

# Maternal and Child Outcomes Associated With the Special Supplemental Nutritional Program for Women, Infants, and Children (WIC)

## Evidence Summary



### Main Points

#### Maternal and Neonatal Birth Outcomes

- Maternal participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) may be associated with a lower likelihood of inadequate gestational weight gain (Strength of evidence [SOE]: Low), lower alcohol use in pregnancy (SOE: Low), no difference in smoking during or after pregnancy (SOE: Low), no difference in perinatal death overall (SOE: Low), and lower risk of stillbirth in Black women (SOE: Low).
- Maternal WIC participation during pregnancy is likely to be associated with lower risk of preterm birth and lower risk of low birth weight infants (SOE: Moderate).
- The evidence was insufficient to determine whether maternal WIC participation was associated with decreased neonatal intensive care unit (NICU) stays.

#### Maternal Dietary Outcomes

- WIC participation during pregnancy may be associated with better diet quality and greater intakes of total fruit (SOE: Low).
- The evidence was insufficient to determine whether maternal WIC participation during pregnancy was associated with intake of other specific maternal nutrients.

#### Infant and Child Health Outcomes

- Maternal WIC participation during pregnancy is likely to be associated with reductions in infant mortality (SOE: Moderate).
- Maternal WIC participation may be associated with increased child preventive care visits and immunizations during the first year of life (SOE: Low).
- Child WIC participation may be associated with increased immunizations of children (SOE: Low).

*(continued on page 2)*



## **Infant and Child Health Outcomes** (continued)

- The evidence was insufficient to determine whether either maternal or child participation was associated with other child health outcomes including child mortality and morbidity.

## **Child Anthropometric Status or Growth**

- The evidence was insufficient to determine whether child WIC participation was associated with weight status in children.

## **Breastfeeding Outcomes**

- Maternal WIC participation is likely to be associated with no difference in breastfeeding initiation rates (SOE: Moderate).
- WIC participation may be associated with no difference in the introduction of solid foods before 4 months of age (SOE: Low).
- The evidence was insufficient to determine whether maternal or child WIC participation was associated with longer duration of breastfeeding or breastfeeding exclusivity.

## **Child Dietary Outcomes**

- Child WIC participation is likely to be associated with better child diet quality and greater intakes of 100% fruit juice, whole grain cereals intake, and age-appropriate shifts from whole milk to lower fat milk (SOE: Moderate).
- Child WIC participation may be associated with higher intakes of vitamin D and iron, and for children 2 to 4 years, limiting saturated fat (SOE: Low).
- The evidence was insufficient to determine whether child WIC participation was associated with fruit or vegetable intakes.
- Household participation in WIC is likely to be associated with purchasing of healthy food groups and reduced purchasing of less healthy foods and beverages (SOE: Moderate).

## **Child Development and Academic Achievement**

- Maternal WIC participation may be associated with higher cognitive development scores in early childhood (SOE: Low), no differences in measures of child communication and adaptive behavior in early childhood (SOE: Low), and no differences in measures of child social development in early childhood (SOE: Low).
- The evidence was insufficient to determine whether child WIC participation was associated with cognitive development or whether maternal or child WIC participation was associated with other child development outcomes.



## Background and Purpose

WIC was established to improve the health of low-income women and children by providing nutritious supplemental foods, education, breastfeeding support, and referrals to healthcare and social service programs. This systematic review summarizes evidence on whether participation in WIC was associated with outcomes for women and children, focusing mainly on studies published since 2009, including studies evaluating outcomes before and after the federal regulatory change to the WIC food package in 2009. The Key Questions are briefly described below; please see the full report for details.

- **Key Question 1: Among women who are eligible to participate in WIC, how is WIC participation during pregnancy associated with maternal and infant birth outcomes? Does the association vary by gestational age at WIC enrollment or duration of the mother's WIC participation or participant factors?**

**Outcomes of interest:** Maternal health outcomes in pregnancy and postpartum (mortality, morbidity, anemia, mode of delivery, weight status, healthcare utilization, health behaviors), neonatal birth outcomes (fetal death, stillbirth and neonatal mortality, gestational age, birth weight, small/large for gestational age, NICU admission, hospital length of stay), breastfeeding, dietary outcomes of mothers, and food security.

