

Improving prenatal nutrition in developing countries:  
Strategies, prospects, and challenges.

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Running head: prenatal nutrition in developing countries

1     **ABSTRACT**

2     In developing countries, the health and nutrition of females throughout their entire life is affected by  
3     complex and highly interrelated biological, social, cultural, and health service-related factors. Rather than  
4     focusing exclusively on the prenatal period, a life cycle approach is described to improve maternal  
5     nutrition, which goes beyond the traditional provision of nutrition services during pregnancy, by  
6     addressing risk factors that are present well before pregnancy, even before childbearing age. This  
7     approach involves specific policy initiatives and a **Aminimum package@** program that is targeted to  
8     females. Policy actions and the components for effective implementation of the program are described.  
9     The prospects and challenges to be overcome, which include translating scientific knowledge into action,  
10    removing conceptual and implementation constraints, identifying biologically meaningful indicators for  
11    problem identification, better understanding of physiological and social adaptation mechanisms, and  
12    persistent problems with health care delivery systems are also discussed.

13  
14  
15    **KEY WORDS**         Prenatal nutrition, developing countries, nutrition strategies, women, adolescent  
16    girls, nutrition programs

17

## 1 INTRODUCTION

2 Good maternal nutrition is important for both the health and reproductive performance of women and  
3 the health, survival, and development of their children. Malnutrition in women, including pregnant  
4 women, is not conspicuous and remains, to a large extent, uncounted and unreported; thus, insufficient  
5 attention has been given to its extent, causes, and consequences (1). As a result, inadequate resources  
6 and efforts have been allocated to improving women=s nutrition compared with other nutrition and  
7 public health actions (2). The limited available data and the few program experiences that do exist come  
8 mostly from small-scale efforts to improve nutrition during pregnancy, often through nutrition  
9 supplementation to enhance fetal growth and birth weight (3). It has been suggested that highly  
10 publicized initiatives such as Achild survival@ and Asafe motherhood@ have not had the impact  
11 expected because too little attention has been given to the nutrition status of mothers or women (4). This  
12 lack of emphasis on women=s nutrition is unacceptable given its importance to women=s health,  
13 pregnancy outcome, and child survival; the availability of effective nutrition-related programs; and the  
14 increased opportunities for policies and programs that can be implemented through existing health care  
15 systems, which are expanding and providing better coverage, particularly in prenatal care, in most  
16 developing countries.

17  
18 The situation is not dire, however. By translating and integrating existing biological and socioeconomic  
19 knowledge into practical action, a solid basis for policy and program decisions can be developed. The  
20 purpose of this paper is first to review the rationale for improving prenatal nutrition and strategy, policy,  
21 and program options and, second, to identify the prospects for and challenges to improving prenatal  
22 nutrition in developing countries.

## 24 RATIONALE

25 Some 200 million women become pregnant each year, most of them in developing countries (5). Many  
26 of these women suffer from both ongoing nutrition deficiencies and the long-term cumulative  
27 consequences of undernutrition during childhood. Pregnancy-related health and nutrition problems affect

1 a woman=s quality of life, that of her newborn infant well beyond delivery, and that of her family and  
2 community as a whole.

3  
4 The impact of women=s prenatal health and nutrition status on child growth, health, survival, and  
5 development is both through their reproductive performance and survival and through fetal growth and  
6 development. McGuire and Popkin=s (6) review of studies on the nutrition status of pregnant and  
7 lactating women found that women in developing countries consumed only about two-thirds of the  
8 recommended daily intake for energy and their average weight-for-height was, in most cases, well  
9 below the 50th percentile for small frame women in developed countries. Moreover, the energy and  
10 nutrient intakes of pregnant and lactating women tended to be only slightly higher than those of non-  
11 pregnant women although their nutrition requirements were significantly greater. Other studies, for  
12 example Black et al. (7), found that micronutrient deficiencies, particularly iron and vitamin B<sub>12</sub>, were  
13 frequent among pregnant women in Mexico. Poor health and nutrition are associated with repeated,  
14 closely spaced pregnancies that progressively reduce women=s nutritional reserves to the point of  
15 nutritional depletion known as the maternal depletion syndrome (8,9,10).

16  
17 The definitive negative outcome of poor prenatal health and nutrition, as well as inadequate care during  
18 pregnancy and delivery, is reflected in the high prevalence of maternal mortality in developing countries;  
19 nearly 600,000 women die each year from pregnancy-related causes (11). Table 1 shows the global  
20 maternal mortality rate is 460 per 100,000 live births with the rate for developing countries being  
21 500/100,000 live births compared with 10/100,000 live births in developed countries. Within the  
22 developing world, however, there are huge regional variations -- from 140/100,000 live births in Central  
23 America to 1,080/100,000 live births in Eastern Africa (12). Adolescent girls are at two to five times  
24 greater risk of mortality than other women of reproductive age (1). Indeed, of all the human  
25 development indicators, the greatest disparity between developed and developing countries is for the  
26 risk of maternal mortality (11). Although poor prenatal nutrition contributes directly and indirectly to this  
27 large death toll, the extent of its contribution has not been quantitatively established because the main

