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Authors: Danial Joseph Schultz, Carmen Byker Shanks, & Bailey Houghtaling

This is a postprint of an article that originally appeared in [Journal of the Academy of Nutrition & Dietetics](#) on November 2015.

Schultz, Daniel Joseph, Carmen Byker Shanks, and Bailey Houghtaling. "The Impact of the 2009 Special Supplemental Nutrition Program for Women, Infants, & Children Food Package Revisions on Participants: A Systematic Review." *Journal of the Academy of Nutrition & Dietetics* 115, no. 11 (November 2015): 1832-1846. DOI#: [10.1016/j.jand.2015.06.381](https://doi.org/10.1016/j.jand.2015.06.381)

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The Impact of the 2009 Special Supplemental Nutrition Program for Women, Infants, and Children Food Package Revisions on Participants: A Systematic Review

Daniel Joseph Schultz, MS; Carmen Byker Shanks, PhD; Bailey Houghtaling

ABSTRACT

For the first time since 1980, the US Department of Agriculture Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) food package policies were revised in 2009 to meet the Institute of Medicine's nutrition recommendations. These changes included increases in fruits, vegetables, whole grains, and low-fat dairy to improve nutrition and health of WIC participants. Our systematic review of the literature assessed the influence that the 2009 WIC food package revisions have had on dietary intake, healthy food and beverage availability, and breastfeeding participation. The systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses recommendations. Four electronic databases were searched between April 1 and 30, 2014, for peer-reviewed research. Two reviewers screened the articles, extracted the data, and established inter-rater reliability by discussing and resolving discrepancies. Twenty articles were included that met our inclusion criteria. Nine of the studies analyzed changes in dietary intake, eight examined changes in healthy food and beverage availability, and three evaluated breast-feeding participation exclusively. The review demonstrated an improved dietary intake and an increase in the availability of healthier foods and beverages in authorized WIC stores. The revised food package was also associated with improved dietary intake of WIC participants. Mixed results were demonstrated in regard to improved breastfeeding outcomes. Further research is needed to assess the influence of WIC 2009 food package revisions on breastfeeding outcomes and to make conclusions about broad nutrition-related implications.

The mission of the United States Department of Agriculture (USDA) Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is to safeguard the health of low-income women, infants, and children up to age 5 years who are at risk for poor nutrition.¹ WIC, which was created as a 2-year pilot program in 1972 and made permanent in 1975, addressed the public and medical concern about malnutrition among low-income mothers and children.¹ WIC provides nutritious foods to supplement diets, nutrition education, and referrals to health care and other social services.¹ The majority of WIC participants acquire foods through retail food stores (also called vendors) authorized by WIC state agencies. Authorized vendors carry WIC-approved foods and accept WIC checks, vouchers, and/or electronic benefit transfer.¹ The focus of WIC has transitioned from preventing malnourishment to concerns of childhood obesity and excessive energy consumption combined with a low intake of fruits, vegetables, and whole grains have become the primary dietary concern of WIC participants.

The USDA Food and Nutrition Service charged a 2004 Institute of Medicine (IOM) committee with reviewing the program's current supplemental food packages and evaluating the necessity of redesigning them to improve WIC participants' diets in regard to nutrition-related diseases.² The IOM developed a report from their findings entitled, *WIC Food Packages: Time For Change*,² which recommended WIC match the current dietary guidance for infants and young children. The committee's revisions encouraged consumption of fruits and vegetables (F/V), emphasized whole grains, lower saturated fat, and food packages that appealed to diverse populations.² Informed by the IOM recommendations, the USDA published an interim rule for the food packages on December 6, 2007, that required all revisions to be implemented by October 1, 2009.³ The interim rule largely reflected the IOM recommendations.⁴ However, due to certain cost containment modifications, the interim ruling did not provide all WIC participants with a \$10 cash voucher allotment for F/V purchases as recommended by the IOM. Exclusively breastfeeding mothers were provided with a \$10 per month F/V cash value voucher and all other

women received an \$8 F/V cash value voucher. This decrease in allotment for F/V cash value vouchers was later changed to provide all WIC participants with the IOM \$10 recommendation.⁴

The final ruling on March 4, 2014, expanded whole-grain options, provided yogurt as a partial substitute, allowed parents to buy fresh F/V instead of jarred baby food, and gave states the flexibility to meet the needs and cultural preferences of their WIC participants.⁵ The final ruling still included the revisions of more fruits, vegetables, whole grains, a reduction in juice consumption, and a switch from whole milk to low-fat milk for children aged 2 years and younger.⁵ The revisions also incentivized and supported breastfeeding by increasing the amount of food allotted and the length of time the exclusive breastfeeding package could be provided. In contrast, the amount of formula for women partially breastfeeding was decreased to incentivize the exclusive breastfeeding package.⁵ The 49,000 WIC-authorized retail stores were required to stock specific items such as fruits, vegetables, and whole-grain products to benefit from sales related to WIC.⁵ Overall, these revisions aimed to improve dietary intake, increase breastfeeding participation rates, and expand healthy food and beverage availability at retail stores.

