulatory and/or other effective measures to control the marketing of breastmilk substitutes should be developed (or, where necessary, strengthened) in order to ensure implementation and enforcement of the Code [152] and subsequent relevant resolutions adopted by the World Health Assembly [153].
- The effect of the burden of poor maternal, infant and child nutritional status in hindering national economic development should be recognized. Poor nutrition during fetal development and infancy has lasting and irreversible negative effects on cognitive development, and lasts throughout life.

10.3 Suggestions for health care service providers and professionals

- Consistency of advice on good nutrition should be encouraged for women during pregnancy and lactation.
- Professional bodies and health care professionals can have an active role, free from conflict of interest, to support and inform policy development and implementation through technical expertise and advocacy. This role is important and can be a prominent feature of local interest and societal input to government and the media. Mechanisms for audit both of professional practice and the community's support could be developed and promoted.
- National policies and guidance should be up to date and put into practice using appropriate facilities, equipment and staff. Results from the survey of countries of the European Region (see Part II) suggest that health practitioners (general practitioners, obstetricians/gynaecologists, midwives, nurses and community health care workers) request specific training in how to give dietary and physical activity advice and how to manage GWG support. Institutions are urged to draft their guidance based on national policies and existing

care pathways, linking up preconception, pregnancy and postnatal care for a life-course approach, using participatory processes in order to generate ownership by all members of health care staff.

- Barriers to access should be identified and removed in order to increase the proportion of women of low socioeconomic status who use public services [212]. This group of women may be overweight or obese, raising their health risks and those of their offspring. Risks can be reduced through behavioural changes, but practitioners may need support to ensure that they understand the women's circumstances without stigmatizing when discussing diet and physical activity.
- Effective, protective and supportive environments should be created and encouraged, including by implementing initiatives such as the BFHI [166] and the safeguarding of breastfeeding through the Code [152,153].

10.4 Suggestions for civil society (e.g. communities, families, NGOs)

- Sustainable policy implementation for improved maternal and infant health should be supported and facilitated (for example, through the provision of local breastfeeding facilities).
- The implementation of national guidelines and recommendations on both food and nutrition and physical activity should be advocated and assistance provided, along with support to control the marketing of breastmilk substitutes and the inappropriate marketing of complementary foods.
- Enforcement of the Code [152] should be monitored and violations (including inappropriate marketing of complementary foods) reported to local authorities and consumer groups.
- Participatory local and national decision-making should be promoted by interacting with policy- and decision-makers, using relevant democratic processes.
- Knowledge and information should be disseminated, and conflicts of interest avoided which may undermine the independence and credibility of the information provided.
- Social media and grassroots movements should be used to make parents' lives easier by pooling knowledge, advice and support.

10.5 Suggestions for researchers

- Gaps between the latest scientific evidence and existing national policies should be identified and addressed.
- The most effective ways to implement nutrition and physical activity interventions that are sustainable should be investigated; for example, how to strengthen preconception care mechanisms so that women in all socioeconomic groups enter pregnancy in good nutritional health.
- Measures should be identified and addressed that reduce inequalities and establish how to protect and promote health equalities and support an inclusive approach to public health and nutrition.
- Evidence should be provided on the determinants of exclusive breastfeeding until six months of age and the timely introduction of appropriate complementary foods, as well as informing policy-makers how current feeding and eating patterns could be improved.
- Evidence should be presented to policy-makers on the cost-effective benefits of supportive environments, such as the BFHI [166,215] and restrictions on marketing of breastmilk substitutes and inappropriate marketing of complementary foods (World Health Assembly resolution WHA63.23) [152–154,216].

11

Capacity-building on maternal nutritional health

11.1 The need for well-informed health care professionals

Professionals dealing with maternal health need to be trained, both during pre-service preparations and in the form of ongoing in-service training; their curricula should be consistent and regularly updated [212]. However, only 20 Member States in the WHO European Region reported providing both pre- and in-service nutrition training on the recommendations to be given during pregnancy and lactation. Moreover, 45 Member States requested guidance from the Regional Office on specific issues related to maternal and newborn nutrition, as shown in Table 11.1.

Table 11.1. Examples of issues for which guidance has been requested from the WHO Regional Office for Europe

ISSUE
Nutrition
- During the reproductive years
- During pregnancy and lactation
- For newborn, infants and young children
Physical activity
- During pregnancy
Appropriate weight gain during pregnancy
- In general and with specific focus on underweight and obesity in pregnant women

In addition, 45 Member States requested technical support in terms of guidance on the development and review of existing national guidelines and 44 Member States requested support on how to improve implementation. Only five countries reported that they did not need any support and another four countries did not provide any information at all on this matter. Member States have also asked for WHO guidance on physical activity for young children, nutrition for pregnant adolescents and working women, as well as weight gain during pregnancy. The issue of how to improve uptake of services by at-risk groups, including women with GDM, was also highlighted as a significant concern.

Forty-eight of the 53 countries stated that an e-health approach with shared access among health care professionals would be useful.

Measures to ensure a supportive environment are needed for all neonates and infants in order to ensure healthy growth and development. These measures include: implementation and enforcement of the Code [152,153]; legislating on maternity leave to support six months of exclusive breastfeeding; and improving access to baby-friendly hospitals [166]. A total of 19 countries have implemented the Code fully into national legislation and 14 countries have done so only partially, while 37 countries reported having implemented BFHI and acknowledged that regular in-service training is needed to ensure all staff are aware of the competencies required.

11.2 Suggestions for policy-advisers

- A health care system should be designed with universal health care coverage, integrating the principle of proportionate universalism²⁴ to improve maternal, infant and young child health.
- Nutrition, physical activity during preconception, pregnancy and postpartum and GWG should be included in professional continuing education on the principles of BFHI services for all health care service staff, including those working in primary health care settings [166,215].
- Creation of intersectoral and multidisciplinary collaboration should be encouraged, to promote health throughout the life-course, including facilitating healthier food choices and increased physical activity.
- Cost savings achieved by improved services should be demonstrated, and the expected benefits quantified. The available evidence should be used, and adapted according to the experiences of other Member States [211].


11.3 Suggestions for health care service providers and professionals

- They should use the latest guidelines and recommendations, based on the newest evidence.
- Both pre- and in-service education and training should be provided for all relevant health care professionals (general practitioners, paediatricians, obstetricians/gynaecologists, midwives, nurses, paediatricians, nutritionists, dietitians, kinesiologists, and others) and community workers giving advice on nutrition, diet and physical activity for women, including pregnant and lactating women, neonates and infants.
- Training materials should be facilitated and updated in pre- and in-service training curricula to include details on the concepts, as well as how to develop and put into practice skills such as counselling, and dialogue with patients to reduce stigma.
- Professional bodies can develop and update guidance on public health policies and clinical care pathways to manage and prevent underweight, overweight and obesity for women of reproductive age, especially around pregnancy.
- Facilities providing maternal services should be run by health care professionals who are specifically trained to support women appropriately, having received training on newborn and infant nutrition recommendations.

11.4 Suggestions for civil society (e.g. individuals, families, communities)

- Their potential should be used to empower communities (for example, mother-to-mother support groups and peer support groups).
- Through health education and promotion, awareness should be increased of maternal, infant, child and adolescent nutrition and health needs, as well as self-care before and during pregnancy and the postpartum/lactation periods, including the need for social support during and after pregnancy.