1 reported causes of maternal mortality (hemorrhage, obstructed delivery, eclampsia, sepsis, and unsafe  
2 abortion) greatly overshadow the role of nutrition itself. It is well established, however, that stunted  
3 women are at higher risk of obstructed labor due to cephalo-pelvic disproportion (13). Nationally  
4 representative data collected in the Demographic and Health Surveys show that between 3-40% of  
5 non-pregnant women were at risk of adverse pregnancy outcomes by virtue of their short stature (<145  
6 cm) and/or low body weight (<45 Kg) (Table 2) (S. Rutstein, personal communication, 11 May, 1998).  
7 Among these same women, between 1-20% were chronically energy deficient (14), although there is no  
8 consensus about the value of BMI as an indicator (15).

9  
10 Maternal mortality, however, is not the only adverse or most frequent outcome of pregnancy. More than  
11 40% of pregnancies in developing countries result in complications, illness, and/or permanent disability  
12 for the mother or child (1). Due to a woman's child bearing and nurturing roles, her pre- and postnatal  
13 nutrition and health status is an important determinant of the survival and development of her fetus and  
14 newborn child. More than seven million newborn deaths are associated with maternal health and  
15 nutrition-related problems resulting from poorly managed pregnancies and deliveries or inadequate care  
16 of the neonate soon after birth (5).

17  
18 An inter-generational cycle of ill health and growth failure has been described, in which undernutrition in  
19 childhood leads to small body size in adulthood. Malnourished women, i.e., women who are short,  
20 underweight, do not gain sufficient weight during pregnancy, and/or who are anemic, are more likely to  
21 have miscarriages or still births, deliver intrauterine growth retarded (IUGR) or low birth weight (LBW)  
22 babies (16, 17, 18) which, in turn, are linked to increased risk of perinatal and infant mortality  
23 (19,20,21). Globally, 15.3% of all babies are born with a LBW; over 2.5 times more so in developing  
24 (16.4%) than in developed (6.2%) countries (22). Severe anemia in pregnancy is believed to increase  
25 the risk of maternal mortality in childbirth (21) and about one-half of the infants whose mothers have  
26 died do not survive to celebrate their fifth birthday (23). There is also evidence to suggest that severe  
27 maternal iron deficiency causes reduced iron storage in the fetus and newborn infant, which predisposes

1 them to iron deficiency anemia (16). In addition, malnourished women do not have adequate capacity to  
2 sustain prolonged lactation (17,18).

3  
4 IUGR newborns and LBW babies are at greatest risk of infection because of reduced immune  
5 competence. Poor nutrition in early childhood not only increases the risk of perinatal, infant, and child  
6 morbidity and mortality, it also affects long term physical growth (24,25), cognitive development and  
7 future learning capacity (26), school performance (26,27) and educational outcomes, as well as work  
8 performance (28). The girl child often experiences discriminatory childcare, feeding, and health care that  
9 can result in energy-protein malnutrition (EPM) and micronutrient deficiencies. The increased nutritional  
10 demands for adolescent growth, coupled with chronic EPM and micronutrient deficiencies, and often  
11 early childbearing precludes many teenage girls from fully realizing their growth potential (29,30).  
12 Moreover, Bruner et al. (31) found that treating anemic US adolescent girls improved their cognitive  
13 abilities, which has important implications for childcare among the many adolescent mothers in  
14 developing countries. During their reproductive years, particularly during pregnancy and lactation, many  
15 females continue to be exposed to both EPM and micronutrient deficiencies, although some suffer from  
16 consequences of overnutrition. In the post reproductive years, undernutrition, anemia, osteoporosis, and  
17 other nutrition-related problems are frequently observed among women (4). There is also growing  
18 concern that poor fetal and infant health and nutrition determines health risks, such as coronary heart  
19 disease, in adulthood (32,33). Clearly, the lack of attention to women=s nutrition has enormous  
20 implications for social, economic, and national development.

21  
22 It is difficult to estimate the extent of women=s malnutrition, even among pregnant women, in developing  
23 countries because few nationally representative studies have been done. This is compounded by the lack  
24 of consensus on the appropriate indicators and reference standards for women. In 1985, Leslie (2)  
25 conservatively estimated that among the 1,130 million women over 15 years old living in developing  
26 countries, almost 500 million were stunted as a result of EPM, about 250 million were at risk of Iodine  
27 Deficiency Disorders (IDD), and almost two million were blind due to vitamin A deficiency (VAD).

1 VAD is more frequent in Asia and Africa (34) and, in endemic areas, night-blindness has been observed  
2 to be 5-25 times more frequent in pregnant women than in preschool children (35,35) indicating  
3 women=s increased vulnerability to vitamin A deficiency during times of increased requirements. Using  
4 1998 data, and assuming 59% of pregnant women and 47% of all women (37) are anemic, over 745  
5 million of the more than 1,514 million women of childbearing age (15-49 years) would be anemic.  
6 Prevalence rates for anemia are greater in Asia, where about 60% of pregnant women and 55% of non-  
7 pregnant women, and in Africa, where 51% and 42%, respectively (38), are anemic compared with  
8 35% and 20%, respectively, for Latin America (39). EPM, IDD, and iron deficiency are known to  
9 disproportionately affect females throughout infancy and childhood, as well as before and during  
10 pregnancy.

