

Report on the

**Regional consultation towards the  
development of a strategy for optimizing fetal  
growth and development**

Cairo, Egypt  
5–7 December 2005



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## 1. INTRODUCTION

A regional technical consultation towards the development of a strategy for optimizing fetal growth and development was organized in Cairo, Egypt, 5–7 March 2005. The objectives of the meeting were to:

- inform representatives of Member States about the draft integrated strategy to promote optimal fetal development;
- conduct a technical discussion on the purpose, direction and content of the draft strategy;
- obtain guidance on the subsequent implementation of the draft strategy.

Dr Ramez Mahaini, WHO Coordinator for Family and Child Health, Health Protection and Promotion, delivered the opening address of Dr Hussein Gezairy, the Regional Director for the Eastern Mediterranean Region, to participants. In his message, Dr Gezairy extended a warm welcome to all experts from the Region attending the consultation and expressed his appreciation to colleagues from the Department of Nutrition for Health and Development and the Department of Reproductive Health and Research at WHO headquarters for their support and assistance.

In his message, Dr Gezairy stated that the current focus on low birth weight as an indicator and neonatal rates as outcomes of fetal development was limiting. He noted that it excluded consideration of a range of important contributory factors of fetal development and other aspects of early life that are important once survival is secured. Furthermore, he stated that it disregarded the effects of adverse influences or beneficial interventions on aspects of maternal health and well-being, artificially separating maternal and child health.

Dr Gezairy referred to the fact that much of the qualitative information that was available to assess the magnitude of the problem relied on measurements of birth weight in populations. Low birth weight as an indicator of suboptimal fetal development is mostly prevalent in developing countries, and is estimated at around 17%. Low birth weight may arise because of premature delivery or impaired fetal growth, or both. Dr Gezairy noted that prematurity as a cause of low birth weight was a major determinant of early mortality, morbidity and adverse long-term health outcomes, incurred substantial costs to the health sector and represented a significant burden on society.

The causes of suboptimal fetal growth were listed as numerous. They included genetic factors, maternal characteristics, such as nutrition, lifestyle including smoking, age and disease; complications of pregnancy; and the physical, social and economic environment. Dr Gezairy pointed to the fact that addressing all these issues required a comprehensive strategy and guidance on global strategic directions promoting optimal fetal growth and development.

He reminded participants that WHO's initiative for optimizing fetal growth and development commenced with an initial meeting of experts in 2002, and a second meeting in 2003. While the initial discussion had focused on developing a strategy for reducing the incidence of low birth weight, it had subsequently been realized that a major shift in

understanding had occurred and that efforts should in future be diverted to optimizing fetal development which encompassed a more holistic approach.

Experts had noted that the burden of death and disability as a result of impaired fetal development was high, particularly in developing countries, but was also a source of concern in developed countries. Optimal fetal development required the potential mother to be in an optimal state of physical and emotional health prior to and during pregnancy. Sufficient information existed to support the view that maternal nutritional status at conception, and other factors that determined maternal health at conception, during pregnancy, childbirth and at the stage of postnatal care are key determinants of the outcome of pregnancy.

A global strategy was needed to ensure that optimal fetal development would influence a plethora of outcomes throughout the life-cycle, including improved school performance and skills, improved health in infancy, childhood and adolescence; improved health for the next generation of mothers and their fetuses; improved health in adult life; increased productivity and economic gains and a lower burden of disease at all points in the life-cycle.

Dr Gezairy said it was his firm belief that the objectives of the meeting would be achieved with all clarity and thoroughness given the presence of so many technical experts, and he wished the participants a successful consultation.

Dr Hamid Rushwan was elected Chair. The programme and list of participants are included as Annexes 1 and 2 respectively. Annex 3 includes the table 'Determinants of suboptimal fetal growth development and possible interventions' which was used during the group work.

## **2. TECHNICAL PRESENTATIONS**

### **2.1 Opening comments**

*Dr Denise Coitinho, Director, Nutrition for Health and Development, WHO-HQ*

The importance of optimizing fetal development is imperative for good health in the early years of life and throughout the life-cycle into adulthood. A comprehensive framework, the *Integrated strategy to promote optimal fetal development*, has been prepared which highlights interventions to optimize fetal development. This consultation has been organized to discuss the framework in the context of the Eastern Mediterranean Region.

It is necessary to look at existing initiatives which can be used as components of the new strategy, such as such as Roll Back Malaria, Child and Adolescent Health, the Tobacco Free Initiative, etc. to promote optimal fetal growth and development. It is important to build on these initiatives which have been endorsed and which are already in place rather than to create a new vertical strategy. It is necessary to now address the implementation of this framework and identify the gaps. The momentum has to be maintained in global efforts to promote optimal fetal development and to sensitize policy- and decision-makers to the magnitude of the problem and the costs to society.

The technical presentations which follow are devoted to an introduction of the concept of optimal fetal development; the history and process through which the draft strategy on optimal fetal development has evolved; and to regional and country level presentations on aspects of optimal fetal development.

### **2.2 Optimal fetal development**

*Dr Alan Jackson, Short-term Consultant, WHO-HQ*

There have been many changes in the world: demographic, epidemiological, nutritional, social and economic, which have impacted on patterns of disease. As societies have improved the quality of health care, the increasing cost of curative care has led to a shift in focus in which preventative care has become increasingly important in terms of better health outcomes and greater cost-effectiveness. Part of the problem in reproductive and child health has been the classical focus of the medical profession on the separate stages of pregnancy, infancy and childhood with health professionals focusing on curative care and not having been well trained to deal with preventative care.

A number of factors impact on maternal morbidity and mortality, including infection, metabolic disease and behavioural and social stressors. It is important to look at how the preparation for pregnancy relates to the growth and development of the fetus. The best marker of the growth and development of the fetus is birth weight, and although it is not ideal, birth weight does predict potential outcomes in neonatal, infant and childhood health, and in adult health, and in terms of chronic disease.

Birth weight has been a valuable marker for measuring fetal development but it is not sufficient in itself; low birth weight is a statement of weight at birth, but pregnancy is a process over time. Low birth weight may represent a shorter-than-term pregnancy or a fetus not grown sufficiently well for the duration of the pregnancy. The new strategic direction towards the promotion of optimal fetal development presents an exceptional and unique opportunity for engaging a wider group of health professionals in reproductive health and pregnancy outcomes.