²⁴ As described in the Introduction to Part II (Chapter 5), proportionate universalism is a key concept for addressing health inequalities. "To reduce the steepness of the social gradient in health, actions must be universal, but with a scale and intensity that is proportionate to the level of disadvantage" [181, p.15].

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- Local and national civil society organizations can advocate for better health services based on the BFHIs [166] and professional advice, and advocate for strengthening the skills and training available to health workers.
 - Training should be provided on how to use WHO growth standards for monitoring healthy growth and development.
 - The benefits of exclusive breastfeeding and timely introduction of appropriate complementary foods, along with continuation of breastfeeding should be promoted and facilitated, with relevant groups and wider society educated as necessary.
 - Training should be provided on how to support, guide and counsel mothers to exclusively breastfeed for as long as possible.
 - The use of new approaches to promote healthy food choices and healthier lifestyles should be advocated and actively encouraged.

11.5 Suggestions for researchers

- National and international examples of good practice (for example, based on BFHI principles) should be compared and contrasted, in terms of capacity-building for professionals delivering services for maternal, newborn and infant health.
- The reasons for non-attendance by women and teenagers of low socioeconomic status should be monitored.
- Birth weight alone is probably a poor indicator of optimum development [9,68] as it appears to be a predictor of fat-free mass rather than fat mass. Further investigations are therefore needed to establish the optimum minimum and maximum birth weights according to gestational age.
- Although adverse effects are associated with both high and low GWG, only one set of guidance (by the IoM) [97] exists on the amount of weight that should be gained during “normal” pregnancy, and none on how much an obese pregnant woman should gain/lose, especially according to obesity classification or within different ethnic populations. This warrants further investigation [217].
- Cost-effective measures with new technologies should be developed and the cost-effectiveness of training health care professionals demonstrated, in order to better support maternal nutritional health and to provide all neonates with a healthy start.
- Various communication delivery strategies should be explored for health workers dealing with adolescents, parents and potential parents.
- The major barriers to successful communication of health advice should be investigated, including popular myths, irresponsible media reporting or misleading marketing messages [212].
- Evidence should be built on the most useful methods to communicate and ensure knowledge transfer of national guidelines and recommendations on food-based dietary guidance, healthy dietary habits, and physical activity.
- Evidence should be gathered on the most useful methods to improve health literacy by, for example, improving cooking and shopping skills in order to enable people to make informed food choices.

12

Monitoring, surveillance and care pathways for maternal and infant nutritional health

12.1 The need for facts and agreed standards

Monitoring and surveillance systems should be optimized in order to be valid, reliable, standardized, coordinated, comparable at international and national levels, and tailored to specific needs of individual Member States. Collection and analysis of high-quality data disaggregated by socioeconomic status are fundamental to identify good practices and then to plan and monitor care pathways and policies. This may require coordination with the development of national standards and guidelines for professional practice.

A total of 36 out of 53 countries provide national recommendations for appropriate GWG. However, methods used for monitoring appear to vary both between and within Member States and only 10 countries reported that health care professionals are required to monitor routinely and record weight gain during pregnancy.

12.2 Suggestions for policy-advisers

- The existence of a national surveillance system that facilitates monitoring of maternal, newborn and infant nutritional health status should be ensured, using recommended indicators, disaggregated by socioeconomic status and other variables, and reported routinely.
- Monitoring systems should be tailored to address specific needs at national level.
- Monitoring methods should promote high-quality data, validity, reliability, and should be standardized in order to be comparable at international and national levels.
- National participation in international networks should be supported, with standard monitoring methodology and data collection [202].
- Support should be provided to establish an e-health system in order to ease data collection and data sharing between health care service providers and professionals responsible for routine monitoring.
- A national system for monitoring enforcement of the Code [152] should be established.

12.3 Suggestions for health care service providers and professionals

- National and subnational programs and mechanisms should be implemented to collect data on agreed indicators of maternal, newborn and infant nutritional health at routine patient check-ups, including

nutritional status data such as pre-pregnancy BMI and the degree of weight gain during pregnancy, as well as the extent to which women lose weight after pregnancy. Data on dietary habits and physical activity are also necessary.

- An e-health approach should be advocated, with shared access among health care professionals in order to ease communication and improve follow-up and monitoring of patients' needs (especially in relation to nutritional health).
- The development of monitoring components should be supported in the health professional guidelines and standards for managing nutrition during pregnancy and early childhood, including the principles of BFHI [166] and the Code [152].
- Standardized anthropometric measures of women of reproductive age should be recorded and monitored, in order to support and guide them in general policy advice.
- Professional associations should be encouraged to monitor accreditation of the professions to ensure that they comply with the principles of the BFHI [166] and the Code [152].

12.4 Suggestions for civil society (e.g. individuals, families, communities)

- Enforcement of the Code should be monitored and non-compliance reported [152], including inappropriate marketing of complementary foods.
- Health service implementation of patients' rights should be monitored.
- Monitoring of nutritional and health status should be supported by participating in and giving permission for data to be used within routine monitoring systems.
- An e-health approach should be advocated so that data can be shared among a range of different health care professionals.

12.5 Suggestions for researchers

- Current national surveillance and monitoring systems should be evaluated and suggestions provided to policy-makers as to how improvements could be made to achieve better cost-effectiveness.
- Information generated from routine monitoring and surveillance should be analysed to contribute to evaluation, guide policy improvements, and encourage sharing of good practices.
- Existing and core indicators should be tested and explored to prevent diet-related NCDs in women of reproductive age and their offspring; for example, by employing the NCD Global Monitoring Framework [218].
- How best to improve monitoring of national and subnational data for micronutrient deficiencies and other nutritional conditions should be investigated. This includes improved biomarkers and how they affect health and development.
- How best to monitor both low and high birth weights should be investigated, along with the existing national data.
- Ways to monitor GWG (both high and low) in normal weight and obese pregnant women should be investigated.
- Special provision should be made for monitoring the prevalence and trends in gestational glucose intolerance and GDM in order to alert policy-makers to any changes occurring at national level, bearing in mind the propensity of some ethnic groups to greater rates of GDM.
- Delayed cord clamping until at least one minute after birth (or after cessation of cord pulsation) can prevent iron deficiency in neonates [131,132]. How many maternity services carry out this practice should be investigated.

13

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14

Annexes

14.1 Annex 1. Undernutrition during pregnancy

The nutritional status of the fetus is dependent on the maternal-fetal interface and poor availability of substrates will impair its development [1]. Historical cohorts – mainly from the Dutch Hunger Winter and the Chinese and Leningrad famines – have during pregnancy shown associations between exposure to severe energy restriction and insulin resistance, glucose intolerance, hypertension, cardiovascular diseases (CVD) and obesity in the adult offspring [1–6]. These associations are supported by experimental studies in animal models [5]. Studies in developing countries demonstrate associations between chronic undernutrition (stunted linear growth) and impaired glucose metabolism with the development of type II diabetes mellitus (T2DM) [3]. The timing of nutritional deprivation appears to be important: it is suggested that early gestational exposure to famine promotes hypertension, whereas energy restriction in late gestation may promote adult adiposity and glucose intolerance or insulin resistance [1,4].