11  
12 Both the magnitude of female undernutrition and the enormous social, economic, health and  
13 development implications of poor prenatal nutrition for women and children provide a compelling  
14 rationale for systematic stronger action. Because of both the reproductive consequences and the long  
15 term effects of childhood malnutrition on adult physical and intellectual productivity, as well as the  
16 widespread impact of women=s health and nutrition on child survival, women=s productivity, family  
17 welfare, and poverty reduction in the community as a whole, securing adequate nutrition of women,  
18 particularly before and during pregnancy, is a socially and economically important goal for developing  
19 countries.

## 20 21 **CONCEPTUAL FRAMEWORK**

22 Throughout their entire life cycle, women=s health and nutrition is affected by complex social and  
23 cultural, psychological, biological, and health service-related factors that are highly interrelated. Figure 1  
24 outlines a conceptual framework, adapted from Tinker (4), which identifies the critical points for action.  
25 Specifically:

26 Social, economic, and cultural factors that include social status, female discrimination, fertility patterns  
27 (e.g., pregnancy intervals, teenage pregnancy, unplanned pregnancies), and disease exposure;

1 Individual behavior and psychological factors including dietary practices, reproductive patterns, health  
2 seeking behavior, and use of health and nutrition services;  
3 Biological factors (age of menarche, menstruation, pregnancy, and increased risk of infections); and  
4 Improved access to, quality of, and quantity (coverage) of health and nutrition services.

5  
6 To have an impact on women=s health and nutrition status, programs that are socially, economically,  
7 culturally, and biologically appropriate are needed throughout the female life cycle, beginning as early on  
8 as possible. In other words, women=s health and nutrition has to be considered as part of an inter  
9 generational continuum under the rubric of reproductive and child health, i.e., pre- and post-natal care  
10 including family planning, child survival, child development, school health, adolescent health, and so  
11 forth. This framework highlights the important role for both the public and private health services and  
12 two practical conclusions need to be emphasized. First, the consequences of women=s undernutrition  
13 on child survival and development are at least as important as the direct biological effect of  
14 undernutrition on the fetus during pregnancy and infant during lactation. Second, focusing on prenatal  
15 nutrition ignores the more fundamental problem of women=s nutrition throughout their entire life, of  
16 which prenatal nutrition is only a small albeit important contributory factor. This is significant because  
17 nutrition status, unlike disease, is cumulative over time and is not an isolated incident (40).

## 18 19 **STRATEGIES**

20 Strategies to improve prenatal nutrition need to go beyond the conventional approach of providing  
21 services to pregnant women through the traditional maternal and child health care programs. Instead, a  
22 more comprehensive life cycle approach is needed that addresses the risk factors present well before  
23 pregnancy, ideally beginning in early childhood or, at the very least, before pregnancy or before girls  
24 reach reproductive age.

25  
26 Investing in the promotion of optimal nutrition in girls during childhood is a sound strategy for affecting  
27 female nutrition because it can build up the nutritional reserves needed during periods of increased

1 nutritional demand including the adolescent growth spurt, pregnancy, and lactation. Such action should  
2 be complemented by specific programs during critical periods, e.g., adolescence, childbearing age,  
3 pregnancy and lactation. Research in Guatemala, for instance, showed that improved nutrition during  
4 early childhood had longer-term pay offs, in terms of greater stature and fat-free mass, especially in  
5 females, improved work capacity in males, and enhanced intellectual performance in both genders, than  
6 had been previously thought (41).

7  
8 Although primary health care nutrition programs are often targeted to women, particularly pregnant  
9 women, in practice the majority are primarily designed to reduce malnutrition in children. Leslie (2)  
10 makes an important distinction between being the target and being the beneficiary of a program;  
11 indeed, women have been the targets of nutrition and health programs aimed at improving fetal growth  
12 (birth weight) and/or children's growth with little attention to their own health and nutrition needs. At  
13 the program level, there is currently a move toward getting consensus that health and nutrition programs  
14 implemented well before women become pregnant, and within a life cycle perspective, will have a long  
15 term impact on both the mother and child, although data to support this are still lacking. It is also quite  
16 probable that women will be more likely to be motivated to participate in program activities that have a  
17 clear benefit for themselves as well as for their children.

## 18 19 **POLICY AND PROGRAM OPTIONS**

20 In the ideal world, policy and program options are based on a generally accepted, research-proven,  
21 conceptual framework that has been tested in an appropriate environment. Unfortunately, this has rarely  
22 been the case for prenatal nutrition in developing countries. There is an urgent need to identify the  
23 conditions and circumstances under which prenatal undernutrition, e.g., EPM or specific micronutrient  
24 deficiencies, can be prevented throughout a woman's full reproductive cycle and/or improved during  
25 pregnancy, after which the appropriate strategy can be carefully shaped to the particular situation in  
26 each individual country or setting.

