



## **Effective Nutritional Practices and Policies for Childbearing and Childrearing Women**

*ELIZABETH REIFSNIDER, PhD*

*University of Texas Medical Branch, Galveston, USA*

*(Published online April 4, 2003)*

*(Revised January 10, 2006)*

### **Topic**

*Nutrition and pregnancy*

### **Introduction**

Adequate nutrition in women is one of the most crucial components of a healthy society. Many of the chronic, ongoing problems that women experience in the areas of health, employment, and productivity can be alleviated if they receive adequate nutrition throughout their life cycle. This paper will present the programs that reduce the prevalence of malnutrition in women at a macro (or societal) level, or that are effective at a micro (or individual) level, and those that emphasize the importance of maternal nutrition from a life-course perspective.

### **Subject Relevance**

Poor nutrition in women creates a self-perpetuating cycle. Infants born with low birth weight or presenting with retarded growth are at risk for higher-than-average rates of morbidity and mortality during infancy and childhood, and rate lower-than-average in their productivity as adults.<sup>1,2</sup> Women who were malnourished as children, or who are currently malnourished as evidenced by underweight Body Mass Index (BMI), enter their reproductive years with inadequate nutritional stores, a strong predictor of low infant birth weight and increased infant mortality.<sup>3,4</sup> Nutritional supplementation in childhood has been shown to have a significant effect not only on a girl's growth, but also on her subsequent children.<sup>5</sup> Stunted growth in infants (the strongest marker for inadequate nutritional status) is more closely related to inadequate prenatal nutrition in mothers than it is to postnatal environmental factors.<sup>6</sup> In addition, malnourished women with short inter-pregnancy intervals enter each pregnancy with depleted physical resources, thereby perpetuating the cycle of mother-child malnutrition.<sup>7</sup>

### **Problems**

No single method for ensuring adequate nutrition to childbearing women has been identified to date. Indeed, nutritional counselling for malnourished women during pregnancy or during inter-pregnancy intervals has not been shown to be an effective method for reducing malnutrition.<sup>8</sup> The supplemental ingestion of important nutrients such as iron, folate, and calcium is contingent upon the availability of supplements, the purchasing power of poor women, and their toleration of side effects from some

supplements such as iron.<sup>9</sup> Some authors argue for a social ecological approach to ensure that reproductive-aged women receive sufficient folic acid supplementation prior to conception and during the first trimester.<sup>10</sup> The diets of pregnant women have been shown to have no significant differences, in regards to micronutrients, from the diets of non-pregnant women; pregnant women also have inadequate knowledge of general and prenatal nutrition.<sup>11,12</sup> The reduction of protein energy malnutrition (PEM) is contingent upon adequate supplies of high-quality food that may also be beyond the purchasing power of poor families. It is difficult for impoverished, malnourished women to achieve adequate nutrition, especially if they lack access to education that could increase their knowledge of health and nutrition.

### **Research Context**

Research has been conducted regarding the improvement of women's nutrition at the macro (or societal) level as well as the micro (or individual) level. At this time, the majority of studies conducted have been pilot projects or program projects, with little research regarding large, society-wide programs for women.<sup>13</sup> A recent review of the Special Supplemental Nutrition Program for Women, Infants and Children (WIC program, a large program in the United States) examining the records of 60,731 pregnant women, demonstrates that WIC has notable cost-savings outcomes for infants.<sup>14</sup> However, the documented positive outcomes for mothers were limited to a reduction in days of postpartum hospitalization. Other authors report that WIC has a positive impact on children's health, but maternal health outcomes are rarely reported, and have been confined to reduction in iron deficiency anemia.<sup>15-17</sup> Most often, nutrition programs targeting women have used infant outcomes as their measures of success rather than the health outcomes of their women subjects.<sup>18</sup>