14.1.1 Energy restriction

Undernutrition in the first trimester results in small infants; undernutrition in the second trimester results in infants that are both small and thin; whereas undernutrition in later gestation is associated with small head circumference [7]. Studies in humans show moderate ($\leq 30\%$) reduction of food intake during pregnancy results in reduced birth weight, so-called catch-up growth and predisposition to obesity [2,8,9]. Animal studies suggest that an even more severe (50%) restriction results in endocrine and metabolic abnormalities with related low birth weight, reduced β -cell mass, insulin secretion and possibly insulin resistance in offspring [10]. Extreme food restriction (70%) is associated with intrauterine growth restriction, adult hyperphagia, hyperinsulinaemia, hypertension, hyperleptinaemia and obesity [7,11].

In obese pregnant women, gestational energy restriction may reduce the risk of metabolic programming of obesity in the offspring. However, concerns about possible detrimental effects have been expressed, such as: altering sensitivity to fetal growth hormones, insulin and insulin-like growth factor-1, and up-regulating the hypothalamo-pituitary-adrenal stress axis [12,13]. When exposed to gestational energy restriction, fetal brain growth is prioritized at the cost of other organs and tissue development [7]. Muscle and bone development may even be compromised in favour of adipose tissue and programming may become permanent during this critical window of development [7].

Animal studies suggest that a moderate ($\leq 30\%$) reduction of food intake during lactation results in a reduction of body weight and adipose tissue in offspring and this may protect infants against diet-induced overweight and obesity [14,15].

14.1.2 Protein restriction

Any imbalance of gestational macronutrient intake may alter metabolic programming [11,16]. Restriction of protein, the most widely studied form of gestational undernutrition, is thought to be key to the so-called developmental origin of health and disease [3,17,18]. Amino acids are vital as substrates for cellular proteins, hormones and other signalling molecules. Conversely, amino acids and their derivatives can, in high concentrations, act as pathogenic factors in oxidative stress and CVD [17].

Animal studies suggest that low-protein diets (5–8%) are associated with endocrine and metabolic abnormalities and intrauterine growth restriction [11,17]. The offspring demonstrate: impaired glucose tolerance and β -cell dysfunction – T2DM, hyperinsulinaemia, insulin resistance and hypertension [3,17,19] – and risk of possible impaired adult bone health [11,20].

14.2 Annex 2. Maternal micronutrient deficiency

There is a strong relation between preconception micronutrient status and the healthy development of pregnancy. The nutritional status of women of reproductive age is often inadequate [21,22]. In addition, periconceptual micronutrient status is thought to play a significant role in metabolic programming [4,20–25]. For example, the protective effect of prenatal micronutrient adequacy in promoting fetal growth and preventing mortality is established for iron-folic acid in combination with vitamin A [24–27].

Following the formulation of the United Nations Children's Fund (UNICEF)/WHO/United Nations University multiple micronutrient supplement for pregnant and lactating women (UNIMMAP), the results from randomized controlled trials suggest a positive effect on birth weight and small-for-gestational-age babies, compared with iron-folic acid alone [24,28] (see Table 14.1 for further details).

Table 14.1. Composition of iron-folic acid, UNIMMAP, and UNICEF/WHO daily supplements for pregnant and lactating women

NUTRIENT	FORM	IRON-FOLIC ACID AMOUNT	UNIMMAP AMOUNT	UNICEF/WHO AMOUNT
Vitamin A (μg)	Retinol	–	800	800
Vitamin D (μg)	Cholecalciferol	–	5	5
Vitamin E (mg)	Tocopherol	–	10	15
Vitamin C (mg)	Ascorbic acid	–	70	55
Thiamine (mg)	Thiamine HCL	–	1.4	1.4
Riboflavin (mg)	Riboflavin	–	1.4	1.4
Niacin (mg)	Nicotinamide	–	18	18
Vitamin B6 (mg)	Pyrodoxine	–	1.9	1.9
Vitamin B12 (μg)	Cyanocobalamine	–	2.6	2.6
Folic acid (μg)	–	400	400	600
Iron (mg)	Ferrous fumarate	60	30	27
Zinc (mg)	Zinc sulfate	–	15	10
Copper (mg)	Copper sulfate	–	2	1.15
Selenium (μg)	Sodium selenite	–	65	30
Iodine (μg)	Potassium iodide	–	150	250

Sources: Roberfroid et al. [24, p.917]; *Essential nutrition actions. Improving maternal, newborn, infant and young child health and nutrition* [29, p.46].

A WHO review [30] underlines the importance of a systematic evaluation of UNIMMAP's safety and effectiveness before routine prenatal supplementation is recommended, and results of one cross-sectional study suggest that nutritive compounds such as phytochemicals – not included in these supplements and found in fruits and vegetables – may account for some of the observed positive effects on birth weight [31]. In addition, longitudinal studies have not yet demonstrated whether supplementation of UNIMMAP translates into protective long-term health effects in offspring [24].

14.2.1 Vitamin A

Vitamin A is involved in various embryonic systems [21]. Deficiency in vitamins A and B6 negatively affects the structural integrity of the uterine arterial walls during implantation and early placental development. On the other hand, excess vitamin A intake is teratogenic in animals, and pregnant women are recommended not to take supplements of vitamin A [21].

14.2.2 Calcium

Low calcium intake during pregnancy may negatively influence bone mineral content in children and peak bone mass in early adulthood [11,32]. In addition, fetal calcium deficiency has been associated with low birth weight [33] and high blood pressure in adult offspring [7]. Moreover, evidence suggests that calcium supplementation during pregnancy offers some protection against gestational hypertension, pre-eclampsia and preterm birth [34,35].

14.2.3 Zinc

Zinc is a component of many proteins involved in normal metabolic functions and cellular replication, and plays a key role in the development of most tissues [36], especially in the central nervous system [37]. Moderate maternal zinc deficiency may influence fetal development through reduced cell proliferation and maturation, or protein synthesis [21,36]. Low plasma zinc is associated with risk of fetal malformations and low birth weight in the first and third trimesters, respectively [21]. However, results from zinc supplementation in later gestation showed no improvements in birth weight [37].

14.2.4 Iodine

Iodine deficiency disorders (IDDs) are the greatest cause of preventable brain damage. Within the WHO European Region, IDDs are endemic and without intake of rich dietary sources of iodine (seafood, milk) or universal salt iodization, the Region would soon see a return of goitre and cretinism. Iodine is also included in the UNIMMAP [24] and the UNICEF/WHO [25] micronutrient supplements for pregnant and lactating women. Iodine is critical for the thyroid gland and essential for brain development, growth and metabolism; pregnant and lactating women and their offspring are especially vulnerable [38–41] and low iodine intakes have been documented in women of reproductive age [40–45]. Pregnant women can therefore boost their iodine intake from dietary sources or, if necessary, iodine supplements should be prescribed (via iodized oil and not only universal salt iodization, owing to the risks related to high salt consumption and hypertension). Recent findings from the United Kingdom show that mothers who were iodine-deficient while pregnant, increased their child's risk of having a low verbal IQ and poor reading accuracy and comprehension by the time they were eight years of age [46]. It appears that the more iodine levels drop during pregnancy, the lower the child's performance in terms of IQ and reading ability.