Although evidence exists about dietary intake, healthy food and beverage availability, and breastfeeding participation of the 2009 WIC food package revisions, to our knowledge, no systematic review exists that assesses the overall influence of the 2009 WIC food package revisions. Therefore, the objective of this review was to assess the effects of the 2009 food package revisions on healthy food and beverage availability, breastfeeding outcomes, and dietary intake of WIC program participants 5 years later using only peer-reviewed research.

METHODS

Articles included in this review were extracted from CINAHL, Cochrane Database, Web of Knowledge, and PubMed through a systematic review of literature utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses format.⁶ The authors tested potential key words related to WIC packages and revisions found in the Medical Subject Headings Library (<http://www.nlm.nih.gov/mesh/>) through mock searches to ensure that the final list of terms captured relevant articles that met inclusion and exclusion criteria. Final terms used in this search included a combination of the following words: *WIC; The Special Supplemental Nutrition Program for Women, Infants, and Children; food package; and 2009 revisions*. Reference lists of primary studies were scanned for additional citations. Inclusion criteria for manuscripts were peer-reviewed, English language, and United States. Meeting abstracts were excluded due to limited information provided. Articles were added to the initial review in cases where the title, abstract, or key words indicated that the study analyzed the implications of the 2009 WIC food package revisions, measured availability of healthy food and beverages at WIC retail locations, breastfeeding participation, and dietary intake, and were published before the peer-reviewed study was started April 1, 2014, and ended April 30, 2014. Articles were excluded if published before the 2009 WIC revisions occurred, did not analyze changes due to 2009 WIC revisions, or focused on other federal food and nutrition assistance programs.

Two coders (D. J. S. and C. B. S.) independently extracted and then compared data to resolve any discrepancies through consensus. Both coders extracted information into a standardized form from selected articles and eligibility criteria into a table to note author, year published, research design, participants, location, data collection, study description, and results (see [Table 1](#)). Risk of bias was noted by assessing publication and funding mechanisms, experimental design (eg, whether there was a control group), sample size, follow-up measures, validity and reliability of the data collection instrument, and reporting. Where quantitative results existed, no summary measures were addressed due to inconsistent measurement methods across studies.

In total, 28 articles were identified in the initial review. Full articles were read for inclusion in the study. Two articles were excluded because they did not assess the 2009 WIC revisions and six articles were excluded because they were conference abstracts (see the [Figure](#)). This study was exempt from institutional review board review because there was no interaction with human subjects.

RESULTS

Twenty articles met the aforementioned study criteria (see the [Figure](#)). The following sections summarize changes in dietary intake, availability of healthy foods and beverages, and breastfeeding outcomes. Eight of the studies examined changes in the availability of healthy foods and beverages, nine analyzed changes in dietary intake, and three evaluated an increase in breastfeeding participation. The articles reported a variety of quantitative and qualitative research methods, including cross-sectional surveys, secondary data analysis, inventories, and interview methodology.

Dietary Intake

Dietary changes after the 2009 WIC food package revisions were observed among WIC participants across several food groups.⁷⁻¹⁵ Households enrolled in WIC purchased more whole-grain breads and brown rice.⁷ Retail scanner data demonstrated that WIC households also decreased purchases of juice.⁸ Native-American children participating in WIC reported increased consumption of whole-wheat bread at rates of four to seven times per week and two or more times per day and decreased consumption of white bread in an interview setting.⁹

Significant changes were observed in dietary intake in another study, with increased fruit consumption by 0.33 servings (one fruit serving is equivalent to 1 medium fruit, whereas $\frac{1}{4}$ cup dried fruit is equivalent to $\frac{1}{2}$ cup fresh, frozen, or canned fruit based on the 2005 Dietary Guidelines for Americans [DGA]) per day among Hispanic mothers enrolled in WIC.¹⁰ In the same study, low-fat dairy intake increased by 0.21 servings (one milk serving is equivalent to 1 cup milk, 1 cup yogurt, and 1.5-oz cheese based on the 2005 DGA) per day among Hispanic WIC-enrolled mothers, 0.34 servings per day among Hispanic WIC-enrolled children, and 0.24 servings per day for African-American WIC-enrolled children.¹⁰ Native-American WIC-enrolled children consuming F/V four or more times per day increased from 7.0% and 3.9%, respectively, to 11.5% and 8.0% after the 2009 WIC food package revisions.⁹ Saturated fat intake decreased as the purchase of milk and cheese declined by 85 g/month