1 Based on the documents reviewed, and personal experiences, the text that follows identifies some  
2 general and specific policy and program options that have either been shown to be effective or are likely  
3 to be effective, although there may be no data to support the latter. More data are needed to  
4 demonstrate the effectiveness of programs under the specific conditions that exist in most developing  
5 countries.

## 6 7 **Policy**

8 At the policy level several initiatives have been proposed (4):

9 *Broaden policy support for enhanced investments in female education.* Given the strong evidence  
10 associating higher levels of maternal education with improved child survival and nutritional status (42),  
11 and very likely with better nutritional status of women themselves, investing in female education is  
12 expected to have enormous pay offs in health, nutrition, and development (43,44). These effects are  
13 likely to be mediated through more efficient purchasing and intra household distribution of food (45), a  
14 greater propensity and more efficient use of health services (42), fewer pregnancies, and increased  
15 employment opportunities (46). It is, therefore, an important component of any policy to enhance the  
16 status of women.

17 *Strengthen legislative and other support for women=s nutrition* so as to provide universal food  
18 fortification; provide consumer price subsidies and targeted food distribution; provide labor saving  
19 devices for women; improve women=s access to agricultural extension services and credit for small-  
20 scale business; reduce discrimination against females in employment practices; encourage women=s  
21 control over family resources; remove credit restrictions against women; enact fair marriage legislation;  
22 abolish practices harmful to women=s health, such as violence against them; remove legal impediments  
23 to the effective delivery of health services for females, such as contraception and barriers to service  
24 based on age, gender or marital status; support appropriate training and delegation of responsibility,  
25 particularly for non physician health care in rural areas; and encourage private sector participation in the  
26 delivery of health services for women.

1 *Improve equity and efficiency in financing health/nutrition services for women* by selecting a  
2 package of highly cost-effective nutrition programs for public finance; establishing cost recovery  
3 schemes that target public expenditures to the poor; protecting women in poverty and removing legal  
4 impediments to the effective delivery of health services.

5  
6 *Increase women=s access to health/nutrition services* by designing delivery strategies to meet  
7 women=s needs; strengthening the health care delivery infrastructure; improving the quality of services  
8 for women; increasing the number of female health care providers; and delegating responsibilities to non  
9 physicians.

10  
11 *Integrate women into health/nutrition planning* and implementation through local health committees  
12 and women=s groups.

13  
14 *Strengthen collaboration with the private sector* through non-government organizations and for-  
15 profit providers.

16  
17 *Intensify public education* for promoting the use of health services and healthy behaviors; and  
18 advocating for both policy change and behavior modification.

19  
20 *Meet information needs* on health status indicators; designing programs based on culture-specific  
21 health needs, formative research, and program-based operations research; and monitoring and  
22 evaluating programs.

## 23 24 **Program options**

25 Women=s nutrition is expected to be equally or more strongly influenced by policies and actions  
26 intended to improve nutrition in the entire household, e.g., increased crop yields, higher income, food  
27 price subsidies, better nutrition knowledge, and/or food fortification, than those targeted solely to

1 women. Because the focus of this paper is on effective community- and household-level programs that  
2 the health system can target to women, with the emphasis on prenatal nutrition, the components that  
3 need to be considered in designing such programs are presented below.

4  
5 A comprehensive health/nutrition program: The provision of regular health/nutrition services for women  
6 require that a comprehensive program is provided, rather than single isolated programs. Although  
7 framed in the context of a life cycle approach, the program focuses on specific female life periods: pre-  
8 pregnancy, pregnancy, delivery and lactation, early childhood, adolescence, and childbearing age. An  
9 important aspect is that appropriate information, education, and communication (IEC) aimed at key  
10 behavior modifications for that life period would be given. The essential health/nutrition care program  
11 includes:

12 Prevention and management of unwanted pregnancies and management of abortion services, by  
13 improving access to birth spacing information and services, including counseling, education, and  
14 family planning. Significant efforts are being made, and substantial progress has been achieved in  
15 a number of developing countries, to reduce fertility and increase birth spacing (47). Family  
16 planning services still need to be fully integrated with other health/nutrition services for women of  
17 childbearing age. IEC family planning strategies need to incorporate women=s health/nutrition  
18 concerns. Existing service delivery channels for contraceptives can be effectively used for the  
19 provision of preventive iron supplements and other nutrition services for women.

20 Expanded health/nutrition services for non-pregnant women including adolescents. This has been a  
21 highly neglected area. Both the availability of and access to health services by females are often  
22 restricted to prenatal and delivery services, often with limited contact with health personnel,  
23 usually a few times during pregnancy and a few hours during delivery. Women=s visits to health  
24 services, either for curative or preventive child health services are excellent opportunities for  
25 health workers to tap and provide health/nutrition preventive services (education, counseling,  
26 micronutrient supplements) to women. The delivery of micronutrient and possibly even food  
27 supplements to female adolescents through the school system can also be considered.

