

Prenatal Special Supplemental Nutrition Program for Women, Infants, and Children Participation

A Step Toward Human Capital Development

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The first 1000 days (conception to age 24 months) represent a foundational period for lifelong health, well-being, and productivity linked to development of human capital (the knowledge, skills, and competencies that influence individual productivity). Prenatal stress and lack of adequate nutrients can disrupt fetal physiologic processes, leading to epigenetic changes that can alter subsequent health and functioning.¹ Global initiatives, including the United Nations' Sustainable Development Goals and Global Strategy for Women's, Children's and Adolescent's Health, recognize the positive effect that ensuring infant health has on entire societies.

The effect of maternal health and nutrition on infants' early health and development begins prenatally, even prior to conception. Maternal nutritional risks, such as anemia, can undermine fetal development. Provision of prenatal iron and folic acid supplementation has led to improvements in both maternal and infant health. Yet many women are not receiving adequate nutrition education during pregnancy, often owing to clinicians' lack of time, resources, and relevant training, as illustrated in a review of 25 studies² from high-income countries including the United States.

To address maternal and infant health and development in the United States, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established through federal legislation in 1975 and is now included in the Healthy Hunger-Free Kids Act of 2010. The program is administered through the US Department of Agriculture, and following annual congressional budgetary appropriations, grants are given to the states. By targeting pregnant and postpartum women, infants, and children younger than 5 years, WIC is intended to intervene at a critical time of children's growth and development. Eligibility is based on economic status (less than 185% of the US Poverty Income Guidelines or enrollment in other federal means-tested assistance programs) and nutritional risk (eg, anemia, underweight, or not consuming a healthy diet). Participants receive nutrition counseling, supplemental foods that include nutrients lacking in the target population, and referrals for needed health and social services. The program has increased since its introduction in 1975; in 2018, federal costs for WIC approached \$5.3 billion and an estimated 6.9 million participants received monthly benefits.³

However, many WIC-eligible pregnant and postpartum women do not participate in the program. Of the 15.1 million women,

infants, and children who were WIC eligible in 2015, only 7.9 million received benefits, for a national coverage rate of 53%.³ For infants, coverage rates were 77%. For pregnant and postpartum women, coverage rates were 46% and 69%, respectively, illustrating a gap between availability of program benefits and use.

In 2009, the US Department of Agriculture introduced new food packages to address the changing nutritional needs of women and children, reflecting concerns about excess weight gain and recognizing the increasing cultural diversity of the population. With guidance from the Institute of Medicine (now the National Academy of Science), the revised package is more aligned with the Dietary Guidelines for Americans and includes cash value vouchers for fruits and vegetables, new whole-grain products, lower-fat content of dairy foods, and reduced juice quantities. Evaluations of the original WIC program (prior to the 2009 revision) have been positive and linked with reductions in low birth weight (LBW), prematurity, and iron deficiency.⁴

Evaluations of the 2009 food package revisions have also been positive: availability and visibility of healthier food increased in WIC-authorized stores⁵; WIC participants purchased smaller amounts of juice, whole milk, and cheese, and greater amounts of lower-fat milk, whole grains (bread and brown rice), and fruits and vegetables⁶; WIC-participating families reported satisfaction with the changes⁷; and children's diet quality based on the 2010 Healthy Eating Index improved.⁸ However, prior to the Hamad et al study,⁹ evaluations of the WIC revisions were conducted primarily by pre-2009 vs post-2009 comparisons, and the association with perinatal health was unknown.

Most evaluations of federal programs, such as WIC, have compared participants with nonparticipants, a strategy vulnerable to selection bias, potential cohort differences, or temporal trends. Hamad et al⁹ contribute to science and policy by comparing differences between pregnant women receiving WIC benefits prior to and following 2009 using non-WIC recipients as a counterfactual. By analyzing more than 2.4 million linked birth certificate and hospital discharge data from California from 2007 to 2012, they found that WIC participation was associated with post-2009 reductions in preeclampsia; in excess maternal gestational weight gain; and in small-for-gestational-age (SGA) infants, large-for-gestational-age infants, and LBW infants. Using both maternal and infant covariates bolstered their conclusions that the revised WIC food package improved both maternal and perinatal health.

Evaluation of policy effects can be strengthened by using additional designs that yield findings comparable with random-

ized clinical trials (RCTs), such as comparative interrupted time series analysis or regression discontinuity,¹⁰ particularly when RCTs are not feasible or ethical. Leveraging advances in design and analytical strategies to examine both targeted and distal benefits of policies is essential to justify the continued investment in federal assistance programs such as WIC.

Given the large sample size, Hamad et al⁹ were able to conduct subgroup analyses, revealing racial/ethnic differences in birth weight and in associations between WIC participation and birth weight. Not only have racial/ethnic differences been documented in the national prevalence of LBW infants (7.0% among non-Hispanic white individuals, 7.4% among Hispanic individuals, and 13.9% among Non-Hispanic black individuals in 2017¹¹), but LBW is also influenced by maternal health, socioeconomic status, access to prenatal care, and community factors.¹² Thus, improvements in maternal nutrition, along with early prenatal care, are important components in the reduction of prenatal growth restriction and LBW, but greater reductions in adverse birth outcomes will require consideration of additional factors.

Future research related to WIC could address at least 3 issues. First, the findings from the Hamad et al study⁹ could be extended by identifying subgroups of pregnant women who are most likely to benefit from the revised WIC food package. For example, a meta-analysis of 17 prenatal supplementation trials¹³ found that the most salient benefits of reductions in LBW and SGA births were seen among women with nutritional risk factors (ie, anemia) and when women received intervention prior to 20 weeks' gestation. Likewise, pregnant women with nutritional risk factors, such as anemia or food insecurity, or who enroll in WIC early in their pregnancy may experience the greatest benefits.

Second, the underenrollment of pregnant women in WIC is a concern because many women are not receiving benefits shown to improve maternal and infant health. Although the

American Pregnancy Association recommends that prenatal care begin by 8 weeks following the last menstrual period, many women delay in accessing prenatal care. Barriers to enrollment in prenatal care and WIC include structural issues (eg, clinic location and policies, long wait times, language and attitudes of clinic staff and health care professionals, and lack of child-friendly facilities), as well as maternal and societal barriers (eg, medical procedures, apprehension about disclosing the pregnancy, depression, unintended pregnancy, and a belief that prenatal care is unnecessary).^{14,15} In addition, in the current immigration climate, women who are undocumented may hesitate to enroll in federal programs, although WIC does not require proof of citizenship. Implementation research involving pregnant women and health care clinicians can be designed to identify barriers to WIC enrollment and develop strategies to improve WIC coverage, guarantee equal access across all racial and ethnic groups and states, and ensure the provision of culturally appropriate foods and culturally sensitive health and nutrition counseling.

Third, the benefits of promoting maternal and infant health affect the entire society by reducing health care costs, ensuring that infants avoid the negative health and developmental consequences associated with prenatal growth restriction, and increasing the likelihood that infants reach their developmental potential and achieve high human capital. These benefits are likely to extend to subsequent generations, reducing health disparities and promoting the economic development of the society. Along with well-designed research, economic analyses to measure the impact of benefits can inform the annual advocacy necessary to ensure that congressional appropriations for WIC are maintained and strengthened and that future revisions to the WIC program continue to be driven by scientific organizations, such as the National Academy of Science.

ARTICLE INFORMATION

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