Table 1. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on dietary intake of participants (N=9)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Andreyeva and colleagues, 2014 ¹¹	Observational pre–post analysis (longitudinal data)	WIC households	Supermarket chain, 60+ stores in Connecticut and Massachusetts	Loyalty card system recorded purchases and payment method (SNAP, ^a WIC benefits, cash assistance, or personal funds)	Purchasing data compared before and after the revisions to determine effect on whole-milk and cheese purchases	Reductions in whole-milk and cheese purchases in both states
Andreyeva and Luedicke, 2013 ⁷	Observational pre–post analysis (longitudinal data)	WIC households	Supermarket chain, 60+ stores in Connecticut and Massachusetts	Loyalty card system recorded purchases and payment method (SNAP, WIC benefits, cash assistance, or personal funds)	Purchasing data compared before and after the revisions to determine effect on whole-wheat bread and brown rice purchases	Increase in purchases of whole-grain bread and brown rice
Andreyeva and colleagues, 2013 ⁸	Pre–post design	WIC households	Supermarket chain, 60+ stores in Connecticut and Massachusetts	Loyalty card system recorded purchases and payment method (SNAP, WIC benefits, cash assistance, or personal funds)	Purchasing data compared before and after the revisions to determine changes in 100% juice and other beverage purchases	Decrease in juice and soft drink purchases. Increase in fruit drink, noncarbonated drink, and juice purchases by non-WIC funds

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Table 1. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on dietary intake of participants (N=9) (*continued*)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Black and colleagues, 2009 ¹⁴	Cross-sectional study, qualitative	WIC participants, pregnant, or primary caregiver to WIC-enrolled child	WIC clinics (n=7) in diverse counties in Maryland	Interviews and focus groups, adapted food frequency questionnaire, and cost analysis	Examined responses to food package changes, racial/ethnic differences, and cost of products	Frequently consumed are fruits and vegetables and commercial baby foods. Consumption of vegetables did not differ among ethnicities and preference of form (fresh, frozen, canned) did. White bread and non-low-fat options preferred.
Chiasson and colleagues, 2013 ¹³	Cross-sectional study	WIC-enrolled infants and children (aged 0-4 y)	New York	3.5 million+ WIC administrative records (Statewide Information System) and parent certification interviews	Examined WIC revision influence on nutrition-related behavior and obesity	Delayed introduction of solid foods and daily fruit and vegetable and whole-grain intake. Low nonfat milk consumption by children (aged 2-4 y). Weight reductions.
Ishdorj and Capps, 2013 ⁹	Cross-sectional, pre-post design	Native-American WIC-enrolled children (aged 2-4 y)	States in United States (n=40)	National Food and Nutrition Survey for WIC responses from caregivers of preschool-aged children	Consumption patterns including milk, fruits and vegetables, and grains	Increased consumption of fruits and vegetables, whole grains, and low-fat or fat-free milk

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Table 1. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on dietary intake of participants (N=9) (*continued*)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Kim and colleagues, 2013 ¹⁵	Cross-sectional, pre –post design	California WIC dyads with infants (aged 6-11 mo)	California	California Nutrition Education & Food Package Impact Survey and California WIC voucher redemption information	Determined use and satisfaction of JBF ^b and preferences for cash value vouchers for fruits and vegetables in comparison to JBF	Decrease in JBF consumption with age among all ethnic groups. Preference to receive additional cash value vouchers for fruits and vegetables in place of JBF.
Odoms-Young and colleagues, 2013 ¹⁰	Natural experiment	Hispanic and African-American WIC dyads with children (aged 2-3 y)	WIC clinics (n=12) in Chicago, IL	Cross-sectional survey provided baseline data for natural experiment	Postrevision influence on home food availability and dietary change	Variations by ethnic group and no significant correlates between home food availability and dietary change. Increased home food availability of low-fat dairy and whole grains. Hispanic dyads and African-American children increased low-fat dairy intake. Hispanic mothers increased fruit intake.

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Table 1. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on dietary intake of participants (N=9) (continued)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Whaley, 2012 ¹²	Pre–post, cross-sectional comparison	Pregnant or postpartum caregivers of children in WIC	California	Telephone surveys	Influence of WIC revisions on consumption of fruits and vegetables, whole grains, and low-fat milk	Increased consumption of new food items with significant increase in intake of whole-grain foods and milk

^aSNAP=Supplemental Nutrition Assistance Program.