1 Enhanced maternity care that is effective, affordable, accessible, and acceptable and includes both  
2 prenatal health and nutrition services, safe delivery, and postpartum care. The well documented  
3 increase in the coverage of prenatal services, currently over 50% in most developing countries  
4 (5), offers a unique opportunity to reach women during pregnancy with a package of health and  
5 nutrition services, including education/counseling and micronutrient supplements. About one-  
6 third of the women, however, still do not have access to good quality health services during  
7 pregnancy (Table 1) and childbirth, especially the poor and uneducated ones who live in rural  
8 areas.

9 Extended nutrition assistance to vulnerable female groups to improve overall nutrition status that  
10 includes supplementary feeding, micronutrient supplements, and food fortification. Nutrition  
11 assistance has usually been restricted to limited supplementary feeding and the distribution of  
12 iron supplements to pregnant women, rather than to all women, because of resource constraints.  
13 Providing a program of nutrition services to all women of child bearing age may be a more  
14 effective way to improve prenatal nutrition than limited prenatal programs, which are unlikely to  
15 begin early enough in pregnancy to have a significant biological impact. For example, providing  
16 long term preventive weekly iron or multi vitamin/mineral supplements to non pregnant women,  
17 ideally beginning during adolescence and/or implementing a widespread iron fortification  
18 program, may improve their iron reserves to the extent that the need for preventive daily  
19 supplementation during pregnancy to meet the increased requirements to prevent anemia could  
20 be significantly reduced.

21  
22 The key behavioral change programs include:

23 Expanded promotion of positive health and nutrition practices for females, including behavioral changes  
24 to improve maternal, infant, and early childhood feeding as well as eliminating self-inflicted  
25 female discrimination. Most health and nutrition education activities currently targeted to women  
26 focus almost exclusively on child feeding, particularly breastfeeding. There is a need to redirect  
27 some of the IEC focuses to women themselves. Concrete efforts are needed to improve

1 women=s eating practices, which is important for both their own health as well as that of their  
2 child(ren), particularly in rural areas where women endure the dual burden of moderate-to-high  
3 levels of physical work and frequent pregnancies, without noticeable increases in energy and  
4 nutrient intakes. Studies have shown that female discrimination in developing countries may be  
5 to a large extent self-inflicted (48) as a result of a self-sacrificing@ role that dictates they must  
6 meet their own needs last, e.g., increased female wages have been associated with improved  
7 nutrient intakes of most household members except for that of women themselves (49). IEC  
8 activities targeted to women could be specifically designed to reduce and ultimately remove  
9 these attitudes.

10 Delay childbearing among adolescents. First births can be delayed by postponing age of marriage and  
11 the onset of sexual activity and by using effective methods of family planning. This requires  
12 culturally-sensitive IEC programs for changing individual and society motivations for early  
13 childbearing as well as enhanced opportunities for girls= formal education.

14 Remove gender discrimination. Enhancing the social status of women will require specific policies and  
15 intensive IEC efforts addressed to the population as a whole as well as to women in the  
16 community, at schools, and in the work place.

17  
18 The implementation of a comprehensive health/nutrition program may not be feasible due to financial and  
19 resource limitations. Although a comprehensive approach would be expected to lead to significant and  
20 sustainable improvements in women=s nutrition, hence prenatal nutrition, a minimum program can be  
21 tailored to the local situation given the resources available. It should be emphasized, however, that  
22 nutrition programs restricted to the limited provision of health and nutrition services during pregnancy  
23 may not make a significant difference in the health and nutrition status of mother and child.

24  
25 A minimum health/nutrition program: Given that financial and resource constraints frequently limit the  
26 number and scope of programs, the >minimum package= of key nutrition programs that Baker et al.  
27 (50) identified has been modified and expanded to specify those required to improve the nutrition of

1 adolescent girls and pregnant and lactating women. The purposes of this minimum program are to delay  
2 first pregnancy, improve knowledge and practices related to reproductive health and nutrition, and to  
3 improve access to quality prenatal and postpartum services. The following minimum programs are  
4 recommended for the different physiological groups:

5  
6 *For adolescent girls:*

7 Improve access to family planning and reproductive health services.

8 Provide nutrition education through schools, religious organization, and market/work places as well as  
9 health promotion that is based on research that has identified cultural and institutional constraints  
10 and detrimental attitudes and practices.

11 Prevent and treat sexually-transmitted diseases, parasites, and micronutrient deficiencies.

12 Provide supplementary food through school meals to induce catch-up growth and maximize the puberal  
13 growth spurt; increase school attendance; and serve as an excellent opportunity for  
14 health/nutrition education (51).

15  
16 *For pregnant and postpartum women:*

17 Service delivery:

18 Provide iron/folate supplements during pregnancy.

19 Monitor pregnancy weight gain.

20 Provide anti-malarials, anti-helminths, and other micronutrient supplements, where appropriate, including  
21 post partum vitamin A in deficient areas.