### **Recent Research Results**

Mora and Nestel<sup>18</sup> have provided a summary of policy initiatives in developing countries that can improve prenatal nutrition. They concluded that increasing policy support for women's education, legislating for women's nutrition, financing health services for women, and integrating women into the planning systems for health care and nutrition services can effectively reduce the life cycle of malnutrition among women and children. Studies examining the effects of micronutrient supplementation during pregnancy have demonstrated positive effects in infant weight, size, and length of gestational age,<sup>19-22</sup> but few studies have examined the impact of supplementation on maternal health.<sup>23</sup> A comprehensive view of women's health and nutrition should acknowledge the importance of women's education as the primary step in reducing malnutrition.<sup>24,25</sup> Lengthening inter-pregnancy intervals by providing contraception in a culturally sensitive manner can also reduce the depletion of a woman's nutritional stores due to frequent pregnancies. Family planning services must therefore be integrated into postpartum services. In addition, support must be provided for breastfeeding—an important contributor to child survival in developing countries.<sup>26</sup>

Similarly, nutritional services should be integrated into health care services. Existing programs that target women and children's health should also be integrated, so that a woman can receive care for herself, her children, and nutritional supplementation during

one visit or in one locale. These programs should be desired and supported by the community, and the community should have a say in the services provided through these programs. Children's diets tend to resemble their mothers,<sup>23</sup> so obtaining diet histories for either a mother or child may be a feasible way to screen for adequate nutrition for the maternal child pair. Dietary counselling and nutrition information also needs to be provided in a culturally competent manner, as research has demonstrated that grandmothers, eating customs, and locally available foods often determine what foods are consumed by mothers and children.<sup>27,28</sup>

The most efficient and effective way to increase the levels of iron, folate, and calcium in women appears to be through the nutritional supplementation of certain foods in their diets.<sup>29</sup> Research conducted in Denmark demonstrated that a minority of pregnant women took 400 mcg of folic acid during the peri-conceptual period. The authors conclude that folic acid fortification of foods is the best way to reach a majority of women.<sup>30</sup> Since 1998, all enriched grains and cereals in the United States have been fortified with 140 micrograms of folate per 100 grams of grains or cereal.<sup>31</sup> In fact, it can now be said that the prevalence of iron-deficiency anaemia in women of reproductive age has been reduced largely through the nutritional supplementation of breakfast cereals in the U.S.<sup>9,32</sup> In England, low-income mothers who consumed breakfast cereals fortified with folate and iron were more than twice as likely to have an adequate diet as a group of low-income mothers who did not consume breakfast cereals.<sup>8</sup> Food manufacturers are also adding calcium to a variety of foods (e.g., orange juice) in the U.S., allowing women who consume inadequate amounts of dairy products to increase their calcium consumption.

### **Fetal programming**

Fetal programming is the hypothesis that maternal and fetal nutrition can have a profound, lifelong effect on the health of the child as an adult.<sup>33-37</sup> Much of the recent literature concerning women's nutrition during pregnancy is focused on the impact of the maternal diet on the intra-uterine environment, and the effect that in turn has on the developing fetus. Fetal nutritional deprivation is seen as a strong stimulus for development of heart disease, hypertension, and type 2 diabetes,<sup>38,39</sup> structural defects of the hippocampus,<sup>40</sup> defects in immune function,<sup>41</sup> and development of depression in later life.<sup>34</sup> Some researchers think that efforts to address the increasing obesity epidemic may be most effective if they are addressed through public-health policies ensuring adequate nutrition to all women, and not from an individual-focused approach.<sup>42-44</sup>

### **Conclusions**

Reducing malnutrition and avoiding obesity among childbearing women should not be confined to interventions during pregnancy. A life cycle approach to women's nutrition will acknowledge that adequate nutrition for women is not only important to their health but also to the health of their children and families. Women should be assessed for diet adequacy during family planning visits (e.g., haemoglobin measurement, diet history, BMI measurement); education should be provided in elementary and secondary schools on nutrition and health care, and women should be advised to space pregnancies at least 18 to 24 months apart to allow their bodies to recover their nutritional stores.<sup>6</sup> Pregnant adolescents are an especially vulnerable group as their risk of maternal mortality is two to

five times greater than that of older women.<sup>45</sup> The most effective dietary interventions for reducing malnutrition center on public health approaches such as food fortification, comprehensive nutritional supplementation programs for all low-income women, community-based provision of health care, and education for all about the importance of nutrition. The most effective approaches for reduction of obesity focus on public-health infrastructure issues such as promotion of physical activity in the environment, availability of high quality foods at fast food venues and vending machines, and provision of low calorie beverages.<sup>46</sup>