^bBF=jarred baby food.

per WIC household in Connecticut and 107 g/mo in Massachusetts.¹¹ Another study observed an increase in caregiver and child consumption of whole grains and fruits and a decrease of whole milk and fruit juice.¹² In addition, a study assessing the New York State WIC program demonstrated that daily consumption of fruit, vegetables, and whole grains increased for WIC-enrolled children aged 1 to 4 years.¹³ Similarly, rates for ≥ 95 th percentile weight-for-recumbent length among 1-year-old WIC-enrolled children and body mass index ≥ 95 th percentile among 2- to 4-year-old WIC-enrolled children decreased after the revised WIC food packages were implemented.¹³

WIC participants who were interviewed supported the 2009 WIC food package revisions, specifically with regard to fruits, vegetables, and whole-grain products. On the other hand, the same WIC participants did not enjoy the reduced-fat milk and soy product options.¹⁴ In addition, caregivers enjoyed the addition of jarred F/V to the food package for infants aged 6 to 11 months, but many caregivers also wanted the option to choose between jarred foods and fresh F/V.¹⁵ Results for dietary intake are compiled in Table 1.

Availability of Healthy Foods and Beverages

Managers and owners of WIC-authorized and non-WIC-authorized vendors had mixed perceptions about consumer demand (eg, number of customers, sales, and profits) for healthy products and impressions of the 2009 WIC food package changes.¹⁶⁻¹⁸ WIC-authorized and non-WIC-authorized vendors at 58 non-supermarket retailers in five towns in Connecticut perceived lower customer demand for healthy food and beverage items compared with unhealthy foods and beverages after the 2009 WIC changes.¹⁶ Another study found that WIC-authorized retail storeowners' and managers' attitudes toward offering healthy foods positively increased after the revisions.¹⁷ These attitudes, collected through interview methodology, differed in non-WIC store managers; however, these changes were not statistically significant.¹⁷ Many retailers had a positive (46%) or neutral (36%) overall impression of the 2009 WIC food package revisions, compared with 18% who had a negative overall impression of consumer demand.¹⁶

Four studies demonstrated that WIC-authorized vendors improved healthy food and beverage availability compared with non-WIC vendors as a result of WIC food package revisions.¹⁸⁻²¹ WIC-authorized vendors demonstrated the greatest benefit, showing an increase in sales of the emphasized food products^{17,22} and improved stocking of brown rice, fruits,²³ whole-grain breads, and low-fat dairy options, but no significant change in fresh vegetables compared with non-WIC vendors.²¹ Furthermore, the WIC food package revisions influenced food prices, with modest reductions in price for canned F/V at small stores in seven Illinois counties.¹⁸ Price reduction for F/V did depend on the store size and location. Results for health food and beverage availability are compiled in Table 2.

Breastfeeding Outcomes

The 2009 WIC food package revisions had mixed results about breastfeeding initiation and duration.^{13,22-25} After the 2009 WIC food package revisions, the partial breastfeeding package issuance decreased, the full breastfeeding package