22 Prompt diagnosis and treatment of illness.

23 Provide and target supplementary food to at-risk and undernourished women, using appropriate  
24 indicators for screening, beginning as early as possible during pregnancy.

25 A review of randomized controlled trials on the effectiveness of nutrition programs in pregnancy to  
26 reduce IUGR found that only balanced protein-energy supplementation was effective (3). The authors  
27 raised concern about the dearth of data to support recommended nutritional programs during

1 pregnancy, some of which are widely used even among women with no evidence of nutrition  
2 deficiencies. Although the above review was limited to the effects of programs on IUGR, it does  
3 highlight the need for better monitoring and evaluation of prenatal programs as well as the need for  
4 further operations research on how to improve the nutrition of women in general.

5  
6 Health promotion:

7 Provide nutrition, breastfeeding, family planning, and HIV counseling and disease prevention education.

8 Involve men and other family members in behavior modification activities so that they too increase the  
9 demand for health services for girls and women.

10  
11 In order to realize the goal of improving women=s nutrition, 10 actions are critical to effectively  
12 implement a package of health and nutrition programs targeted to women. These are:

13  
14 1. *Integrate existing programs within health service.* By integrating nutrition programs within the  
15 health service, complementary health care activities can be clustered at the same place and time, which  
16 will reduce service delivery costs for both the providers and clients. Opportunities exist for better  
17 integration of all MCH activities, child survival programs, supplementary feeding programs, safe  
18 motherhood, and family planning and other reproductive health activities.

19  
20 2. *Combine community- and facility-based health and nutrition care.* The provision of health  
21 services alone is not enough to improve women=s nutrition. Community-based programs can  
22 complement regular health services by focusing on nutrition monitoring and supplementation, family  
23 planning, hygiene practices, infection prevention and control, and identification and referral of  
24 complicated illness. Community health care providers including community health committees, health  
25 workers, traditional birth attendants and practitioners, and mobile outreach teams from health services  
26 need to be trained, supervised, and supported by health service staff. Government policies and  
27 programs, however, are more likely to influence the coverage and effectiveness of formal health and

1 nutrition services than the community-based care provided by untrained community members and  
2 traditional practitioners who are often the major source of advice and counseling on nutrition and health  
3 care for women in developing countries.

4  
5 *3. Combine public and private sector health/nutrition service delivery systems.* Despite the  
6 substantial improvement in health care coverage in recent decades, the public health sector in most  
7 developing countries still lacks the material and human resources required for providing sufficient  
8 coverage of health care to the majority of the population, let alone for those at greatest risk of ill health  
9 and malnutrition, who are often not easily accessible geographically and economically.

10  
11 Compounding the limited number of service delivery points is the fact that health and nutrition services in  
12 developing countries, particularly preventive services for women, are largely under used. This has been  
13 attributed to women=s preference for seeking care from traditional health care providers, poor  
14 accessibility to services, poor quality of care, lack of information, relatively high costs, lack of women=s  
15 decision-making power and control of family income, and the opportunity cost of women=s time (52).  
16 While removing these constraints, so as to increase the use of health services by women is a clear  
17 priority, delivery channels outside the regular health system need to be identified and tapped, e.g.,  
18 traditional health care providers, secondary schools, women=s groups and cooperatives, and factories.

19  
20 *4. Use a risk approach for targeting and referral.* Risk assessment is seen as a logical tool for  
21 rationalizing service delivery to ensure special care for those in need. Experience has shown, however,  
22 that a formal risk approach can be problematic and divert scarce resources away from the majority of  
23 women with poor pregnancy outcomes. WHO (53) has proposed that, because of the absence of data  
24 to demonstrate the effectiveness of screening for high-risk pregnancies, risk assessment should not be  
25 relied on as the sole basis for matching the requirements for and provision of maternity services.  
26 Because there are often a number of objectives to be included in risk assessments, it is difficult to  
27 develop a simple tool as a panacea. It has been shown, for example, that the effectiveness of

1 supplementary feeding to improve fetal growth (birth weight) is greater when targeted to undernourished  
2 pregnant women identified through anthropometric indicators (54); thus, anthropometric indicators can  
3 be useful if birth weight is the outcome but will not be useful for identifying women at risk of pre-  
4 eclampsia.

5  
6 *5. Organize health services by levels of care.* Stratifying health care provision by levels of care is both  
7 cost-efficient and improves the quality of care. This is because responsibilities can be more clearly  
8 defined and a functional bi-directional referral system, e.g., referring the severely anemic, for specialized  
9 care at more complex facilities with feedback to lower levels, can be put in place.

10  
11 *6. Train and motivate health personnel to deliver nutrition services.* Good quality services imply  
12 that health care providers have adequate clinical and counseling skills and are sensitive to women=s  
13 needs. This requires appropriate initial training and periodic retraining and updating, as well as a quality-  
14 based system that ensures both health care providers and their supervisors are sufficiently motivated to  
15 do a good job.