14.2.5 Antioxidants

Antioxidants are suggested to positively influence embryonic development. The administration of antioxidants has been reported to reduce placental damage from oxidative stress, particularly in women with pre-eclampsia [21]. In addition, studies in rodents suggest that antioxidants seem to have a preventive effect on the development of adiposity in offspring of obese mothers or mothers with a high fat intake during pregnancy [47].

14.3 Annex 3. Observed relationship between obesity and micronutrient status in women by pregnancy status

MICRONUTRIENT	OBESE NON-PREGNANT WOMEN	OBESE PREGNANT WOMEN
Folate	<p>Some studies report significantly less folate consumption*</p> <p>An inverse relationship exists between folate intake and BMI</p> <p>Elevated BMI is associated with lower serum folate, controlling for folate intake</p> <p>Obese women may be at greater risk of folate deficiency*</p>	<p>In the latter half of pregnancy, serum folate concentrations are significantly lower in women with pre-pregnancy obesity*</p>
Antioxidants	<p>Obese women have a higher likelihood of selenium deficiency and marginal vitamin C status*</p> <p>The odds of low vitamin E, α- and β-carotene, and other carotenoids are greater among obese women*</p>	<p>BMI does not appear to be associated with mid-trimester ascorbic acid or retinol concentrations</p> <p>Ascorbic acid concentrations are significantly lower in women who subsequently deliver small-for-gestational-age infants, compared with those who deliver appropriate-for-gestational-age infants</p>
Vitamin D	<p>Obese women have lower serum 25(OH)D concentrations and are at higher risk of deficiency*</p>	<p>Pre-pregnancy BMI is associated with lower 25(OH)D concentrations and higher prevalence of vitamin D deficiency at <21 weeks of gestation</p> <p>Neonates of overweight and obese women are about twice as likely to be vitamin D deficient compared with those of lean women</p>
Trace minerals (iron, zinc)	<p>An inverse relationship may exist between adiposity and serum iron concentrations</p> <p>Adiposity predicts decreased iron absorption</p>	<p>Obesity may be associated with high haemoglobin and reduced prevalence of antepartum iron-deficiency anaemia</p> <p>Pre-pregnancy obesity predicts postpartum anaemia</p> <p>High pre-pregnancy BMI is correlated with lower plasma zinc concentrations early in pregnancy</p>
Calcium	<p>Higher calcium intake is associated with lower probability of adiposity</p> <p>Supplementation in women with low intake may result in decreased body weight and fat mass</p>	<p>The relationship between calcium and adiposity in pregnancy is unclear</p>

*Compared with non-obese women or those of normal weight.
Source: Bodnar & Parrott [48, p.200].

14.4 Annex 4. WHO European Region Member States and survey respondents

Albania	Croatia
Andorra	Cyprus
Armenia	Czech Republic
Austria	Denmark
Azerbaijan	Estonia
Belarus	Finland
Belgium	France
Bosnia and Herzegovina	Georgia
Bulgaria	Germany

Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxembourg
Malta
Monaco*
Montenegro
Netherlands
Norway
Poland
Portugal

Republic of Moldova
Romania
Russian Federation
San Marino*
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
The former Yugoslav Republic of Macedonia
Turkey
Turkmenistan
Ukraine
United Kingdom
Uzbekistan

**Signifies a non-respondent Member State. All other countries responded to the survey.*

14.5 Annex 5. Questionnaire: survey of national recommendations on nutrition, physical activity, and weight gain during pregnancy

14.5.1 Introduction

“Dear Participant,

Thank you for opening the link to this WHO Regional Office for Europe questionnaire.

According to an assessment of the quality of antenatal services of the WHO European Region, several countries request updated guidance. Therefore, we have developed this questionnaire in order to evaluate the existing guidance in your country and subsequently to improve our next guidance package.

The questionnaire is divided into seven sections and takes only 20 minutes to complete. It has a strong focus on the pregnancy and postpartum periods. The questions relate to maternal and early nutrition, physical activity before/during/after pregnancy, and weight gain during pregnancy.

Please take your time, as your contribution is crucial to the development of our upcoming guidance package.”

14.5.2 Section 1. Respondent information

Q1: Please select the name of your country

Select country: _____ (all 53 countries in a drop-down list)

Q2: What is your professional background?

- 1 General practitioner or family doctor
- 2 Paediatrician
- 3 Obstetrician
- 4 Midwife
- 5 Gynaecologist
- 6 Nurse
- 7 Dietician
- 8 Nutritionist
- 9 Community health care worker
- 10 Other, please specify: _____

14.5.3 Section 2. Nutrition for women during/after pregnancy

The following section will include questions on national nutrition and food-based dietary recommendations for pregnant women and those in the postpartum period.

Q3: Does your country have document(s) providing national recommendation(s) on nutrition and/or food-based dietary guidelines for...? (If "No information available", go to Question 16)

- 1 Women before pregnancy
- 2 Pregnant women
- 3 Women in the postpartum period
- 4 No information available
- 5 Other, please specify: _____

Please provide information about the document(s) (data sources): _____

Q4: Which bodies are responsible for the implementation of the national recommendation(s) on nutrition and/or the food-based dietary guidelines for women during/after pregnancy?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name(s) of the specific bodies: _____

Q5: Which bodies are responsible for the review of the national recommendation(s) on nutrition and/or food-based dietary guidelines for women during/after pregnancy?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name(s) of the specific bodies: _____

Please provide information on the national recommendation(s) on nutrition and/or food-based dietary guidelines for pregnant women.

Q6: Please select and briefly describe the specific food-based dietary guideline recommendation(s) for pregnant women, which are nationally available:

- 1 Calories, please specify: _____
- 2 Proteins, please specify: _____
- 3 Alcoholic beverages, please specify: _____
- 4 Calcium, please specify: _____
- 5 Folic acid, please specify: _____
- 6 Iron, please specify: _____
- 7 Iodine, please specify: _____
- 8 Vitamin A, please specify: _____
- 9 Vitamin B, please specify: _____
- 10 Vitamin D, please specify: _____
- 11 Zinc, please specify: _____
- 12 Other, please specify: _____
- 13 No information available

Q7: Please select who delivers the national recommendation(s) on nutrition and/or food-based dietary guidelines for pregnant women:

- 1 General practitioner or family doctor
- 2 Obstetrician
- 3 Midwife
- 4 Gynaecologist
- 5 Nurse
- 6 Dietician
- 7 Nutritionist
- 8 Community health care worker
- 9 Information only available online
- 10 Information only available via campaigns
- 11 Other, please specify: _____
- 12 No information available

Q8: Who receives training related to the national recommendation(s) on nutrition and/or food-based dietary guidelines for pregnant women?

- 1 General practitioner or family doctor
- 2 Obstetrician
- 3 Midwife
- 4 Gynaecologist
- 5 Nurse
- 6 Dietician
- 7 Nutritionist
- 8 Community health care worker
- 9 Other, please specify: _____
- 10 No information available

Q9: What kind of training for health professionals, related to the national recommendation(s) on nutrition and/or food-based dietary guidelines, does your country provide?

- 1 Pre-service (specific training BEFORE entering public health service or private practice)
- 2 In-service (specific training DURING the course of employment)
- 3 Both
- 4 No training provided
- 5 No information available

Please provide information on national recommendation(s) on nutrition and/or food-based dietary guidelines only for women in the postpartum period.