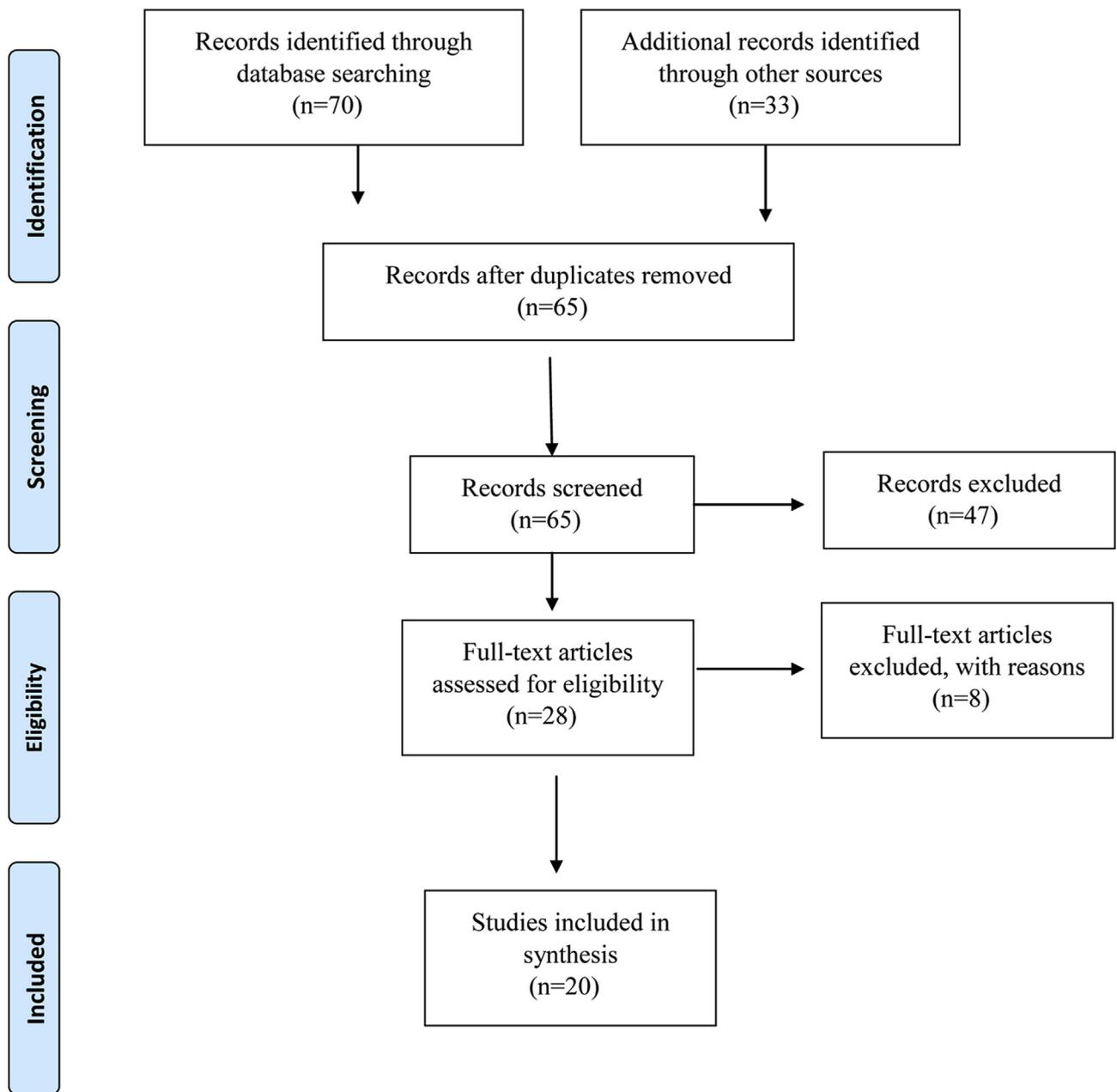


Figure. Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2009 flow diagram. Terms used in this search included a combination of the following words: *WIC*; *The Special Supplemental Nutrition Program for Women, Infants, and Children*; *food package*; *2009*; and *revisions*. Inclusion criteria for manuscripts were peer-reviewed, English language, and United States.

issuance increased, and the full formula package increased for mother-and-infant dyads during the birth month.²⁴ The full breastfeeding package issuance did not change for dyads with infants aged 3 to 5 months. After the 2009 WIC food revisions, breastfeeding initiation rates were stable even with the changed assignments in the food packages²⁴ (see [Table 3](#)).

Another study showed an 86% increased issuance rate of the full breastfeeding package and a 10% decrease in issuance rates for formula-only packages after revisions.²⁵ According to the study, training and education policies before

the implementation of 2009 WIC food package revisions increased breastfeeding package issuance, decreased partial breastfeeding package issuance, and decreased formula package issuance.²⁵ A study looking at WIC participants in Los Angeles county demonstrated an 8% increase in WIC participants exclusively breastfeeding through 3 months after the revisions occurred.²⁶ An increase of 9% of WIC participants exclusively breastfeeding through 6 months also occurred in this population.²⁶ In contrast, the study demonstrated that overall the new food package appeared to have had little or no effect on overall breastfeeding at