Impaired fetal development is known to be associated with increased rates of coronary heart disease, stroke, hypertension and non-insulin dependent diabetes. These associations have been extensively replicated in studies in different countries and are not the result of confounding variables. They extend across the normal range of birth weight and depend on lower birth weights in relation to the duration of gestation rather than the effects of premature birth. The associations are thought to be consequences of developmental plasticity, the phenomenon by which one genotype can give rise to a range of different physiological or morphological states in response to different environmental conditions during development. Recent observations have shown that impaired growth in infancy and rapid childhood weight gain exacerbate the effects of impaired prenatal growth.

Coronary heart disease and the disorders related to it arise through a series of interactions between environmental influences and the pathways of development that preceded them. These diseases are the product of branching pathways of development in which the branchings are triggered by the environment before and after birth. A new vision of optimal early human development is emerging which takes account of both short and long-term outcomes. Maternal influences, including body composition and dietary balance, can have long-term effects without necessarily affecting size at birth. Long-term patterns of hormone release and their metabolic effects may be influenced by periods of modified nutrition at critical times during early development, and may be marked by differences in birth size. Such changes have long-lasting effects on form, function and health in later life.

Early nutritional exposure can affect the structure and function of different systems in the body, including mental function and development, stature and mass affecting work capacity, and carbohydrate metabolism, fat metabolism and blood pressure causing obesity, diabetes, hypertension, heart disease and cancer. Dietary manipulation is important but not necessary causal. Evidence from animal studies shows that modest dietary manipulation during pregnancy leads to reproducible change in a wide range of functions.

There is a strong positive association between maternal pre-pregnancy nutritional status in particular and the ability of a mother to nourish her growing foetus, mostly through defining rates of fetal growth. Nutritional interventions during pregnancy appear to be able to modify this association by altering the rate of fetal growth, although the extent of the modification is dependent on maternal baseline nutritional status, and is usually modest in terms of birth weight. Problems in understanding the reason for this limited impact of dietary modifications during pregnancy include the, as of yet incomplete, unravelling of the causal pathway between maternal nutrition (whether cumulative or dietary) and fetal nutrition, and our limited knowledge of the effect of peri-conceptual nutrition on later fetal growth.

It appears that the determinants of fetal growth are largely established prior to pregnancy, either in the immediate peri-conceptional period and/or during the life course development of the mother (including her own intrauterine development). Recent evidence also suggests that peri-conceptional under-nutrition may be important in setting the length of gestation. Most trials to date have been on post-conception interventions, and focused on single micronutrients, when in reality it is multi-nutrient and macronutrient imbalances that are prevalent in the majority of under-nourished women.

Globally, the burden of low birth weight remains high, with the greatest contribution from developing countries, where the main cause of low birth weight at delivery is reduced growth rate in the uterus. Addressing this problem in the long term may have more to do with improving the nutritional status and food availability to women throughout their life course, rather than short-term pregnancy interventions. Although focusing only on nutritional solutions ignores the social and cultural context in which maternal dietary deficiencies have arisen including the coexisting problems, such as poverty and infection, which allow them to proliferate.

A woman can bring three different states to pregnancy: well nourished with adequate reserves in order to meet the demands of the pregnancy; undernourished with dietary dependence making up the deficit, i.e. the woman must know what she needs at each stage of her pregnancy; and overnourished with nutrient partitioning controlling access to endogenous reserves. Demands differ with each stage of pregnancy. To meet the demands a woman prepares for pregnancy by having adequate reserves. Pregnancy creates additional demands on the mother, and if the mother has a poor nutritional status at the start of her pregnancy then she is at high risk of experiencing vulnerability to concurrent availability of food and suffering impaired ability to cope with the uneven demand over time.

The metabolic capability of the mother is particularly important (what she brings to the pregnancy). If her nutritional status at conception is poor, she will experience an ongoing poor status. This raises particular issues for adolescent pregnancy as the mother herself is still developing and this means that there will be competition between the needs of the fetus and the needs of the mother. Infection also can result in increased losses, decreased nutrient transport and delivery to tissues and decreased appetite.

Demands on the body are created by a range of factors including age, gender and physiological state, and stressors can be biological, behavioural or social. The overall problem is that reproductive health is less than optimal for mother and offspring and there is a nutritional component which is potentially amenable to effective intervention. The consequences of nutritional interventions may be related to nutritional considerations alone, or by operating through or interacting with other stressors, such as obesity, infection, behaviour and social factors.

### 2.3 Overview of global fetal development and growth

*Dr Sultana Khanum, Medical Officer, Nutrition for Human Development, WHO-HQ*

WHO's definition of low birth weight is < 2500 g. Birth weight is determined by the duration of gestation and the rate of fetal growth. Low birth weight can arise either as a result of a baby being born too soon, i.e. born at less than 37 weeks, which is known as preterm birth, or can be born too small for gestational age or is small as a result of intrauterine growth restriction.

Low birth weight is a public health problem in most developing countries, in which 16% of births result in low-birth-weight babies. The figure for low-birth-weight babies in developed countries is 7%, and worldwide the figure is 15%. The causes of low birth weight are multiple and it is a major determinant of early mortality, morbidity and adverse long-term health outcomes. It also accounts for substantial costs to the health sector and represents a significant burden on society. Some of the attributable causes of low birth weight and preterm births are: genitourinary infection; multiple births; low body mass index; incompetent cervix; cigarette smoking; a prior preterm birth; abruptio placentae and heavy workload. A single comprehensive strategy to address this issue does not exist and global strategic directions towards the promotion of optimal fetal growth and development (including cognitive development) are necessary.

Between 2002 and 2003 meetings of expert groups took place to identify consensus issues of what was known; recognize major gaps in knowledge; analyse and crystallize the evidence; and recommend further reviews for action. The main result of expert consultations has been that there has been a paradigm shift from the focus on low birth weight to optimal fetal development. The initial discussions had been based on the need to develop a strategy to reduce low birth weight but this excluded a range of important factors which must be seen as contributing to fetal development, but which are not manifested in fetal weight. It also ignores other aspects of life which are important once survival is secured, for example, cognitive development. It disregards the effects of adverse influences or beneficial interventions on aspects of maternal health and well-being, artificially separating maternal and child health. Although the term low birth weight has been useful as a single measure in helping to identify a problem of major public health significance, the term itself can be potentially misleading when used in a simplistic way to embrace wider aspects of function and health. In effect, there is a need to acknowledge the synergistic effects, a need for horizontal and 'upstream' policies and the need for clear messages for population-based interventions.