### **Implications for Development and Policy**

In the US, lack of political support for a broad-based approach to nutrition has hampered the practical application of research. The provision of high quality nutrition for women during their life cycle should be seen as an investment in the health of the population and not just a method to increase the birth weights of infants during pregnancy. The fetal programming hypothesis supports the view that fetal under or over nutrition will impact obesity and levels of chronic diseases for generations in the future. Further support for research is needed to define adequate diets for non-pregnant, pregnant, lactating, and postpartum women. More research is also required to determine how anthropometrics and laboratory values should be used as indicators of malnutrition or over nutrition. Political support is necessary to address the disparities in nutrition found in wealthy, developed countries and to create culturally sensitive methods of delivering nutritional services. Behavioural studies must be conducted to examine women's eating patterns and determine effective ways of changing dietary habits. Finally, as policy is often driven by program cost, nutritional programs must integrate methods of cost analysis to demonstrate the cost effectiveness of providing adequate nutrition for women throughout their life cycles.

## REFERENCES

1. Martorell R, Rivera J, Kaplowits H, Pollitt E. Long-term consequences of growth retardation during early childhood. In: Hernandez M, Argente J, eds. *Human growth: basic and clinical aspects*. Amsterdam, Netherlands: Excerpta Medica, New York; 1992:143-149.
2. Merchant KM, Kurz, KM. Women's nutrition through the life cycle: social and biological vulnerabilities. In: Koblinsky MA, Timyan J, Gay J, eds. *The health of women: a global perspective*. Boulder, Colo: Westview Press; 1993:63-90.
3. World Health Organization. *Coverage of maternity care: a listing of available information*. 4<sup>th</sup> ed. Geneva, Switzerland: World Health Organization; 1996.
4. Hinderaker SG, Olsen BE, Bergsjø PB, Gasheka P, Lie RT, Kvale G. Perinatal mortality in northern rural Tanzania. *Journal of Health Population and Nutrition* 2003;21(1):8-17.
5. Stein AD, Barnhart HX, Hickey M, Ramakrishnan U, Schroeder DG, Martorell R. Prospective study of protein-energy supplementation early in life and of growth in the subsequent generation in Guatemala. *American Journal of Clinical Nutrition* 2003;78(1):162-167.
6. Schmidt MK, Muslimatun S, West CE, Schultink W, Gross R, Hautvast JGAJ. Nutritional status and linear growth of Indonesian infants in West Java are determined more by prenatal environment than by postnatal factors. *Journal of Nutrition* 2002;132(8):2202-2207.
7. Gonzalez-Cossio T, Habicht JP, Rasmussen KM, Delgado HL. Impact of food supplementation during lactation on infant breast-milk intake and on the proportion of infants exclusively breast-fed. *Journal of Nutrition* 1998;128(10):1692-1702.
8. Doyle W, Srivastava A, Crawford MA, Bhatti R, Brooke Z, Costeloe KL. Inter-pregnancy folate and iron status of women in an inner-city population. *British Journal of Nutrition* 2001;86(1):81-87.
9. Beard JL. Effectiveness and strategies of iron supplementation during pregnancy. *American Journal of Clinical Nutrition* 2000;71(5 suppl):1288S-1294S.
10. Quinn LA, Thompson SJ, Ott MK. Application of the social ecological model in folic acid public health initiatives. *JOGNN – Journal of Obstetric Gynecologic and Neonatal Nursing* 2005;34(6):672-681.
11. Pick ME, Edwards M, Moreau D, Ryan EA. Assessment of diet quality in pregnant women using the Healthy Eating Index. *Journal of the American Dietetic Association* 2005;105(2):240-246.
12. Fowles ER. Comparing pregnant women's nutritional knowledge to their actual dietary intake. *MCN - American Journal of Maternal Child Nursing* 2002;27(3):171-177.
13. De Onis M, Villar J, Gulmezoglu M. Nutritional interventions to prevent intrauterine growth retardation: evidence from randomized control trials. *European Journal of Clinical Nutrition* 1998;52(suppl 1):S83-S93.
14. Bitler MP, Currie J. Does WIC work? The effects of WIC on pregnancy and birth outcomes. *Journal of Policy Analysis and Management* 2005;24(1):73-91.