Table 2. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on healthy food and beverage availability (HFA) in both WIC and Non-WIC stores (n=8)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Andreyeva and colleagues, 2012 ²⁰	Pre–post design	Nonchain grocery stores, both WIC-certified (n=33) and non-WIC (n=229)	Towns (n=5) in Connecticut	Nutrition Environment Measurement Survey in stores	Measured availability, price, variety, and quality of WIC-approved foods and before and after the intervention, effect on HFA	WIC-certified stores improved availability and variety of healthy foods. Non-WIC stores had mild increase.
Andreyeva and colleagues, 2011 ¹⁷	Pre–post design	Owners/managers of WIC-certified and non-WIC stores	Nonsupermarket retailers in Connecticut towns (n=5)	In-person standardized interviews	Perception of demand, supply, and barriers to stocking healthy foods	Demand primary factor in stocking decisions with weaker demand for healthier food. Some product demands increased after the revision.
Ayala and colleagues, 2012 ¹⁶	Cross-sectional study	Owners/managers (1 y experience) of small WIC-certified stores	Major cities (n=8) in Maryland, Illinois, Minnesota, Connecticut, Louisiana, Pennsylvania, and California	In-depth interviews with open and close-ended questions	Influence of WIC revisions on perceived sales, product selection, and stocking habits	Consumer requests, cold storage, and profitability important for stocking decisions. Perceived increase in sales for most products. No change in sales for processed fruits and vegetables.
Gittelsohn and colleagues, 2012 ¹⁸	Qualitative study	Owners/managers (1 y experience) of small WIC-certified stores	Major cities (n=8) in Maryland, Illinois, Minnesota, Connecticut, Louisiana, Pennsylvania, and California	In-depth interviews	Vendor perspectives of WIC food package revisions	Reported increase in customers, sales, and profits. Steady supply of perishable foods and explaining new rules are challenges.

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Table 2. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on healthy food and beverage availability (HFA) in both WIC and Non-WIC stores (n=8) (continued)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Havens and colleagues, 2012 ²²	Pre–post design	Corner stores (n=45)	Hartford, CT	Store inventories with use of revised Nutrition Environment Measurement Survey in stores	Availability of fresh fruits and vegetables, whole grains, and low-fat milk in WIC-certified stores in comparison to non-WIC stores	Increased availability of produce, whole-grain foods, and lower-fat milk in WIC-certified stores
Hillier and colleagues, 2012 ²¹	Pre–post design	Supermarket, grocery stores, and nonchain corner stores (n=141)	Philadelphia, PA	Stores identified through field enumeration and surveyed using Nutrition Environment Measurement Survey in stores	Influence of WIC food package revisions on HFA in 2 low-income areas	Increase in HFA postpolicy change overall with substantial increases in WIC-certified stores
Zenk and colleagues, 2012 ¹⁹	Quasiexperimental, 1-group, pre–post design	WIC-certified vendors	Northern Illinois counties (n=7) not inclusive of Chicago	Trained observers assessed fresh, frozen, and canned fruits and vegetables using adapted instrument	Examined availability and selection of common and culturally specific fruit and vegetable availability	Improved selection of common fresh fruits and vegetables and availability to African-American culturally specific fresh fruits and vegetables. Mildly improved availability of canned (low-sodium) vegetables and frozen fruits and vegetables. Data differed by vendor, not neighborhood characteristics.

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Table 2. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on healthy food and beverage availability (HFA) in both WIC and Non-WIC stores (n=8) (*continued*)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Zenk and colleagues, 2014 ²³	Quasiexperimental, pre–post design	WIC-certified vendors	Northern Illinois counties (n=7) not inclusive of Chicago	WIC Northern Illinois Vendor Project instrument adaptation	Determined availability and price of fruits and vegetables with vendor characteristics	Higher canned and frozen fruits and vegetables prices and lower fresh fruits and vegetables prices among small vendors. Lower canned and frozen fruits and vegetables prices and higher fresh prices among large vendors. Differences dependent on type and neighborhood of vendor.

Table 3. Food and Nutrition Service Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) 2009 food package policy revision: Influence on breastfeeding (BF) initiation and duration and issuance of BF packages (n=3)

Author(s), y	Design	Participants	Location	Data collection	Study description	Results
Langellier and colleagues, 2014 ²⁶	Repeated cross-sectional study	WIC participants, Latina (majority)	Los Angeles County, CA	Survey adapted from Los Angeles County Health Survey with input from California State WIC Division and WIC local agency staff	Demonstrates effect of WIC revisions on BF initiation and duration	Increase in BF initiation with significant increase at 3 and 6 mo
Whaley and colleagues, 2012 ²⁵	Pre–post design	WIC infants	Southern California	WIC administrative data	Prerevision participant education focused on package changes, BF incentives, and importance of making BF decision early on	Full BF package increased postrevision (86%)
Wilde and colleagues, 2012 ²⁴	Pre–post design	WIC-enrolled dyads with infant (aged 0-5 mo)	California, Florida, Georgia, Idaho, Illinois, Minnesota, Rhode Island, Tennessee, Texas, and Utah	Administrative records for local WIC agencies	Assessed changes in WIC food-package assignments, infant formula, and BF initiation	Increased issuance of both full BF packages and full formula packages. No change in BF initiation rates.