In considering the whole picture it is necessary to take into account nutrition and body composition. An attributable percentage of intrauterine growth restriction is due to low body mass index. Maternal morbidity and infection independently also represent an attributable percentage of intrauterine growth restriction, in addition to placental malaria and genital tract infection. Tobacco use is an attributable fraction of intrauterine growth restriction independently, and rates of smoking in young women are increasing in less-developed countries. Smoking in pregnancy increases intrauterine growth retardation by 2.5%. Adolescent

pregnancies and environmental toxins are also attributable factors. Babies born with intrauterine growth retardation risk a 50% higher risk of premature coronary heart disease and a sixfold risk of impaired glucose tolerance.

In regional consultations that have already taken place in the WHO South-East Asian Region, the West Pacific Region and Europe the following issues were highlighted:

- nutrition and reproductive health issues, barriers to implementation in existing programmes;
- verticality of exiting programmes;
- shortcomings of the safe motherhood programme;
- nutritional preparation for first pregnancy;
- preventing adolescent pregnancy;
- birth spacing and family planning;
- shortcomings of nutritional programmes;
- social consideration and measures (education, taboos, violence, workload, labour law, maternity leave);
- wide variation in data quality and information gap, eg, West Europe versus Uzbekistan, Turkey;
- high maternal age;
- high maternal body mass index—obesity;
- large for gestational age babies;
- prematurity;
- environmental toxins, such as smoking, alcohol consumption.

Two further regional consultations are planned. Following these consultations, the integrated strategic framework will be prepared taking regional issues into consideration to report to the Executive Board in January in 2007. A generic and region-specific integrated package will then be developed to implement through existing health systems. The strategy will be presented to the World Health Assembly for ratification /endorsement in 2007.

#### **2.4 The global strategy on promoting optimal fetal growth**

*Dr Jelka Zupan, WHO-MPS, WHO-HQ*

In the 1920s birth weight of less than and equal to < 2500 g was identified as a public health problem. In 1948 a WHO expert group on prematurity endorsed the international definition of prematurity as a birth weight of 2500 g or less, this was adapted by the first World Health Assembly although was revised in 1957. The beginning of the WHO consultative process on low birth weight began in 2002. The consequences of low birth weight have implications for: the immediate survival of the neonate; morbidity, disability, growth and development; cognitive development; anthropometric parameters in adulthood; adulthood disease and the next generation.

Birth weight may be an easily identifiable indicator but it is an inadequate marker of etiologic pathway. There are substantial differences in the mean birth weight between populations and marked differences in birth weight within populations. Factors determining

the differences in birth weight within populations are not necessarily the same as those operating between populations. There is the need to determine the nature of factors which contribute to poor growth and development before birth, within and between populations. Although the problem of low birth weight is well known there is little knowledge about the determinants of the size at birth as a proxy for intrauterine growth and development. The question of what is trying to be achieved through the paradigm shift needs to be addressed; whether it is the prevention of low birth weight or heavier babies or wider improvements in fetal development.

Existing WHO programmes and instruments include: reproductive health and safe motherhood; various nutrition programmes; diet and lifestyle; tobacco convention; malaria in pregnancy; HIV; infant and young child feeding; and iodine deficiency elimination. All of these programmes could be embedded in a larger framework as components of an optimal fetal development strategy. It is necessary to assess how this could be achieved and to identify gaps, identify old and new problems and find ways to incorporate new knowledge. There is a lot of new knowledge to be built into the existing strategies.

Before pregnancy we need to maximize the role of an individual woman as an environment for her fetus through: good nutrition and diet; clean water and sanitation; immunization; family planning; prevention and treatment of nutrient deficiencies; the avoidance of smoking, alcohol and drugs; safe sex practices; childbearing at the time of biological and psychosocial maturity; and pregnancy spacing. During the pregnancy, to make the environment optimal for the (potential) mother to nurture the fetus it is important that the mother has access to pregnancy and childbirth care, maternity protection, safe food and does not have an unnecessary heavy workload.

In developing the global strategy on optimizing fetal development many issues need to be addressed. In regard to the solutions of problems in the current situation, it is necessary to assess whether to implement existing interventions or to search for new ones, and whether these interventions should be directed at individual women or at the population/societal level. The optimal time scale for action needs to be determined and the kind of evidence required for the effects of the interventions needs to be defined. It is also necessary to assess the practicalities, safety and cost-effectiveness of known interventions and how much can be achieved in one generation. In regard to financial implications, the long-term benefits and the cost of the status quo should be assessed, and in measuring progress, it is necessary to determine if there is a summary measure of effects, and is there one indicator for all. The optimal value of an intervention and the critical periods in development to achieve maximum effect all need to be determined.

The challenges (for WHO) include: to identify, quantify and evaluate strategic approaches to modify prenatal and perinatal determinants of adverse birth outcomes including adult health outcomes; identify the best ways of ensuring the well-being of women of reproductive age and their newborn children and substantial health promotion effects on the next generation; and to be alert for new threats in a changing environment.

In proposing a way forward it is important to:

- identify causes, determinants and risk factors;
- identify effective interventions
- determine the cost-effectiveness in various settings;
- determine the costs with regard to immediate and future outcomes
- propose staging that fits the socioeconomic level of development;
- design information and advocacy to support the proposed strategy for various audiences to better understand the complex issues.

## **2.5 Aspects relating to fetal development in the Region**

*Dr Kunal Bagchi, Regional Adviser on Nutrition, WHO-EMRO*

The WHO Eastern Mediterranean Region includes 22 Member States covering a range of diverse environments and conditions. In Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates and Oman there is insufficient or ineffective education on nutrition and a lack of clear nutritional policy, goals and targets. The countries contain high levels of over-nutrition and obesity resulting in dietary risk factors for chronic diseases. This Region also contains moderate under-nutrition and micronutrient deficiencies in certain population subgroups. Among the population there is a very high intake of energy dense foods, such as fats, sugar and refined carbohydrates and low consumption of fruit and vegetables. There is also aggressive commercial marketing of processed foods, such as fast food, breast milk substitutes and carbonated drinks.

In Morocco, Tunisia, Libyan Arab Jamahiriyya, Egypt, Jordan, Palestine, Syrian Arab Republic, Lebanon, Iraq and the Islamic Republic of Iran, there are large pockets of poverty, in particular, there are urban and peri-urban poor and remote rural areas. There is a lack of a clear nutritional policy, goals and targets and uncoordinated nutritional programmes. These countries contain moderate levels of overweight and obese populations resulting in dietary risk factors for chronic diseases. There are also moderate levels of under-nutrition in some areas and population groups and widespread micronutrient deficiencies. Among the population there is co-existence of increased dietary energy, such as fats, sugar and refined carbohydrates and low consumption of fruit and vegetables.