15. Kowaleski-Jones L, Duncan G. The effects of WIC on children's health and development. *Poverty Research News* 2001;5(2):6-7.
16. Swensen AR, Harnack LJ, Ross JA. Nutritional assessment of pregnant women enrolled in the Special Supplemental Program for Women, Infants, and Children (WIC). *Journal of the American Dietetic Association* 2001;101(8):903-908.
17. Pehrsson PR, Moser-Veillon PB, Sims LS, Sutor CW, Russek-Cohen E. Postpartum iron status in nonlactating participants and nonparticipants in the Special Supplemental Nutrition Program for Women, Infants, and Children. *American Journal of Clinical Nutrition* 2001;73(1):86-92.
18. Mora JO, Nestel PS. Improving prenatal nutrition in developing countries: strategies, prospects, and challenges. *American Journal of Clinical Nutrition* 2000;71(5 suppl):1353S-1363S.
19. Osrin D, Vaidya A, Shrestha Y, Baniya RB, Manandhar DS, Adhikari RK, Filteau S, Tomkins A, Costello AMD. Effects of antenatal multiple micronutrient supplementation on birthweight and gestational duration in Nepal: double-blind, randomised controlled trial. *Lancet* 2005;365(9463):955-962.
20. Ramakrishnan U, Gonzalez-Cossio T, Neufeld LM, Rivera J, Martorell R. Multiple micronutrient supplementation during pregnancy does not lead to greater infant birth size than does iron-only supplementation: a randomized controlled trial in a semirural community in Mexico. *American Journal of Clinical Nutrition* 2003;77(3):720-725.
21. Merialdi M, Caulfield LE, Zavaleta N, Figueroa A, Costigan KA, Dominici F, Dipietro JA. Randomized controlled trial of prenatal zinc supplementation and fetal bone growth. *American Journal of Clinical Nutrition* 2004;79(5):826-830.
22. Friis H, Gomo E, Nyazema N, Ndhlovu P, Krarup H, Kaestel P, Michaelsen KF. Effect of multimicronutrient supplementation on gestational length and birth size: a randomized, placebo-controlled, double-blind effectiveness trial in Zimbabwe. *American Journal of Clinical Nutrition* 2004;80(1):178-184.
23. Lee JI, Lee JA, Lim HS. Effect of time of initiation and dose of prenatal iron and folic acid supplementation on iron and folate nutriture of Korean women during pregnancy. *American Journal of Clinical Nutrition* 2005;82(4):843-849.
24. Briggs N. Illiteracy and maternal health: educate or die. *Lancet* 1993;341(8852):1063-1064.
25. Wolfe BL, Behrman JR. Women's schooling and children's health. Are the effects robust with adult sibling control for the women's childhood background? *Journal of Health Economics* 1987;6(3):239-254.
26. Postpartum care of the mother and newborn: A practical guide. Technical Working Group, World Health Organization. *Birth-Issues in Perinatal Care* 1999;26(4):255-258.
27. Andersen LT, Thilsted SH, Nielsen BB, Rangasamy S. Food and nutrient intakes among pregnant women in rural Tamil Nadu, South India. *Public Health Nutrition* 2003;6(2):131-137.
28. Macharia CW, Kogi-Makau W, Muroki NM. Dietary intake, feeding and care practices of children in Kathonzwi division, Makueni District, Kenya. *East African Medical Journal* 2004;81(8):402-407.