3 and 6 months, after adjustment for other factors.²⁶ In addition, a study that looked at various influences of the food pack revisions demonstrated a 7.3% increase in breastfeeding initiation¹³ (see Table 3).

DISCUSSION

The 2009 WIC food revisions demonstrated a positive influence on WIC participants' dietary intake. Increased consumption of fruits, vegetables, and whole-grain products were prevalent after the revisions. WIC participants bought less juice, white bread, and whole milk postimplementation. Overall, improvement in whole-grain consumption was widely established in the research.

Although studies demonstrated improved F/V consumption, this improvement was minimal. Future research should assess why the improved F/V consumption was limited. Potential studies could focus on assessing higher cash value voucher allotments for acquiring produce. Furthermore, research could focus on the required WIC educational lessons and how to integrate education on preparing and purchasing fresh, frozen, dried, or canned produce.

In February 2015, an expert IOM committee published the first of three reports on the WIC food packages.²⁷ The first report addressed the topic of white potatoes being ineligible for purchase with the WIC cash value voucher.²⁷ The committee recommended that white potatoes contain similar nutritional properties of other starchy vegetables that are currently permitted for purchase with the cash value voucher.²⁷ The committee found no direct evidence to support that consumption of white potatoes adversely affected the health outcomes for WIC participants.²⁷ The committee decided to allow white potatoes to henceforth be a WIC-eligible vegetable in the cash value voucher. Future research should assess whether the allowance of white potatoes increases vegetable intake with WIC participants and whether this cash value voucher white potato eligibility displaces consumption of other vegetable sources.

Despite the minimal produce consumption change, improvement in dietary intake among WIC participants from the 2009 revisions are closer to meeting the 2010 DGA.²⁸ Specific improvements that are particularly important involve helping WIC participants reduce consumption of sugar and solid fats and increase consumption of whole grains, low-fat dairy, and fruits.²⁸ WIC can also continue to limit juice allotments to help reduce higher consumption rates among WIC participants.²⁹ With the recent publication of the 2015 DGA, future research should assess whether the food packages meet these new recommendations. Similarly, WIC could be modified to meet the DGA recommendations through the upcoming 2015 Child Nutrition Reauthorization Act.

As the revisions become more established, future research should analyze long-term effects of 2009 WIC food package revisions. For example, robust anthropometric measurements, such as body mass index, could be assessed with WIC participants. Future research should assess the specific use of specific food package products through multiple pass dietary recalls. Additional qualitative interviews should be conducted with participants about food

package products are incorporated into the diet, such as brown rice, beans, and vegetables.

The 2009 WIC food package revisions have demonstrated that USDA policy can improve dietary intake for consumers and healthy food and beverage availability in the retail environment. Researchers, practitioners, and policy have suggested improving the nutritional quality of foods allowed in other federal food and nutrition assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), also operated by the USDA.³⁰ Whereas the WIC program serves a large population of infants and children, 48% of SNAP participants are children and SNAP encompasses three times more children than WIC.³¹ Due to this large reach, SNAP could test the influence of setting nutrition guidelines similar to other supplemental feeding programs such as WIC, National School Lunch Program, and USDA's Child and Adult Care Food Program. In addition, the 2015 Dietary Guidelines Advisory Committee supported aligning food assistance programs such as SNAP and WIC with their recommendations.³² Like WIC's vendor stocking requirements, research has shown that more than 58% of key stakeholders interviewed in regard to nutrition-related changes to SNAP recommended SNAP retailers should stock a minimum quantity of healthful foods.³⁰ Participants enrolled in SNAP have also demonstrated support for incentives to encourage F/V consumption and limitations to decrease consumption of sugar-sweetened beverages.³³ Currently, SNAP is not supporting participants in meeting the 2010 DGA.³⁴ The positive WIC revisions of improved dietary intake, limiting consumption of unhealthy products, and improved healthy food and beverage availability could also provide positive changes to SNAP.³⁰

The 2009 WIC food package revisions were associated with improved healthy food and beverage accessibility, although limitations still existed. Overall, availability of F/V increased in 7 northern Illinois counties after the revision.¹⁸ WIC vendors' inventories carried more varieties of fruit and increased the availability of whole grains and low-fat milk. To a lesser degree, the revisions affected non-WIC vendors, who also increased their availability of healthy food.¹⁶ Further analysis should be completed to identify why stores do not participate in WIC and strategies to address any challenges. Future studies should assess the quality and diversity of foods offered by WIC vendors. In addition, purchasing data could be used to assess what F/V are being purchased with cash value vouchers. These inventory questions should be evaluated to understand issues in product sourcing and consumer demand.