In Pakistan there is widespread, low-grade poverty and insufficient income levels. There is a lack of a clear nutritional policy, goals and targets, and inadequate institutional capacity and trained human resources. This country experiences significant under-nutrition including both acute and chronic child and maternal malnutrition and emerging over-nutrition in specific population groups, such as the affluent urban. Large segments of the population have an inadequate dietary intake.

Sudan, Yemen, Djibouti and Afghanistan are all countries that are experiencing complex emergencies and humanitarian crisis. These countries experience overall poor health and environmental conditions. There is inadequate institutional capacity and a lack of trained human resources. There is severe child and maternal under-nutrition and widespread micronutrient deficiencies. There is ongoing disruption to national development programmes due to continuing civil conflict and insecurity. This group of countries has the highest infant and mortality rates in the Region.

Anaemia and noncommunicable diseases are both a problem in this Region with between 8.8% to 14.8% of infants, 29% to 60% of preschool children and 20% to 70% of pregnant women suffering from anaemia. The burden of noncommunicable diseases was at 47% in 2004 but is projected to reach 60% by 2020.

The average rate for obesity in the Region is estimated at 54% for females and 31% for males. Bahrain, Egypt, the Islamic Republic of Iran, the United Arab Emirates and Saudi Arabia have the highest figures. The prevalence of diabetes mellitus (type 2) is also a problem in countries of the Region. The regional figure is 14.5%, although the figures for Bahrain, Egypt and Jordan are higher than this, with Bahrain at 30%. The regional figure for hypertension is 26.5%, with the highest rates recorded in Egypt, Morocco and Qatar.

Smoking is also prevalent in the Region, especially among males, although figures for female smoking are increasing. The regional average figure for male smoking is 35.1% and for females 9.75%, although the figures for some countries, such as Lebanon, are much higher. For young males the figure is 26.29%, and for young females 5%, but the rates are much higher for some countries.

### **3. COUNTRY PRESENTATIONS**

#### **3.1 Catch-up growth**

*Dr Iman Seoud, Cairo University, Egypt*

There are no data in Egypt on the prevalence of babies who are small for gestational age or on catch-up growth (catch-up growth refers to a baby which has lost one tenth of its body weight but whose growth catches up after three–four weeks). Although the neonatology infant care units of Cairo University Hospital are tertiary care centres, they are able to provide some information on the general situation in Egypt.

There are two neonatal care units, Unit A, established in 1964, was the first unit for low-birth-weight babies and admits babies born in the University hospital immediately following delivery. This unit is adjacent to the Obstetric and Gynaecological Department so the problem of transfer does not arise. The associated problems of transferring low-birth-weight babies increases their mortality and morbidity rates. Unit B, established in 2003, admits low-birth-weight babies from all over Egypt within the first month of their lives.

Most of the interventions undertaken in Egypt have been to reduce the incidences of low-birth-weight babies and to decrease the rates of neonatal morbidity. Achievements that have been made include: training programmes for both doctors and nurses; improved centres increasingly able to admit low-birth-weight babies, the Ministry of Health publication *Neonatal care, protocols for physicians*, used by doctors and nurses all over the country; and the promotion of breastfeeding in neonatal care centres. The main problem faced by health professionals is mothers not returning for follow-up visits more than three to four times following their discharge from care units.

Future strategic directions need to address:

- early diagnosis and follow-up of pregnant women;
- collaboration with obstetric and gynaecological departments;
- the presence of a neonatologist at high-risk deliveries;
- collection of data on weight, length and head circumference for low-birth-weight babies;
- adequate transfer facilities;
- promotion of breastfeeding;
- supply of low-birth-weight formula.

### **3.2 Low birth weight in Egypt**

*Dr Mohamed Rocca, Alexandria University, Egypt*

The possible risk factors for intrauterine growth restriction in Egypt include:

- malnutrition;
- poverty;
- lack of safe water;
- increased prevalence of infections;
- low maternal weight gain;
- marriage among relatives;
- excessive physical workload during pregnancy;
- increased prevalence of iron deficiency anemia;
- environmental pollution;
- illiteracy;
- poor antenatal care;
- adolescent marriage;
- poor birth spacing.

During the last 20 years, a number of studies have been undertaken to determine the incidence of low birth weight in Egypt. The results have varied but have shown that between 5% and 15% of babies are born with low birth weight.

The world summit for children agreed to support the goal of reducing the rate of low-birth-weight babies to less than 10%. To improve women's health and maternal care, quality natal and antenatal care should be provided to all women, in particular to women in high-risk groups. The social economic status of women in the Region needs to be improved in order to reduce the number of women of childbearing age who are themselves stunted and under-nourished. Issues such as the heavy workload of some women during their pregnancy, adolescent health, environmental pollution, female education and pre-marital counselling need to be addressed by any strategic directions to optimize fetal development.

### **3.3 Status of maternal and child nutrition in Djibouti**

*Dr Assakaf Ahmedi and Dr Souad Daoud, Ministry of Health, Djibouti*

Twenty-eight per cent (28%) of women in Djibouti are of childbearing age out of a population of 512 000. About 77% of women attend antenatal clinics and nearly 95% of babies are breastfed for a duration of between 2 and 24 months. The maternal mortality rate is 546 per 100 000 live births and the infant mortality rate is 103 per 1000 live births. There are no available data on the numbers of low-birth-weight infants.

Future directions for optimizing fetal development need to include the introduction and strengthening of nutritional interventions in existing programmes concerned with maternal and child health (Safe Motherhood, Integrated Management of Childhood Illness). Poverty reduction projects are currently being undertaken by both the Government and civil society in Djibouti.

A policy for safer reproductive health has been established and includes:

- standardized antenatal visits;
- referral networks for high-risk pregnancies;
- tetanus immunization of pregnant women;
- procedures for good quality maternity services (intra- and postpartum);
- baby-friendly hospital initiative set up by WHO, UNICEF and the Government of Djibouti.

The constraints facing safer reproductive health include high levels of illiteracy and poverty. Interventions to further improve reproductive health could include:

- national nutritional health programme;
- strategies to improve infant and young child feeding practices, i.e. providing information on continued breastfeeding, the optimum time to introduce complementary foods, etc.
- strategies to reduce/eliminate tobacco use during pregnancy and to address other complications of pregnancy, such as hypertension, diabetes, prematurity, etc.;
- increasing the duration of breastfeeding (in antenatal clinics and maternity hospitals);
- supplementation of vitamin A;
- iodization of salt.