- **Key Question 2: Among infants and children eligible to participate in WIC, how is WIC participation associated with dietary and health outcomes in childhood? Does the association vary by age at enrollment or duration of WIC participation or participant factors?**

**Outcomes of interest:** Infant and child health outcomes (mortality, morbidity, anemia, healthcare utilization), child anthropometric status or growth outcomes, breastfeeding, dietary outcomes of infants and children, household purchases and benefit redemption, food security, child development and academic achievement.



## Methods

The systematic review followed the Methods Guide for Effectiveness and Comparative Effectiveness Reviews (<https://effectivehealthcare.ahrq.gov/topics/ce-methods-guide/overview>). We searched PubMed<sup>®</sup>, Embase<sup>®</sup>, CINAHL<sup>®</sup>, ERIC, SCOPUS, PsycINFO<sup>®</sup>, and the Cochrane Central Register of Controlled Trials for studies of outcomes associated with WIC participation, focusing on participation after the 2009 food package change and comparison to WIC-eligible non-participants. We conducted one search from January 2009 to September 2021 and another search for selected outcomes (infant mortality, maternal mortality, and child development and academic achievement) from January 2000 to September 2021. We also completed a grey literature

search. Paired reviewers independently screened citations. Data were abstracted by one reviewer and checked by an experienced reviewer. See the full report for details.

## Results

We found 82 quantitative observational studies, including 49 studies with direct evidence regarding WIC participation and outcomes and 34 studies with indirect evidence based on evaluation of the 2009 food package change among WIC participants (1 study provided both direct and indirect evidence). Table A summarizes direct evidence regarding WIC participation and outcomes.

**Table A. Summary of the direct evidence regarding association between WIC participation and outcomes<sup>a</sup>**

Outcomes	Evidence on Association Between WIC Participation and Outcomes	Insufficient Evidence Despite One or More Studies
<b>Maternal health outcomes (KQ1)</b>	<p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• Lower likelihood of inadequate gestational weight gain (1 study)</li> <li>• No difference in smoking during or after pregnancy (1 study)</li> <li>• Less alcohol use in pregnancy (1 study)</li> </ul>	NA
<b>Neonatal and birth outcomes (KQ1)</b>	<p><b>Likely to be associated (Moderate SOE)</b></p> <ul style="list-style-type: none"> <li>• Less preterm birth (3 studies)</li> <li>• Lower risk of infant low birth weight (2 studies)</li> </ul> <p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• No difference in perinatal death overall (1 study)</li> <li>• Lower risk of stillbirth in Black women (1 study)</li> </ul>	<ul style="list-style-type: none"> <li>• NICU admission and hospital length of stay (1 study)</li> </ul>
<b>Maternal dietary outcomes (KQ1)</b>	<p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• Better diet quality during pregnancy (1 study)</li> <li>• Greater intakes of total fruit during pregnancy (1 study)</li> </ul>	NA
<b>Infant and child health outcomes (KQ2)</b>	<p><b>Likely to be associated (Moderate SOE)</b></p> <ul style="list-style-type: none"> <li>• Lower infant mortality (2 studies)</li> </ul> <p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• Increased preventive care visits (1 maternal study)</li> <li>• Increased immunizations (1 maternal study and 2 child studies)</li> </ul>	<ul style="list-style-type: none"> <li>• Morbidity - health status, hospitalization (1 study)</li> </ul>
<b>Child growth anthropometric status (KQ2)</b>	NA	<ul style="list-style-type: none"> <li>• Child weight status (1 child study)</li> <li>• Attained weight, length, or head circumference (1 maternal study, 1 child study)</li> </ul>
<b>Breastfeeding outcomes (KQ1 &amp; KQ2)</b>	<p><b>Likely to be associated (Moderate SOE)</b></p> <ul style="list-style-type: none"> <li>• No difference in breastfeeding initiation (6 studies)</li> </ul> <p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• No difference in introduction of solids before 4 months (1 study)</li> </ul>	<ul style="list-style-type: none"> <li>• Breastfeeding duration (2 studies)</li> <li>• Breastfeeding exclusivity (1 study)</li> </ul>