Q10: Please select and briefly describe the specific food-based dietary guideline recommendation(s) for women in the postpartum period, which are nationally available:

- 1 Calories, please specify: _____
- 2 Proteins, please specify: _____
- 3 Alcoholic beverages, please specify: _____
- 4 Calcium, please specify: _____
- 5 Folic acid, please specify: _____
- 6 Iron, please specify: _____
- 7 Iodine, please specify: _____
- 8 Vitamin A, please specify: _____
- 9 Vitamin B, please specify: _____
- 10 Vitamin D, please specify: _____
- 11 Zinc, please specify: _____
- 12 Other, please specify: _____
- 13 No information available

Q11: Please select who delivers the national recommendation(s) on nutrition and/or food-based dietary guidelines for women in the postpartum period:

- 1 General practitioner or family doctor
- 2 Obstetrician
- 3 Midwife
- 4 Gynaecologist
- 5 Nurse
- 6 Dietician
- 7 Nutritionist
- 8 Community health care worker
- 9 Information only available online
- 10 Information only available via campaigns
- 11 Other, please specify: _____
- 12 No information available

Q12: Who receives training related to the national recommendation(s) on nutrition and/or food-based dietary guidelines for women in the postpartum period?

- 1 General practitioner or family doctor
- 2 Obstetrician
- 3 Midwife
- 4 Gynaecologist
- 5 Nurse
- 6 Dietician
- 7 Nutritionist
- 8 Community health care worker
- 9 No information available
- 10 Other, please specify: _____

Q13: What kind of training for health professionals does your country provide in relation to the national recommendation(s) on nutrition and/or food-based dietary guidelines for pregnant and women in the postpartum period?

- 1 Pre-service (specific training BEFORE entering public health service or private practice)
- 2 In-service (specific training DURING the course of employment)
- 3 Both
- 4 No training provided
- 5 No information available

Please provide additional information on the national recommendation(s) on nutrition and/or food-based dietary guidelines for women before/during/after pregnancy.

Q14: Does specific information exist for special cases on national dietary recommendations?

- 1 Women in the preconception period
- 2 Pregnant women who are overweight/obese
- 3 Pregnant women who are underweight
- 4 Pregnant women who need a special diet (e.g. gestational diabetes, vegetarians)
- 5 None of these special cases receive one-to-one dietary counselling
- 6 No information available

Please provide further details, if necessary: _____

Q15: Do special cases receive one-to-one/face-to-face (several & follow-up) sessions of nutrition counselling?

- 1 Women in the preconception period
- 2 Pregnant women who are overweight/obese
- 3 Pregnant women who are underweight
- 4 Pregnant women who need a special diet (e.g. gestational diabetes, vegetarians)
- 5 None of these special cases receive one-to-one or face-to-face nutrition counselling
- 6 No information available

Please provide further details, if necessary: _____

14.5.4 Section 3. Appropriate weight gain during pregnancy

The following section will include questions on weight gain during pregnancy

Q16: Does your country have document(s) providing national recommendation(s) on appropriate weight gain during "normal" pregnancies? (If "No" or "No information available", go to Question 23)

- 1 Yes
- 2 No
- 3 No information available

If Yes, please provide information about the policy document(s) (data sources): _____

Q17: Which bodies are responsible for the development and/or implementation of the recommendation(s) on appropriate weight gain during "normal" pregnancies?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name(s) of the specific bodies: _____

Q18: Does your country provide gestational weight gain (GWG) recommendations according to pre-pregnancy body mass index (BMI) (e.g. BMI >25 or >30; or BMI <18.5) for singleton pregnancies?

- 1 Yes
- 2 No
- 3 No information available

If Yes, on which international GWG recommendations are the national recommendations based?

- 1 The United States Institute of Medicine (IoM) 1990
- 2 IoM 1990 with modification, please specify: _____
- 3 IoM 2009
- 4 IoM 2009 with modification, please specify: _____
- 5 Other GWG recommendations, please specify: _____

Q19: Do the GWG recommendations include specific guidance for each obese class I (BMI 30.0–34.9), II (BMI 35.0–39.9), and III (BMI ≥40.0)?

- 1 Yes
- 2 No
- 3 No information available

If Yes, please specify the recommendations according to class: _____

Q20: Do the GWG recommendations include cut-offs for BMI according to the WHO standards (underweight <18.5, normal 18.50–24.99, overweight ≥25, obese ≥30)?

- 1 Yes
- 2 No
- 3 No information available

If No, please specify the cut-offs in use: _____

Q21: Do the recommendations on GWG provide guidance on how often weight monitoring should be recorded during pregnancy?

- 1 Yes
- 2 No
- 3 No information available

If Yes, please briefly describe, according to the categories, how often weight monitoring during pregnancy takes place:

- 1 BMI <30, please specify when and how often: _____
- 2 BMI <30 and excessive gestational weight gain (EGWG), please specify when and how often: _____
- 3 BMI >30, please specify when and how often: _____
- 4 BMI >30 and EGWG, please specify when and how often: _____

Q22: Please select the health professionals who are responsible for recording weight gain and monitoring it during pregnancy:

- 1 General practitioner or family doctor
- 2 Obstetrician
- 3 Midwife
- 4 Gynaecologist
- 5 Nurse
- 6 Dietician
- 7 Nutritionist
- 8 Community health care worker
- 9 Other, please specify: _____
- 10 No information available

14.5.5 Section 4. Physical activity for women during/after pregnancy

The following section includes questions on physical activity for pregnant women and those in the postpartum period.

Q23: Does your country have document(s) providing national recommendation(s) on physical activity for women during/after pregnancy? (If "No" or "No information available", go to Question 30)

- 1 Yes
- 2 No
- 3 No information available

If Yes, please provide information about the policy document(s) (data sources): _____

Q24: Which bodies are responsible for the implementation of the national recommendation(s) on physical activity for women during/after pregnancy?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name(s) of the specific bodies: _____

Q25: Which bodies are responsible for the review of the national recommendation(s) on physical activity for women during/after pregnancy?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name of the specific bodies: _____

Q26: Please select whom the physical activity recommendation(s) are targeting:

- 1 Women before pregnancy
- 2 Women during pregnancy
- 3 Women during the postpartum period
- 4 Other, please specify: _____
- 5 No information available

Q27: Please briefly describe the recommendation(s) on physical activity, which are nationally available:

- 1 Women before pregnancy: _____
- 2 Women during pregnancy: _____
- 3 Women during the postpartum period: _____
- 4 Other, please specify: _____

Q28: Does specific information exist for special cases on physical activity recommendation(s)?

- 1 Women in the preconception period
- 2 Pregnant women who are overweight/obese
- 3 Pregnant women who are underweight
- 4 Pregnant women who suffer from pregnancy-related complications (e.g. gestational diabetes)
- 5 None of these special cases receive one-to-one counselling on physical activity recommendations
- 6 No information available

Please provide further details, if necessary: _____

Q29: Do special cases receive one-to-one/face-to-face (several & follow-up) sessions of physical activity counselling?

- 1 Women in the preconception period
- 2 Pregnant women who are overweight/obese
- 3 Pregnant women who are underweight
- 4 Pregnant women who suffer from pregnancy-related complications (e.g. gestational diabetes)
- 5 None of these special cases receive one-to-one or face-to-face physical activity counselling
- 6 No information available

Please provide further details, if necessary: _____

14.5.6 Section 5. Newborn, infant and young child nutrition

The following section includes questions about national recommendations for newborn, infant and young child nutrition.