There is a high prevalence of iron deficiency anaemia in women, especially in pregnant women and multiple micronutrient deficiencies (iodine, zinc). Twenty-one per cent (21%) of children under 5 years of age are malnourished. They are mainly suffering from protein-calorie malnutrition. Children are also suffering from nutritional anaemia which is essentially an iron deficiency and protein malnutrition.

### **3.4 Maternal and child nutrition in Iraq**

*Dr Faiza Majeed, WHO Iraq*

In Iraq, 45% of the population is under 15 years of age. The health of Iraqi children was steadily improving between 1960 and 1990 as infant mortality rates dropped from 117 to 40 deaths per 1000 live births, and child mortality fell from 171 to 50 deaths per 1000 live births. Following the Gulf War in 1990, there has been a disastrous decline in health indicators.

Infant and child mortality rates have more than doubled. This decline has been attributed to: sharp rises in poverty, poor sanitation and water supplies, poor nutrition, a decline in educational enrolment, a deterioration in preventive health programmes and the poor accessibility and quality of health services.

Malnutrition among children under 5 years of age is widespread in Iraq. Twenty-three per cent (23%) of children between the ages of 6 months and 5 years suffer from chronic malnutrition (low height for weight), 12% of children suffer from general malnutrition (low weight for age), and 8% suffer from acute malnutrition (low weight for height).

The system of food rationing was set up in 1990 by the Government; the ration per person per day provided 1300 calories. By 2003, the ration had improved to 2000 calories per person per day. The provision of calories was approaching a satisfactory level although the provision of micronutrients, such as iron, absorbable folate, iodine and vitamin A was less satisfactory.

The food rations provide:

- 81% of the UN recommended daily intake of calories;
- 71% of the recommended amount of protein;
- 50% of recommended intake of vitamin A, and;
- 29% of the recommended daily allowance of iron.

Interventions to support improvements in maternal and child health in Iraq include: improved quality of services for newborn babies and infants; improved health service delivery to mothers and children under 5 years of age; improved access to family planning services and adequate birth spacing between pregnancies to 3 years or more; and to raise awareness of maternal and child nutrition and the mother's health needs.

WHO in Iraq advocates for the implementation of the Safe Motherhood Initiative which aims to reduce maternal and child morbidity and mortality. In June 2004, the Ministry of Health in collaboration with WHO, UNICEF and the United Nations Population Fund (UNFPA) had developed the maternal and child health and reproductive health strategy for 2005–2008 in line with the Millennium Development Goals. In August 2005, Iraq adopted the national strategy for infant and young child feeding which is funded by USAID with technical support provided by WHO and UNICEF.

There have been some reproductive health successes in Iraq including: the implementation of the Safe Motherhood Initiative and emergency obstetric care; revitalization of the Integrated Management of Childhood Illness Strategy (IMCI); growth monitoring of children under 5 years of age at primary health care centres; distribution of iron–folate supplements for pregnant and lactating mothers; distribution of vitamin A to lactating mothers and children under 2 years of age with vaccinations (measles and first booster DPT + oral polio); distribution of high protein biscuits to children under 5 years of age suffering from malnutrition and to lactating mothers; and the implementation of the baby-friendly hospital initiative.

The current challenges facing Iraq include: the unstable security situation; lack of awareness in the community; inadequate infant and young child feeding practices; childhood under-nutrition; food insecurity; micronutrient deficiencies; the poor nutritional status of pregnant and lactating women; and the need for and distribution of breast milk substitutes.

Future directions and plans include:

- supporting the introduction, implementation and adaptation of evidence-based WHO guidelines on pregnancy, childbirth, postpartum and newborn care and family planning;
- ongoing implementation of the IMCI strategy;
- increasing community awareness relating to women's and mothers' health needs;
- improving access to family planning services and increased awareness of the community, particularly women, to the importance of family planning measures in high-risk categories;
- ratifying the Iraqi version of the international code of marketing breast milk substitutes;
- replacing the infant formula in the public distribution system with a supplementary food ration for lactating women and older children to reduce intrauterine growth restriction and low birth weight;
- establishing an effective health information system and strengthening the surveillance of health determinants;
- improving management of undernourished children by strengthening and coordinating mechanisms to ensure that resources are used effectively to prevent and treat malnutrition through: the Targeted Nutrition Programme, community child care units, nutrition rehabilitation centres, primary health care centres and the Nutrition Research Institute.

### **3.5 Nutrition, the environment and fetal development in Pakistan**

*Professor Shakila Zaman, Department of Preventive Paediatrics, Lahore*

Four million women in Pakistan become pregnant every year and of these 3.2 million deliver at home. Nearly 80% of deliveries are attended by trained traditional birth attendants or *dais*. Seventy per cent (70%) of these mothers are anaemic. An estimated 15% of mothers are likely to experience some obstetric or medical complication but of these only 5% actually reach a health facility. Delay in seeking care results in untimely death for many. In view of these statistics, Pakistan needs to introduce logical solutions which can bring around visible and measurable improvements to reduce the rate of maternal deaths, improve antenatal care, reduce perinatal deaths, improve newborn care and the subsequent care of neonates and mothers. The dyad has to be effectively dealt with to improve the outcomes.

Possible interventions to improve infant mortality in Pakistan include: promotion of optimal breastfeeding; complementary feeding; zinc supplementation; clean delivery; HiB vaccination; improved water/sanitation; and the prevention of hypothermia. Treatment interventions include: oral rehydration therapy; antibiotics for sepsis; antibiotics for pneumonia; antimalarials; zinc and vitamin A supplementation.

There have been improvements in Pakistan's health statistics, but the country has been slow in making progress towards achieving the targets of the MDGs. Infant health has been the subject of great attention in Pakistan despite the fact that progress toward improvement has been slow. The focus has been on vertical programmes with little or no attention paid to the management or sustainability of projects. However, the introduction of comprehensive programmes has been a success for changing health paradigms. Clear and measurable objectives of various programmes, such as the female health volunteer programmes are necessary.

Programmes need to be integrated, coordinated and supervised effectively so that outcomes can be measured on an epidemiological basis. Integration among primary, secondary and tertiary health care facilities should be made possible, and health education needs to be an essential element. The undergraduate training of doctors needs to adopt a community-based integrated approach and the inclusion of family care and counselling should become an integral part of health care delivery systems. Cohesion between different tiers of health care provision should be ensured for effective health goal achievements. Primary health care should be given priority, not only for improving or guiding maternal health, but also in providing quality care at an affordable cost. Existing programmes should not be run as vertical programmes but should have an inbuilt element of integration and evaluation at all levels. Successful management of health problems, such as a severely malnourished child, requires that both medical and social problems be recognized and corrected. If the illness is viewed as being only a medical disorder, the child is likely to relapse when he or she returns home, and other children in the family, especially females, will remain at risk of developing malnutrition.