29. Hamaoui E, Hamaoui M. Nutritional assessment and support during pregnancy. *Gastroenterology Clinics of North America* 2003;32(1):59-121.
30. Knudsen VK, Orozova-Bekkevold I, Rasmussen LB, Mikkelsen TB, Michaelsen KF, Olsen SF. Low compliance with recommendations on folic acid use in relation to pregnancy: is there a need for fortification? *Public Health Nutrition* 2004;7(7):843-850.
31. Bailey LB. New standard for dietary folate intake in pregnant women. *American Journal of Clinical Nutrition* 2000;71(5 suppl):1304S-1307S.
32. Recommendations to prevent and control iron deficiency in the United States. Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly Report. Recommendations and Reports* 1998;47(RR-3):1-29.
33. Huxley RR, Neil HAW. Does maternal nutrition in pregnancy and birth weight influence levels of CHD risk factors in adult life? *British Journal of Nutrition* 2004;91(3):459-468.
34. Bellingham-Young DA, Adamson-Macedo EN. Foetal origins theory: Links with adult depression and general self-efficacy. *Neuroendocrinology Letters* 2003;24(6):412-416.
35. Jones JH. Fetal programming: Adaptive life-history tactics or making the best of a bad start? *American Journal of Human Biology* 2005;17(1):22-33.
36. Ross MG, Desai M. Gestational programming: population survival effects of drought and famine during pregnancy. *American Journal of Physiology - Regulatory Integrative and Comparative Physiology* 2005;288(1):R25-R33.
37. Hales CN, Ozanne SE. The dangerous road of catch-up growth. *Journal of Physiology – London* 2003;547(1):5-10.
38. Armitage JA, Taylor PD, Poston L. Experimental models of developmental programming: consequences of exposure to an energy rich diet during development. *Journal of Physiology – London* 2005;565(1):3-8.
39. Lau C, Rogers JM. Embryonic and fetal programming of physiological disorders in adulthood. *Birth Defects Research. Part C, Embryo Today* 2004;72(4):300-312.
40. Gomez-Pinilla F, Vaynman S. A “deficient environment” in prenatal life may compromise systems important for cognitive function by affecting BDNF in the hippocampus. *Experimental Neurology* 2005;192(2):235-243.
41. McDade TW. Life history, maintenance, and the early origins of immune function. *American Journal of Human Biology* 2005;17(1):81-94.
42. Kuzawa CW. Fetal origins of developmental plasticity: are fetal cues reliable predictors of future nutritional environments? *American Journal of Human Biology* 2005;17(1):5-21.
43. Moore V, Davies M. Nutrition before birth, programming and the perpetuation of social inequalities in health. *Asia Pacific Journal of Clinical Nutrition* 2002;11(Suppl 3):S529-S536.
44. James WP. Will feeding mothers prevent the Asian metabolic syndrome epidemic? *Asia Pacific Journal of Clinical Nutrition* 2002;11(Suppl 3):S516-S523.
45. Tinker A, Koblinsky MA. *Making motherhood safe*. Washington, DC: World Bank;1993.

46. U.S. Food and Drug Administration. FDA proposes action plan to confront nation's obesity problem. Available at: <http://www.fda.gov/oc/initiatives/obesity/>. Accessed February 14, 2007.

To cite this document:

Reifsnider E. Effective nutritional practices and policies for childbearing and childrearing women. Rev ed. In: Tremblay RE, Barr RG, Peters RDeV, eds. *Encyclopedia on Early Childhood Development* [online]. Montreal, Quebec: Centre of Excellence for Early Childhood Development; 2006:1-8. Available at: [http://www.child-encyclopedia.com/documents/ReifsniderANGxp\\_rev.pdf](http://www.child-encyclopedia.com/documents/ReifsniderANGxp_rev.pdf). Accessed [insert date].

Copyright © 2003-2006