Q30: Does your country have document(s) providing national recommendations for newborn, infant and young child nutrition? (If 'No' or 'No information available': go to Question 40)

- 1 Yes
- 2 No
- 3 No information available

If Yes, please provide information about the policy document(s) (data sources): _____

Q31: Which bodies are responsible for the implementation of the national recommendations for newborn, infant and young child nutrition?

- 1 Governmental
- 2 Professional
- 3 Both, governmental and professional
- 4 No information available

Please provide details, including the name(s) of the specific bodies: _____

Q32: Do the document(s) for newborn, infant and young child nutrition include practical information related to prevention of ...?

Obesity

- 1 Yes
- 2 No

Undernutrition

- 1 Yes
- 2 No

Q33: Please select the national recommendations for newborn, infant and young child nutrition, which are nationally available:

- 1 Early initiation of breastfeeding within one hour of birth
- 2 Breastfeeding "on demand" during the stay in maternity care services
- 3 Breastfeeding "on demand" at home
- 4 Exclusive breastfeeding for 3 months
- 5 Exclusive breastfeeding for 6 months
- 6 Continued breastfeeding at 1 year
- 7 Continued breastfeeding at 2 years or more
- 8 Introduction of complimentary foods at 6 months
- 9 Other, please specify: _____
- 10 No information available

Q34: Which of the following programmes support the national recommendations for newborn, infant and young child nutrition?

- 1 Counselling and support at facility and community levels, e.g. Integrated Management of Childhood Illness (IMCI) and Community Integrated Management of Childhood Illness (CIMCI).
- 2 Baby-friendly Hospital Initiatives (BFHIs)
- 3 Other, please specify: _____

Q35: Is the International Code of Marketing of Breast-milk Substitutes incorporated into national legislation?

- 1 Yes, completely
- 2 Yes, partially. Please specify which parts: _____
- 3 No
- 4 No information available

Q36: Please briefly describe the specific levels of micronutrients recommended nationally for infant and young child health (6–23 months):

- 1 Iron, please specify: _____
- 2 Iodine, please specify: _____
- 3 Vitamin A, please specify: _____
- 4 Vitamin D, please specify: _____
- 5 Zinc, please specify: _____
- 6 Other, please specify: _____

Q37: Please select who “normally” is expected to provide mothers with national recommendations for newborn, infant and young child nutrition:

- 1 General practitioner or family doctor
- 2 Paediatrician
- 3 Obstetrician
- 4 Midwife
- 5 Gynaecologist
- 6 Nurse
- 7 Dietician
- 8 Nutritionist
- 9 Community health care worker
- 10 Information only available online
- 11 Information only available via campaigns
- 12 Other, please specify: _____
- 13 No information available

Q38: Who receives training related to the national recommendations for newborn, infant and young child nutrition?

- 1 General practitioner or family doctor
- 2 Paediatrician
- 3 Obstetrician
- 4 Midwife
- 5 Gynaecologist
- 6 Nurse
- 7 Dietician
- 8 Nutritionist
- 9 Community health care worker
- 10 Other, please specify: _____
- 11 No information available

Q39: What kind of training does your country provide for health professionals in relation to the national recommendations for newborn, infant and young child nutrition?

- 1 Pre-service (specific training BEFORE entering public health service or private practice)
- 2 In-service (specific training DURING the course of employment)
- 3 Both
- 4 No training provided
- 5 No information available

Please provide information on maternity and parental protection.

Q40: Is paid maternity leave implemented according to the law?

- 1 Yes
- 2 No
- 3 No information available

If Yes:

- 1 Maternity leave is fully paid. Please specify number of weeks: _____
- 2 Maternity leave is partially paid. Please specify number of weeks: _____
- 3 The father is also entitled to fully paid parental leave. Please specify number of weeks: _____
- 4 The father is also entitled to partially paid parental leave. Please specify number of weeks: _____
- 5 Other, please specify: _____

If the father is also entitled to parental leave, can the mother and the father use parental leave simultaneously?

- 1 Yes
- 2 No
- 3 No information available

Q41: Is voluntary unpaid maternity leave possible?

- 1 Yes
- 2 No
- 3 No information available

If Yes, please specify the length of voluntary unpaid maternity leave (in weeks): _____

14.5.7 Section 6. Appropriate maternal and child health care services for obesity and diet-related issues

The following section includes questions about maternal and child health care services for obesity and diet-related issues.

Q42: Does your country provide national recommendation(s) on appropriate maternal and child health care services for obesity and diet-related issues? (If "No" or "No information available", go to Question 44)

- 1 Yes
- 2 No
- 3 No information available

If Yes, please provide information about the services (data sources): _____

Q43: Which services are part of routine primary health care (as opposed to specific "projects" or "interventions" that may be tested throughout the country)?

- 1 Preconception obesity prevention (e.g. nutrition advice, physical activity)
- 2 Counselling against EGWG in order to prevent obesity
- 3 Counselling against poor weight gain during pregnancy in order to ensure healthy fetal development
- 4 Postpartum obesity prevention
- 5 No information available

14.5.8 Section 7. Future plans and policies

The following section includes questions about national future plans and policies, such as areas in which more national guidance is needed to support health professionals involved with maternal and child health care services.

Q44: Please specify in which area(s) and what kind of guidance is needed:

- 1 Appropriate food-based dietary guidance for women in the pre-pregnancy period: _____
- 2 Appropriate food-based dietary guidance for women during pregnancy: _____
- 3 Appropriate food-based dietary guidance for the postpartum period: _____
- 4 Appropriate physical activity for women during pregnancy: _____
- 5 Appropriate "normal" weight gain during pregnancy: _____
- 6 Appropriate "normal" weight gain during pregnancy for those with BMI >25: _____
- 7 Maternal undernutrition: _____
- 8 Appropriate recommendations for newborn, infant and young child nutrition: _____
- 9 Other, please specify: _____
- 10 No further guidance is needed: _____

Q45: All national guidelines exist but implementation could be improved. Please specify where and how implementation of national guidelines could be improved:

- 1 Appropriate food-based dietary guidance for women in the pre-pregnancy period: _____
- 2 Appropriate food-based dietary guidance for women during pregnancy: _____
- 3 Appropriate food-based dietary guidance for the postpartum period: _____
- 4 Appropriate physical activity for women during pregnancy: _____
- 5 Appropriate "normal" weight gain during pregnancy: _____
- 6 Appropriate "normal" weight gain during pregnancy for those with BMI >25: _____

- 7 Maternal undernutrition: _____
- 8 Appropriate recommendations for newborn, infant and young child nutrition: _____
- 9 Other, please specify: _____
- 10 Implementation works very well nationally (state how and by whom): _____

Q46: What resources are needed in order to better follow up and keep track of patients?

- 1 No need, the current system is sufficient. Please briefly describe the current system: _____

- 2 Electronic filing system
- 3 Electronic filing system with shared access among health professionals
- 4 Other e-health approaches, please specify: _____
- 5 Other, please specify: _____

Please include your suggestions for the updated guidance, which have not been covered by the questions above: _____

END

Thank you for your collaboration. Your response is very important to us.