### **3.6 Nutrition in pregnancy: experiences from Sudan**

*Professor Maybou Mostafa*

Sudan is comprised of multicultural and multi-ethnic groups with different traditions and beliefs; these differences have an effect on the nutrition and health of pregnant women. No recent comprehensive study has been undertaken in the country on the nutrition of pregnant women or of the general population. There have been smaller-scale studies in some areas which present data revealing the magnitude of the problem.

A community and hospital-based study found that the infant mortality rate in 1989–1990 was 85.4 per 1000 live births in hospital and 29.4 per 1000 live births at home. The main underlying causes were: maternal under-nutrition; malaria during pregnancy; spraying of agricultural pesticides and poor antenatal care. All of these causes are preventable and recommendations to improve infant mortality include: improved maternal nutrition, strengthened malaria control programmes, the avoidance of agricultural pesticides during pregnancy, the provision of adequate antenatal and intrapartum care.

Some studies have indicated that unless intervention measures are implemented over the next 10 years, 16 000 women will die in childbirth as a result of anaemia, 22 000 children will be born with birth defects due to their mothers low intake of folic acid and 200 000 children

will be at high risk of death just before birth or shortly after birth as a result of their mother's anaemia.

Strategies and future directions to reduce infant mortality include: poverty reduction; improved health services for women of childbearing age; strengthening of the malaria control programme, the implementation of a supplementary food programme for women, infants and children; and enhancement of flour fortification initiatives. For the success of these strategies to work, there is a need to strengthen governmental resources and allocations for health and maternal nutrition, and to develop strong partnerships with UN agencies, national and international nongovernmental organizations and academic institutions and to strengthen information, education and communication relating to maternal nutrition.

#### **4. GROUP WORK**

Participants were asked to look at the categories in Table 1 'Determinants of suboptimal fetal growth and development and possible interventions' (see Annex 3) and within these categories to address the current strategic framework to identify the key steps and possible interventions for rapid acceleration towards improvement in the strategy to promote optimal fetal growth and development. The purpose of the group work was not to put together a new strategy but to look for a process in existing strategies to incorporate new knowledge. Within each category, the group added determinants, and individual and public health interventions they viewed as important to their local situations.

##### *A. Marital characteristics at conception*

The group identified the need for interventions to delay marriage and prevent pregnancies at early ages. In Djibouti there are no laws or regulations relating to the age of marriage. A new family law which includes the issue of delaying marriage will shortly be passed by the parliament. It will be challenge to put these laws into practice. In Sudan it was claimed that legislation against early marriage is not working, and information, education and communication needed to be strengthened. The involvement of community leaders was perceived as critical for changes to be implemented.

It was seen as important that sex education be included in the curricula in both formal and informal education, and that education needed to be targeted towards the young who represent the next generation of parents. The development of policies for interventions in overall health promotion, including maternal health, family planning (HIV/AIDS, condoms) and sex education were cited as imperative. A greater allocation of human resources was also cited as important in supporting any public health interventions.

The importance of birth spacing, breastfeeding promotion and family planning were stressed. All countries claimed that family planning methods were available in their respective countries.

##### *B. Maternal body composition at conception*

Groups discussed the low micronutrient status of many women at the time of conception and suggested the need for community-based general health education, including information on nutrition.

To the list of public health interventions participants added nutrition-friendly schools with an emphasis on nutrition for girls whose nutritional needs may suffer as a result of greater emphasis often being given to male nutritional needs in the Region.

#### *C. Maternal diet/nutrition at pregnancy*

The lack of adequate guidelines for the nutrition of pregnant women was cited as a gap in the current framework. Interventions at individual level included community-based general health education, including information on nutrition, and supplementary feeding and micronutrient supplementation.

Health information systems and the system of community-based midwifery were seen as requiring strengthening.

#### *D. Pregnancy complications*

Under the category of pregnancy complications, Djibouti reported a low prevalence of congenital abnormalities but this was explained by the problem of underreporting of cases. Sudan reported all listed causes and determinants as being prevalent in Sudan, and bleeding during pregnancy was reported as a high risk factor in Yemen.

The group reported the need for the strengthening of prenatal and antenatal care services and made the comment that prenatal care is separated from antenatal care. Antenatal care provides routine care but does not include a referral component. During their course of their pregnancy women with high blood pressure or oedema are referred for treatment but at the level of antenatal care referral is not part of the model of antenatal care.

Additional public health interventions were cited as strengthening of emergency obstetric care and a data gathering system or health information system to be in place. The strengthening of the midwifery delivery system was also seen as necessary.

Education was seen as important including overall health education covering pregnancy in formal and informal education. The fact that many girls from the ages of 12 and upward did not attend school was recognised as an issue that needed to be tackled in terms of education being targeted towards them. It was felt that the adolescent targeted health strategy needed further consideration. The participation of the community was perceived as vital, as was the need for education to include men.

#### *E. Other diseases that affect pregnancy*

The causes and determinants listed under the category of other diseases that affect pregnancy included malaria, syphilis, rubella and HIV. The group added sexually-transmitted diseases under syphilis, vaginosis, TORCH infections and helminthiasis.

Sudan has an extensive malaria control programme in place. The group cited the use of insecticides as a source of concern. As an intervention at individual level they added the provision of anti-malarials in pregnancy and caution to be exercised with indoor spraying. As a public health intervention, they cited caution to be exercised with outdoor spraying.

The group discussed needs assessment on cases of rubella before the introduction of routine immunization as the prevalence of rubella in childhood was not as high as other diseases and routine immunization is expensive. They also cited the additional problem of reaching the target group for immunization against rubella and thought that the immunization policy needed to be discussed at country level.

Interventions at the individual level added for HIV included abstinence (as a faith-based approach), and treatment of HIV by ARV, voluntary testing and counselling (VTC), and breastfeeding counselling among HIV-positive mothers. The group considered that the issue of HIV/AIDS required country-specific strategies that targeted education.

#### *F. Micronutrient deficiencies*

A number of micronutrient deficiencies are reported during pregnancy: these comprise iron, vitamin A, folic acid, vitamin B12 and possibly zinc. Interventions have to be applied at the individual and the community levels. Interventions should include the promotion of diverse diet, clinical treatment of deficiencies, nutrition education, preventive measures against pathological causes leading to micronutrient deficiencies and fortification of staple food items with micronutrients. Iodization of edible salt remains an effective measure to correct iodine deficiency disorders during pregnancy and lactation.