Outcomes	Evidence on Association Between WIC Participation and Outcomes	Insufficient Evidence Despite One or More Studies
<b>Child dietary outcomes (KQ2)</b>	<p><b>Likely to be associated (Moderate SOE)</b></p> <ul style="list-style-type: none"> <li>• Child better diet quality measured by the Healthy Eating Index 2010 (2 studies)</li> <li>• Child higher food group intake of 100% fruit juice, whole grain cereals, and age-appropriate shifts from whole milk to lower fat milk (4 studies)</li> <li>• Household purchasing of healthy food groups and reduced purchasing of less healthy foods and beverages (6 studies)</li> </ul> <p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• Child higher nutrient intakes of vitamin D and iron, and after age 2, meeting recommendations to limit saturated fat (2 studies)</li> </ul>	<ul style="list-style-type: none"> <li>• Child diet quality measured by the Toddler Diet Quality Index (1 study)</li> <li>• Child vegetable and fruit intakes (5 studies)</li> <li>• Diet quality, food group intake, and nutrient intakes of women in WIC households (1 study)</li> </ul>
<b>Child development and academic achievement (KQ2)</b>	<p><b>May be associated (Low SOE)</b></p> <ul style="list-style-type: none"> <li>• Maternal participation and better child cognitive development (2 studies)</li> <li>• No difference in child communication and adaptive behavior (1 maternal study)</li> <li>• No difference in measures of child social development (1 maternal study)</li> </ul>	<ul style="list-style-type: none"> <li>• Child participation and cognitive development (2 studies), social development (1 study), motor development (1 study), communication and adaptive behavior (2 studies), developmental risk (1 study), or academic achievement (1 study)</li> </ul>

KQ = Key Question; NICU = neonatal intensive care unit; NA = not applicable; SOE = Strength of evidence; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

<sup>a</sup>Moderate SOE indicates moderate confidence that the estimated association lies close to the true association, low SOE indicates limited confidence that the estimated association lies close to the true association, and insufficient SOE indicates that evidence is unavailable or does not permit a conclusion.



## Strengths and Limitations

This is the first recent systematic review to assess the association of WIC participation with such a wide range of maternal and child outcomes. We also considered evidence on how outcomes were associated with the 2009 WIC food package change. The evidence spans most of the United States and uses data from federal and state surveillance systems, vital statistics, federal studies, and investigator-initiated studies. None of the evidence came from randomized trials, and this led to no findings of high SOE. The review focused mainly on studies having a comparison group with WIC-eligible non-participants. The studies used covariate adjustment and many used innovative design or analytic methods to reduce risk of bias. In general, WIC participation was self-reported with little detail about benefit issuance or duration of participation. We did not use meta-analysis because of the heterogeneity of study designs, populations, comparisons, and outcome measures. For many outcomes, few studies were identified. None of the studies reported on maternal mortality, maternal anemia, or food security, and insufficient SOE was found for many outcomes. Few studies addressed whether the association of WIC participation with outcomes that varied by maternal age, race/ethnicity, geographic location, education, employment status, marital status, or housing.



## Implications and Conclusions

Maternal WIC participation was associated with improved birth outcomes, lower infant mortality, and higher child cognitive development. WIC participation also was associated with improved diet quality for children and women during pregnancy, and with household purchases of quality food groups suggesting improved dietary patterns. No association was seen between maternal WIC participation and breastfeeding initiation. The evidence was insufficient regarding WIC participation and child overweight or obesity. For federal and state policy makers, the review summarizes current evidence on the role of WIC in improving outcomes and could help to inform decisions about potential changes in WIC. The review also highlights gaps which require new studies with strong designs to enhance the rigor of evidence on the spectrum of maternal health outcomes associated with maternal WIC participation; WIC participation and food security; child WIC participation and high weight status; and maternal or child WIC participation and child development and academic achievement.

## Full Report

Caulfield LE, Bennett WL, Gross SM, Hurley KM, Ogunwole SM, Venkataramani M, Lerman JL, Zhang A, Sharma R, Bass EB. Maternal and Child Outcomes Associated With the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Comparative Effectiveness Review No. 253. (Prepared by the Johns Hopkins University Evidence-based Practice Center under Contract No. 75Q80120D00003.) AHRQ Publication No. 22-EHC019. Rockville, MD: Agency for Healthcare Research and Quality; April 2022. DOI: <https://doi.org/10.23970/AHRQEPCCER253>. Posted final reports are located on the Effective Health Care Program [search page](#).