14.6 Annex 6. A selection of summarized results from various countries of the Region

Q#3: Does your country have document(s) providing national recommendation(s) on nutrition and/or food-based dietary guidelines for...?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women before pregnancy	29	54.72
Pregnant women	41	77.36
Postpartum women	33	62.26
Other	0	0.00
No information available	11	20.75

Q#4: Which bodies are responsible for the implementation of the national recommendation(s) on nutrition and/or the food-based dietary guidelines for women during/after pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	10	18.87
Professional	5	9.43
Both, governmental and professional	24	45.28
No information available	14	26.42

Q#5: Which bodies are responsible for the review of the national recommendation(s) on nutrition and/or food-based dietary guidelines for women during/after pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	11	20.75
Professional	5	9.43
Both, governmental and professional	22	41.51
No information available	15	28.30

Q#6: Please select and briefly describe the specific food-based dietary guideline recommendation(s) for pregnant women, which are nationally available

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Calories	28	52.83
Proteins	29	54.72
Alcoholic beverages	27	50.94
Calcium	32	60.38
Folic acid	39	73.58
Iron	31	58.49
Iodine	28	52.83
Vitamin A	25	47.17
Vitamin B	24	45.28
Vitamin D	31	58.49
Zinc	20	37.74
Other	19	35.85
No information available	15	28.30

Q#7: Please select who delivers the national recommendation(s) on nutrition and/or the food-based dietary guidelines for pregnant women

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	29	54.72
Obstetrician/Gynaecologist	29	54.72
Midwife	32	60.38
Nurse	20	37.74
Dietician/Nutritionist	14	26.42
Community health care worker	13	24.53
Information only available online	4	7.55
Information only available via campaigns	2	3.77
Other	14	26.42
No information available	13	24.53

Q#8: Who receives training related to the national recommendation(s) on nutrition and/or the food-based dietary guidelines for pregnant women?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	18	33.96
Obstetrician/Gynaecologist	22	41.51
Midwife	25	47.17
Nurse	15	28.30
Dietician/Nutritionist	14	26.42
Community health care worker	14	26.42
Other	12	22.64
No information available	19	35.85

Q#9: What kind of training for health professionals related to the national recommendation(s) on nutrition and/or the food-based dietary guidelines does your country provide?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Pre-service (specific training BEFORE entering public health service or private practice)	3	5.66
In-service (specific training DURING the course of employment)	6	11.32
Both	17	32.08
No training provided	11	20.75
No information available	16	30.19

Q#10: Please select and briefly describe the specific food-based dietary guideline recommendation(s) for postpartum women, which are nationally available

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Calories	18	33.96
Proteins	19	35.85
Alcoholic beverages	19	35.85
Calcium	23	43.40
Folic acid	21	39.62
Iron	21	39.62
Iodine	19	35.85
Vitamin A	18	33.96
Vitamin B	18	33.96
Vitamin D	21	39.62
Zinc	16	30.19
Other	15	28.30
No information available	23	43.40

Q#11: Please select who delivers the national recommendation(s) on nutrition and/or the food-based dietary guidelines for postpartum women

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	20	37.74
Obstetrician/Gynaecologist	21	39.62
Midwife	26	49.06
Nurse	20	37.74
Dietician/Nutritionist	11	20.75
Community health care worker	14	26.42
Information only available online	4	7.55
Information only available via campaigns	4	7.55
Other	9	16.98
No information available	19	35.85

Q#12: Who receives training related to the national recommendation(s) on nutrition and/or the food-based dietary guidelines for postpartum women?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	15	28.30
Obstetrician/Gynaecologist	18	33.96
Midwife	20	37.74
Nurse	18	33.96
Dietician/Nutritionist	13	24.53
Community health care worker	10	18.87
Other	10	18.87
No information available	22	41.51

Q#13: What kind of training for health professionals does your country provide in relation to the national recommendation(s) on nutrition and/or the food-based dietary guidelines for pregnant and women in the postpartum period?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Pre-service (specific training BEFORE entering public health service or private practice)	0	0.00
In-service (specific training DURING the course of employment)	6	11.32
Both	19	35.85
No training provided	5	9.43
No information available	23	43.40

Q#14: Does specific information exist for special cases on national dietary recommendations?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women in the preconception period	16	30.19
Pregnant women who are overweight/obese	19	35.85
Pregnant women who are underweight	12	22.64
Pregnant women who need a special diet (e.g, gestational diabetes, vegetarians)	20	37.74
None of these special cases receive one-to-one dietary counselling	6	11.32
No information available	24	45.28

Q#15: Do special cases receive one-to-one/face-to-face (several & follow-up) sessions of nutrition counselling?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women in the preconception period	13	24.53
Pregnant women who are overweight/obese	21	39.62
Pregnant women who are underweight	18	33.96
Pregnant women who need a special diet (e.g. gestational diabetes, vegetarians)	24	45.28
None of these special cases receive one-to-one or face-to-face nutrition counselling	6	11.32
No information available	23	43.40

Q#16: Does your country have document(s) providing national recommendation(s) of involving appropriate weight gain during "normal" pregnancies?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	36	67.92
No	12	22.64
No information available	5	9.43

Q#17: Which bodies are responsible for the development and/or implementation of the recommendation(s) on appropriate weight gain during "normal" pregnancies?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	9	16.98
Professional	7	13.21
Both, governmental and professional	17	32.08
No information available	20	37.74

Q#18: Does your country provide gestational weight gain (GWG) recommendations according to pre-pregnancy body mass index (BMI) (e.g. BMI >25 or >30; or BMI < 18.5) for singleton pregnancies?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	24	45.28
No	6	11.32
No information	23	43.40

If Yes, on which international GWG recommendations are the national recommendations based?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
The United States Institute of Medicine IoM 1990	1	1.89
IoM 1990 with modifications	0	0.00
IoM 2009	9	16.98
IoM 2009 with modifications	4	7.55
Other GWG recommendations	13	24.53

Q#19: Do the GWG recommendations include specific guidance for each obese class I (BMI 30.0–34.9), II (BMI 35.0–39.9), and III (BMI ≥40.0)?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	3	5.66
No	23	43.40
No information available	27	50.94

Q#20: Do the GWG recommendations include cut-offs for BMI according to the WHO standards (underweight <18.5, normal 18.50–24.99, overweight ≥25, obese ≥30)?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	21	39.62
No	6	11.32
No information available	26	49.06

Q#21: Do the recommendations on GWG provide guidance on how often weight monitoring should be recorded during pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	10	18.87
No	18	33.96
No information available	25	47.17

Q#22: Please select the health professionals who are responsible for recording weight gain and monitoring it during pregnancy

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	21	39.62
Obstetrician/Gynaecologist	27	50.94
Midwife	27	50.94
Nurse	12	22.64
Dietician/Nutritionist	6	11.32
Community health care worker	3	5.66
Other	4	7.55
No information available	17	32.08

Q#23: Does your country have document(s) providing national recommendation(s) on physical activity for women during/after pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	19	35.85
No	22	41.51
No information available	12	22.64

Q#24: Which bodies are responsible for the implementation of the national recommendation(s) on physical activity for women during/after pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	4	7.55
Professional	1	1.89
Both, governmental and professional	14	26.42
No information available	34	64.15

Q#25: Which bodies are responsible for the review of the national recommendation(s) on physical activity for women during/after pregnancy?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	6	11.32
Professional	1	1.89
Both, governmental and professional	12	22.64
No information available	34	64.15