#### *G. Other factors that affects pregnancy*

The causes and determinants of other factors that affect pregnancy included tobacco (active and passive smoking), alcohol abuse, use of recreational drugs, occupational hazards and workload and stress. In relation to tobacco smoke, the group added as interventions at individual level that greater consideration needed to be given to passive smoke at the level of households, and considered that early recognition and management of stress was an important intervention.

As a public health intervention for smoking, participants agreed that all countries needed to ratify control of smoking and added that there should be greater control of water pipe smoking which is becoming an increasing problem in the Region. They viewed counselling programmes as an important public health intervention for stress.

#### *H. Delivery/birth complications*

The groups identified that any treatment of malnutrition must be linked with care at childbirth to prevent, and to detect early and to manage delivery/birth complications and added safe and adequate delivery to childbirth care as an existing intervention at individual level. Access to childbirth care to access to skilled childbirth care is an essential intervention for ensuring optimal fetal development.

#### *I. Postpartum period/early neonatal period*

During the postpartum/early neonatal period the group added care of low-birth-weight babies and those having suffered intrauterine growth restriction to the existing interventions at individual level of supporting the mother for early and exclusive breastfeeding and maternal vitamin A supplementation. Under the public health interventions of promotion, protection and support for breastfeeding and a code on marketing breast milk supplements they added training.

#### *J. Infancy and childhood*

To the determinants of wasting and stunting and childhood diseases for problems in infancy and childhood, malnutrition was added. To interventions at individual level, exclusive breastfeeding for 6 months, appropriate and adequate food after 6 months, pharmaceutical supplementation and early recognition and treatment of diseases were added.

In addition to the promotion of appropriate feeding practices at public health intervention level, the promotion of physical activity, nutritional health programmes and school health programmes were added.

#### *K. Difficult circumstances*

Under the category of difficult circumstances as a result of natural or man-made disasters and refugees, the group thought the provision of food rations were an important intervention at individual level in addition to nutrition and care of pregnant women. Protection of breastfeeding is critical.

As public health interventions they viewed health care including sanitation, water sanitation and food sanitation as essential for all ages.

#### *L. Maternal general state of health*

For chronic diseases and infections which affect the maternal general state of health, the group added preconceptual health care as an intervention at individual level.

As public health interventions they listed health education, good access to health care and medical care.

## 5. CONCLUSIONS AND RECOMMENDATIONS

There are many specific factors that have been demonstrated to impair fetal development and these must be addressed in any strategy to optimize fetal development. These include: reducing pregnancy at a very young age, maternal nutrition, including intergenerational effects and obesity, maternal smoking, pregnancy complications, maternal drug use, maternal infections including gastrointestinal parasites, malaria and HIV/AIDS, maternal workload in pregnancy, exposure to pesticides, pollutants and household smoke, as well as other social and behavioural factors including domestic violence.

The group considered that the different categories did not include all necessary interventions and was unnecessarily selective. They considered that there were cross-cutting issues and underlying causes which were omitted from the categories, such as education, gender, health systems, food security and the environment. Participants emphasized the life-cycle approach in considering timing for optimal effectiveness as any strategy that only starts once an established pregnancy is identified misses many key opportunities where cost-effective interventions are possible.

Following review of the draft integrated strategy, participants felt that much greater discussion and work was needed to identify the mechanisms through which greater integration of vertical programmes could be achieved. Participants stressed that it still remained to be identified how operationalization of these programmes as elements of a framework to optimize fetal development could be accomplished and until this was done there would be little improvement in the development of steps to further a strategy.

### *Recommendations*

1. Greater integration of vertical strategies is needed to ensure the workability of a strategy to promote optimal fetal growth and development.
2. Each Member State needs to coordinate its own approach within existing strategies and programmes to optimize fetal development. Many of the required components of the strategy already exist as single packages in initiatives, such as IMCI, Making Pregnancy Safer, Roll Back Malaria and HIV/AIDS, and these can be embedded in a broader framework to secure strategy objectives.
3. The involvement of professional organizations at national level should be enlisted to promote the concept of optimal fetal development through conferences, workshops and training programmes.
4. Data management capacity and health information systems need to be strengthened to provide evidential data to policy-makers.
5. The food and nutrition component of various existing programmes, such as The Safe Motherhood Initiative, need to be strengthened. Awareness of the importance of good nutrition at grass roots level should be made possible through the media, and to

operationalize the concept of a strong nutrition programme at national level, health policy-makers should be briefed and their support enlisted.

**Annex 1****PROGRAMME****5 December 2005, Monday**

08.30–09.00	Registration
09.00–09.45	Inauguration Message from the Regional Director, Dr Hussein Gezairy, WHO-EMRO Introduction of participants Election of Chairperson
9.45–10.30	Objectives and mechanics of the consultation Administrative issues WHO-EMRO
10.30–10.45	Opening comments Dr Denise Coitinho, Director, NHD, WHO-HQ
10.45–11.15	Optimal fetal development Dr Alan Jackson, Short-term Consultant, WHO
11.15–11.30	Overview of the global fetal development and growth Dr Sultana Khanum, NHD, WHO-HQ
11.30–11.45	The global strategy on promoting optimal fetal growth Dr Jelka Zupan, MPS, WHO-HQ
11.45–12.00	Aspects related to fetal development in the Region Dr Kunal Bagchi, Regional Adviser in Nutrition WHO- EMRO

**Regional Experiences**

12.00–12.15	Catch-up growth Dr Iman Seoud, Egypt
12.15–13.00	Low birth weight in Egypt Dr Mohamed Rocca
13.00–13.15	Status of maternal and child nutrition in Djibouti Dr Assakaf Ahmedi and Dr Souad Daoud
13.15–13.30	Maternal and child nutrition in Iraq Dr Faiza Majeed
13.30–13.45	Nutrition, environment and fetal development–Pakistan Professor Shakila Zaman
13.45–14.00	Nutrition in pregnancy: experiences from Sudan Professor Maybou Mostafa
14.45–15.00	Instructions on group work: “draft global strategy on promoting optimal fetal development.”

**6 December 2005, Tuesday**

08.30–15.30            Group work

**7 December 2005, Wednesday**

08.30–10.15            Group work (cont.)