16  
17 *7. Provide systematic IEC.* IEC is essential to any nutrition program and has two major purposes.  
18 First, to disseminate information, sensitize the populace, and mobilize both the providers and recipients  
19 to support policies and programs aimed at enhancing the social status of women and the provision of  
20 health, nutrition, and educational services for them. Second, to promote individual-level behavior  
21 changes to increase the use of and demand for available health services for women as well as to  
22 improve women=s (not only children=s) eating and health practices. Changing women=s eating habits  
23 would appear to be one of the most difficult things to do and there is no evidence that efforts to do so  
24 have been effective on a long-term basis.

25  
26 *8. Conduct cost-effectiveness analysis for different programs and delivery systems.* Cost-  
27 effectiveness analysis is an important tool for identifying the appropriate mix of programs and service

1 delivery mechanisms that will achieve specific nutrition objectives. For example, the generally accepted  
2 view that prenatal care was strongly associated with improved pregnancy outcomes in the early 1980s  
3 led to the question of whether prenatal care was cost-effective. The ensuing U.S. Institute of  
4 Medicine=s review showed that for every dollar spent on prenatal care, \$3.38 was saved in direct  
5 medical care expenditures (55).

6  
7 *9. Identify opportunities to reach adolescent girls.* This is a relatively new, challenging, but promising  
8 area for which there are some small-scale but highly relevant experiences (56). As women=s education  
9 levels rise, increased opportunities for programs targeted to adolescents through the school system will  
10 become available.

11  
12 *10. Improve basic supplies for prenatal and delivery care.* Good quality care also requires that  
13 service facilities have the necessary equipment and supplies, including iron/folate supplements (57,58)  
14 This is a frequently neglected area in developing countries that urgently needs systematic attention.

## 15 16 **PROSPECTS AND CHALLENGES**

17 The **prospects** to improve maternal nutrition are contingent upon there being political commitment as  
18 well as national capacity to develop and implement sound policies and programs. Policy decisions and  
19 program implementation will be affected by the context of nutritionally relevant global trends that are  
20 characterized, on the positive side, by increased women=s education, delayed age of marriage,  
21 declining fertility rates, smaller families, longer life expectancy, greater health system coverage, and  
22 increased women=s participation in the labor force and, on the negative side, by severe resource  
23 constraints, slow economic growth, poor use of available health and nutrition services by females, and  
24 slow progress to improving the social status of women in many countries.

25  
26 From a program perspective, possibly the most important factor favoring the implementation of  
27 enhanced health/nutrition services for women is the ongoing trend toward increased coverage of

1 maternal services. A recent analysis of the Demographic and Health Surveys carried out in twelve  
2 countries between 1986-1996 showed that, overall, the countries experienced a steady increase in  
3 prenatal and delivery care coverage ranging from 2-34% for prenatal care, 2-39% for tetanus  
4 immunization, and 3-79% for delivery care. Prenatal care coverage, however, fell in one country and  
5 that for delivery care declined in three (59). Quality of care was not assessed, which is important as it  
6 may not have improved significantly.

7  
8 The **challenges** ahead are not insignificant. There is little documentation on program experiences to  
9 improve prenatal nutrition, women=s food intake, and weight gain during pregnancy in developing  
10 countries. It is disappointing to note that, despite the research evidence that iron supplementation is  
11 efficacious, this relatively simple program has not been effective in reducing the prevalence of anemia  
12 among women and children (58,60). Most iron/folate supplement programs for pregnant women and  
13 young children suffer from serious operational constraints related to supply and distribution systems,  
14 access to health care services, motivation and behavior of health care providers, and compliance by the  
15 target population. Unresolved problems that affect supplement acceptability as well as compliance  
16 continue to persist and include the lack of good quality, low cost, generic supplements; suitable  
17 compounds and dispensing mechanisms (tablets, pills, syrups, liquid forms, powder); appropriate  
18 regimens (daily or intermittent) for different environments (endemic malaria and helminthes areas); and  
19 potential side effects (real or overestimated).

20  
21 Although there is little evidence that an iron supplement program works, it remains one of the few  
22 options available to improve iron status of the population and it appears to be the only program likely to  
23 meet the high iron requirements during pregnancy and early childhood (21). Operations research is  
24 moving toward testing systematic, intermittent supplementation to adolescent girls in schools and non  
25 pregnant women in the workplace in order to reduce the need for aggressive high dose supplementation,  
26 with potential side effects and low compliance, during pregnancy. This approach, however, assumes that  
27 the most at-risk adolescent girls attend school and women work in organized work settings, which is not

1 yet the case in the majority of developing countries.

2  
3 Regrettably, conceptual and implementation constraints have minimized the impact of efforts to improve  
4 women=s nutrition largely because the focus has been almost exclusively on the prenatal period (50).  
5 Many programs have been conducted as small-scale research activities or vertical interventions, or they  
6 have relied heavily on manipulating only the biological factors that influence women=s nutrition. The  
7 above approaches are difficult to scale up because of the lack of broad-based support and demand for  
8 the services. Although, as emphasized earlier, efforts to improve women=s nutrition in a sustainable way  
9 must adopt a life cycle perspective, the reality in most developing countries is that financial and resource  
10 constraints often reduce action to a few programs that tend to focus on pregnancy and to a lesser extent  
11 lactation. A stronger political commitment is needed to support women=s health and nutrition programs  
12 and to create the demand for at least a minimum package of services.