Q#26: Please select whom the physical activity recommendation(s) are targeting

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women before pregnancy	13	24.53
Women during pregnancy	18	33.96
Women during the postpartum period	13	24.53
Other	0	0.00
No information available	34	64.15

Q#28: Does specific information exist for special cases on physical activity recommendation(s)?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women in the preconception period	3	5.66
Pregnant women who are overweight/obese	7	13.21
Pregnant women who are underweight	4	7.55
Pregnant women who suffer from pregnancy-related complications (e.g. gestational diabetes)	5	9.43
None of these special cases receive one-to-one counselling on physical activity recommendations	3	5.66
No information available	41	77.36

Q#29: Do special cases receive one-to-one/face-to-face (several & follow-up) sessions of physical activity counselling?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Women in the preconception period	6	11.32
Pregnant women who are overweight/obese	10	18.87
Pregnant women who are underweight	9	16.98
Pregnant women who suffer from pregnancy-related complications (e.g. gestational diabetes)	10	18.87
None of these special cases receive one-to-one or face-to-face physical activity counselling	3	5.66
No information available	40	75.47

Q#30: Does your country have document(s) providing national recommendations for newborn, infant and young child nutrition?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	42	79.25
No	3	5.66
No information available	8	15.09

Q#31: Which bodies are responsible for the implementation of the national recommendations for newborn, infant and young child nutrition?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Governmental	5	9.43
Professional	1	1.89
Both, governmental and professional	35	66.04
No information available	12	22.64

Q#32: Do the document(s) for newborn, infant and young child nutrition include practical information related to prevention of ...?

		NUMBER OF COUNTRIES	PERCENTAGE (%)
Obesity	Yes	29	54.72
	No	12	22.64
Undernutrition	Yes	31	58.49
	No	14	26.42

Q#33: Please select the national recommendations for newborn, infant and young child nutrition, which are nationally available

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Early initiation of breastfeeding within one hour of birth	40	75.47
Breastfeeding "on demand" during the stay in maternity care services	40	75.47
Breastfeeding "on demand" at home	39	73.58
Exclusive breastfeeding for 3 months	15	28.30
Exclusive breastfeeding for 6 months	38	71.70
Continued breastfeeding at 1 year	19	35.85
Continued breastfeeding at 2 years or more	21	39.62
Introduction of complimentary foods at 6 months	35	66.04
Other	6	11.32
No information available	10	18.87

Q#34: Which of the following programmes support the national recommendations for newborn, infant and young child nutrition?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Counselling and support at facility and community levels, e.g. the Integrated Management of Childhood Illness (IMCI) and Community Integrated Management of Childhood Illness (CIMCI)	20	37.74
Baby-friendly Hospital Initiatives (BFHIs)	37	69.81
Other	8	15.09
No information available	13	24.53

Q#35: Is the International Code of Marketing of Breast-milk Substitutes incorporated into national legislation?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes, completely	19	35.85
Yes, only partially	14	26.42
No	6	11.32
No information available	14	26.42

Q#37: Please select who "normally" is expected to provide mothers with national recommendations for newborn, infant and young child nutrition

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	25	47.17
Paediatrician	34	64.15
Obstetrician/Gynaecologist	9	16.98
Midwife	22	41.51
Nurse	28	52.83
Dietician/Nutritionist	8	15.09
Community health care worker	11	20.75
Information only available online	1	1.89
Information only available via campaigns	0	0.00
Other	7	13.21
No information available	12	22.64

Q#38: Who receives training related to the national recommendations for newborn, infant and young child nutrition?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
General practitioner or family doctor	25	47.17
Paediatrician	32	60.38
Obstetrician/Gynaecologist	11	20.75
Midwife	20	37.74
Nurse	26	49.06
Dietician/Nutritionist	12	22.64
Community health care worker	10	18.87
Other	6	11.32
No information available	17	32.08

Q#39: What kind of training does your country provide for health professionals in relation to the national recommendations for newborn, infants and young child nutrition?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Pre-service (specific training BEFORE entering public health service or private practice)	3	5.66
In-service (specific training DURING the course of employment)	7	13.21
Both	28	52.83
No training provided	3	5.66
No information available	12	22.64

Q#40: Is paid maternity leave implemented according to the law?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	48	90.57
No	0	0.00
No information available	5	9.43

If Yes:

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Maternity leave is fully paid	41	77.36
Maternity leave is partially paid	19	35.85
The father is also entitled to fully paid parental leave	21	39.62
The father is also entitled to partially paid parental leave	15	28.30
Other	12	22.64

If the father is also entitled to parental leave, can the mother and the father use parental leave simultaneously?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	13	24.53
No	13	24.53
No information available	27	50.94

Q#41: Is voluntary unpaid maternity leave possible?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	35	66.04
No	8	15.09
No information available	10	18.87

Q#42: Does your country have document(s) providing national recommendation(s) on appropriate maternal and child health care services for obesity and diet-related issues?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Yes	23	43.40
No	18	33.96
No information available	13	24.53

Q#43: Which services are part of routine primary health care (as opposed to specific “projects” or “interventions” that may be tested throughout the country)?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Preconception obesity prevention (e.g. nutrition advice, physical activity)	22	41.51
Counselling against EGWG in order to prevent obesity	29	54.72
Counselling against poor weight gain during pregnancy in order to ensure healthy fetal development	26	49.06
Postpartum obesity prevention	19	35.85
No information available	22	41.51

Q#44: Please specify in which area(s) and what kind of guidance is needed

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Appropriate food-based dietary guidance for women in the pre-pregnancy period	33	62.00
Appropriate food-based dietary guidance for women during pregnancy	34	64.00
Appropriate food-based dietary guidance for the postpartum period	33	62.00
Appropriate physical activity for women during pregnancy	36	68.00
Appropriate “normal” weight gain during pregnancy	32	60.00
Appropriate “normal” weight gain during pregnancy for those with BMI >25	33	62.00
Maternal undernutrition	31	58.00
Appropriate recommendations for newborn, infant and young child nutrition	27	51.00
Other	3	6.00
No implementation works very well nationally	4	8.00

Q#45: All national guidelines exist but implementation could be improved. Please specify where and how implementation of national guidelines could be improved

	NUMBER OF COUNTRIES	PERCENTAGE (%)
Appropriate food-based dietary guidance for women in the pre-pregnancy period	28	53.00
Appropriate food-based dietary guidance for women during pregnancy	40	75.00
Appropriate food-based dietary guidance for the postpartum period	30	57.00
Appropriate physical activity for women during pregnancy	33	62.00
Appropriate “normal” weight gain during pregnancy	29	55.00
Appropriate “normal” weight gain during pregnancy for those with BMI >25	28	53.00
Maternal undernutrition	25	47.00
Appropriate recommendations for newborn, infant and young child nutrition	31	58.00
Other	2	4.00
No further guidance is needed	5	9.00

Q#46: What resources are needed in order to better follow up and keep track of patients?

	NUMBER OF COUNTRIES	PERCENTAGE (%)
No need, the current system is sufficient	3	5.66
Electronic filing system	0	0.00
Electronic filing system with shared access among health professionals	48	90.57
Other e-health approaches	0	0.00
Other	0	0.00

14.7 Annex 7. References

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