10.15–12.30            Presentation of group work

Discussion

12.30–14.30            Conclusion and recommendations

14.30–14.45            Closing ceremony

**Annex 2**

**LIST OF PARTICIPANTS**

Mr Naguib Ali

Sana'a

**YEMEN**

c/o WR Yemen

Dr Assakaf Ahmedi

Ministry of Health

Djibouti

**DJIBOUTI**

Dr Souad Daoud

Ministry of Health

Djibouti

**DJIBOUTI**

Dr Maybou Mustafa

Khartoum

**SUDAN**

c/o WR Sudan

Dr Mohamed Rocca

Professor of Obstetrics and Gynaecology

Shatby Maternity Hospital

Alexandria University

Alexandria

**EGYPT**

Dr Hamid Rushwan

Professor Obstetrics and Gynaecology

**UNITED KINGDOM**

Dr Iman Seoud

Head of Neonatology Units

Cairo University

Cairo

**EGYPT**

Professor Shakila Zaman

Department of Preventive Paediatrics

Fatima Jinnah Medical College

Lahore

**PAKISTAN**

**WHO SECRETARIAT**

Dr Denise Coitinho	Director MH, NHD, WHO/HQ
Dr Sultana Khanum	Medical Officer, NMH/NHD/HQ
Dr Jelka Zupan	Medical Officer, FCH/MPS/HQ
Professor Alan Jackson	Short-Term Consultant, WHO/HQ
Dr Kunal Bagchi	Regional Adviser, Nutrition, WHO/EMRO
Dr Ramez Mahaini	Coordinator, Family and Child Health, Health Protection and Promotion, WHO/EMRO
Dr Faiza Majeed	WHO Representative, Iraq
Dr Kazuko Yoshizawa	Nutrition Officer, WHO Representative, Sudan
Ms Nashwa Nasr	Secretary, WHO/EMRO
Ms Sam Ward	Short-Term Professional, Editor, WHO/EMRO

### Annex 3

## DETERMINANTS OF SUBOPTIMAL FETAL GROWTH AND DEVELOPMENT AND POSSIBLE INTERVENTIONS

**Table 1. Determinants of suboptimal fetal growth and development and possible interventions**

Category	Cause/Determinant	Intervention at individual level	Public health intervention	Timing for optimal effectiveness	Reference	Existing guidelines/instruments Current actions
Maternal characteristics at conception	Young age (adolescence)	Delaying first pregnancy	Delaying marriage, Education Access to family planning services for adolescents	Adolescence	Martorell et al, 1998 ACC/SCN 1992	
	High parity Pregnancy interval <2 years	Family planning	Access to FP services Women's rights	After first pregnancy	(Kramer 1987) Zhu et al 1999 Shults et al 1999	
Maternal body composition at conception	Low height Low or high weight (BMI)	Infant, child, adolescent nutrition and health	Food, diet, nutrition Water and sanitation Access to health care	All ages	Podja & Kelly 2000 WHO 1995	
Maternal diet / nutrition during pregnancy	Malnutrition Low Weight Gain	Adequate diet and nutrition; Prevention of nutritional deficiencies; Supplementation if deficiency	Food fortification Food, diet, nutrition information for pregnant women; Supplementation	Pregnancy	(Ramakrishnan 2001), (Strauss and Dietz 1999) (WHO 1995) (Kramer 1987) Villar et al 2003	

Pregnancy complications	Pregnancy induced hypertension Diabetes Other complications	Pregnancy care for early detection and timely management	Access to pregnancy care (routine and complications)	Pregnancy	(Kramer, Seguin et al. 2000)	
	Preterm birth IUGR Fetal diseases Congenital abnormalities Stillbirths	Pregnancy care	Access to pregnancy care		(Kramer 2003)	
	Multiple pregnancy	Pregnancy care	Regulated assisted reproduction			
Other diseases that affect pregnancy	Malaria	Antimalarials in pregnancy Insecticide-treated bednets	Vector control	Pregnancy	(Guyatt and Snow 2004) Schultz et al 1994 (Wilcox 2001) (Njagi, Magnussen et al. 2003)	
	Syphilis	Pregnancy care for early detection and treatment	Syphilis prevention and control measures	Pregnancy		
	Rubella	Immunization		Adolescence		
	HIV	Condom use for prevention of HIV infection	Prevention of HIV Treatment of infected women	Pregnancy	(Castetbon, Ladner et al 1999), (Dreyfuss, Msamanga et al 2001), (Villamor, Msamanga et al 2002), (Fawzi, Msamanga et al 2002)	

Micronutrient deficiencies	Iron deficiency/anaemia	Iron and folate supplementation Malaria prophylaxis Anthelminthis treatment	Interventions to address taboos/beliefs about diet in pregnancy	Pregnancy	(Fleming 1989) (WHO 2001) INACG/WHO/UNICEF 1998 (Mockenhaupt, Rong et al 2000)	
	Iodine deficiency disorders	Iodized salt	Access and legislation	All ages	MI/UNICEF VMD Progress report 2004	
Other factors that affects pregnancy	Tobacco (active/passive) smoking	Counselling for smoking cessation	Tobacco control	Reproductive Age	(Nakarura, Alexandre et al 2004) Kramer 1987) (Wilcox 1993)	
	Alcohol abuse	Counselling on alcohol abuse cessation	Preventive alcoholism measures	Reproductive Age	Day et al 1989 Ornoy 2002	
	Use of recreational drugs	Counselling on cessation	Preventive measures	Reproductive Age	Slutsker et al 1992 Addis et al 2001	
	Occupational hazards Workload	Workplace change	Maternity protection Women's rights	Reproductive Age	(Mozurkewich, Luke et al 2000)	
Delivery / birth complications	Complicated birth	Childbirth care	Access to childbirth care	Pregnancy		
Postpartum period	Delayed and non-exclusive / lack of breastfeeding	Supporting mother for early and exclusive breastfeeding Maternal Vitamin A supplementation	Promotion, protection and support for breastfeeding Code on marketing breast milk supplements	Postpartum		

Infancy, childhood	Wasting, stunting	Breastfeeding Complementary feeding, Adequate food Vit. A Supplementation (6–24 months)	Promotion of Appropriate Feeding Practices	Infants and Young children	(Ruel, Neufeld et al. 1996; Mendez and Adair 1999) (de Onis, Frongillo et al. 2000)	
	Childhood diseases	Immunization	Access to health care IMCI	Infants and young children		
Difficult circumstances	Natural and man made disasters, refugees	Extra food and care for pregnant women				
Maternal general state of health	Chronic diseases Infections	Medical care	Access to health care	Throughout life	(Tomkins, Murray et al. 1994)	