13  
14 The major challenges ahead include:

15 *Translating current knowledge into practical application* in the context of developing countries  
16 resource constraints, i.e., move from theory to practice in a resource-limited setting. Baker et al. (50)  
17 identified conceptual and implementation constraints to improvements in female nutrition that need to be  
18 addressed if women=s nutrition is to improve. The conceptual constraints include a consistent lack of  
19 political support for women=s nutrition, nutrition programs narrowly focused on pregnant women,  
20 nutrition programs usually designed as pilot projects or small-scale research activities, the lack of a  
21 consensus on the most appropriate and practical indicators of women=s nutrition, and lack of  
22 information on the cost-effectiveness of programs. The implementation constraints, which are common  
23 to health programs, include limited service delivery capacity and low utilization of existing services, poor  
24 program management, limited focuses on behavioral factors and behavior change, and inadequate  
25 training of health personnel.

26  
27 *Determining an acceptable, biologically meaningful and programmatically relevant definition of*

1 *prenatal nutrition and undernutrition among women* using anthropometric, dietary, and biochemical  
2 indicators. This is critical for problem definition, risk identification, program targeting, and monitoring  
3 and evaluation. Current indicators include anemia rates (based on hemoglobin), and women=s height,  
4 weight and weight gain, body mass index and mid upper arm circumference (61,62). There is no general  
5 consensus, however, on the use and interpretation of anthropometric indicators in pregnant and non-  
6 pregnant adult women (15,63,64). Guidelines on the application of anthropometric indicators emphasize  
7 their use as screening tools rather than for surveillance and instruments designed for the latter are still  
8 pending satisfactory validation. A related question that needs to be addressed is the  
9 identification/interpretation of maternal undernutrition in poor communities where a relatively large  
10 proportion of women are short but overweight, e.g., parts of Latin America, yet indicators of pregnancy  
11 outcomes are also not optimal.

12  
13 *Allaying women=s concern about increased weight gain and delivery complications.* A review of  
14 research from 18 developing countries on changes in dietary practices during pregnancy (65) found that  
15 food intake is consciously restricted during pregnancy because of the fear of delivery complications  
16 associated with having a large newborn. Although this concern is rational, there are no data that support  
17 it. Restricted food intakes by pregnant women can compromise their nutrition status and needs to be  
18 addressed through behavioral change programs, where appropriate.

19  
20 *Understanding better the physiological and social adaptation mechanisms during pregnancy.*  
21 There is suggestive evidence from a number of studies that pregnant women subsisting on limited energy  
22 intakes adapt to this situation through a physiological reduction in their basal metabolic rate or a  
23 reduction in their activity levels in order to conserve energy for fetal growth (66). This clearly has  
24 important program implications and will affect the use and interpretation of both nutrition indicators  
25 during pregnancy and the guidelines on energy intakes to sustain adequate weight gain. Irrespective of  
26 the physiological adaptation the body may make, Naeye (67) has shown that a woman=s nutritional  
27 stores as she enters pregnancy is a more important determinant of perinatal mortality than pregnancy

1 weight gain per se.

2  
3 *Reducing persistent problems with health service development and access to quality prenatal*  
4 *care services.* Prospects for steady increases in the availability of and access to quality health services  
5 for women in developing countries are uncertain, given current financial constraints, although great  
6 efforts have been made toward improving the efficiency of health care expenditures, enhancing coverage  
7 within the existing resource constraints and, to a much lesser extent, improving access for the poor  
8 uneducated women especially those in the rural areas.

9  
10 Problems with access and quality of prenatal care services, however, are not exclusive to developing  
11 countries. In an attempt to understand the poor standing of the United States in the international rankings  
12 of infant mortality rates, a recent situation analysis (68) identified the need for increased access to  
13 prenatal care, redirecting the content of prenatal care, understanding the behaviors of pregnant and  
14 lactating women, and facilitating changes in the delivery of nutritional care. The new guidelines for the  
15 delivery of nutritional care issued by the U.S. Institute of Medicine (69) address the predisposing factors  
16 that inhibit health professionals from including nutritional care in their practices, emphasize a more  
17 culturally sensitive approach to care, and recommend new tools for screening and targeting of prenatal  
18 programs.

19  
20 Women=s nutrition remains a global issue with common problems and constraints that will only be  
21 resolved if women=s health and nutrition are put in the context of the life cycle rather than in discrete  
22 compartments. This includes addressing the underlying social and cultural determinants of behaviors  
23 connected to women=s nutrition at all stages of the life cycle.

24

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4

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**Figure 1. Determinants of women=s health and nutritional status**

Social, economic and  
cultural factors

Individual behavior and  
psychological factors

Women=s health and  
nutrition through life

Health and nutrition  
services

Biological factor