The mission of increasing breastfeeding participation with the 2009 WIC food package revisions had mixed results. Whaley and colleagues²⁵ demonstrated a decline in issuance of partial breastfeeding packages and an increase in full breastfeeding and formula packages. In total, three studies have been published to date on breastfeeding participation after the 2009 WIC food package changes. Further research should assess strategies to increase breastfeeding participation (ie, both initiation and duration).

Despite WIC's overwhelming support for breastfeeding mothers, the breastfeeding rate of WIC participants is 20% lower than non-WIC participants.³⁵ Currently, non-WIC

participants are 2.11 times more likely to breastfeed than WIC participants, up from 1.4 times more likely in 1984.³⁶ Researchers have argued that WIC should address its financial support of formula.³⁷ In 2009, \$34 million or 0.6% of the total WIC budget was designated for breastfeeding initiatives.³⁵ In contrast, formula accounted for \$850 million (11.6%) of WIC's fiscal year 2009 expenses.³⁷ WIC incurs cost savings from rebates from formula manufacturers in exchange for their business and are legally required to bid for contracts with formula makers.³⁷ Notably, rebates from formula companies support WIC's ability to serve more clients.³⁷

Some researchers have suggested shifting funding from formulas to peer counseling programs that support breastfeeding.³⁷ Studies have shown that WIC participants who use peer counseling programs have experienced higher breastfeeding rates.³⁸ Furthermore, a common reason for the low use of peer-counseling programs among WIC programs is lack of financial support.³⁸ Ongoing research is needed about the influence of WIC's formula rebate system on breastfeeding initiation and duration.

Despite the criticism of WIC's financial support of formula, social barriers stand in the way of participants' breastfeeding participation rates as well.³⁷ Positive support systems from partners, family, and the workplace are important for breastfeeding initiation and duration, which may be lacking among some populations of low-income women.³⁹ One study shows that incentivizing baby items like bottles, baby bibs/clothes, car seats, strollers, and diapers encourages women to stop smoking.⁴⁰ Incentive programs should be researched to assess their influence on exclusive breastfeeding in the WIC program.

There were several limitations to the methods used for completing the systematic review. The limited search terms used in the literature review may not have retrieved all articles relevant to the 2009 WIC food package revisions. As such, any conclusions made in the review may not describe the breadth of all published work on this topic. Excluding non-peer-reviewed research may have discounted important work addressing WIC, such as theses, USDA Economic Research Survey reports, or dissertations. This limitation is warranted because the 2015 DGA,²⁸ which guide the WIC food package contents, use a peer-review approach in the development of nutrition guidelines. In addition, relatively few studies were abstracted for our review and, as such, further studies are needed to provide conclusive evidence about dietary intake, availability of healthy food and beverages, and breastfeeding participation before and after the 2009 WIC food package revisions.

CONCLUSIONS

Overall, the 2009 WIC food package revisions helped improve healthy food and beverage availability and dietary intake among participants. The USDA should continue to pursue having WIC food packages match the DGA recommendations. Improving the nutritional quality of the WIC food packages is an important measure in helping to curb diet-related diseases in women, infants, and children.



PRACTICE IMPLICATIONS

Although evidence exists about dietary intake, stocking inventories, and breastfeeding participation of the 2009 WIC food package revisions, no comprehensive review has been completed. Currently, no one has summarized multiple studies on the changes to the 2009 food packages and assessed its overall influence. Findings from this review can inform policy makers, researchers, and food and nutrition practitioners on the influence the 2009 food package revisions had on WIC participants and vendors. These discoveries can help provide feedback about what has worked in terms of reconfiguring the package and where the gaps exist for future improvements. Information from this review can also further enhance WIC's Competent Professional Authority personnel. These results can help strengthen the educational lessons from WIC personnel to improve efficacy of the food products promoted in the 2009 revisions that are not being increased currently in participants' diets.

Furthermore, the dietary intake and food access improvement from 2009 WIC food package revisions have demonstrated that USDA policy can change our food environment and individual intake. As food and nutrition practitioners look to improve dietary intake across different demographic groups, reconfiguring food assistance policy to support health, not just caloric intake, should be considered as part of our solutions.

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AUTHOR INFORMATION

D. J. Schultz is project administrator, ChildObesity180, Tufts University, Boston, MA; at the time of the study, he was a graduate student and dietetic intern, Montana State University, Bozeman. C. Byker Shanks is an assistant professor of food and nutrition and sustainable food systems, and B. Houghtaling is a graduate student, instructor, and research assistant, Montana State University, Bozeman.

Address correspondence to: Daniel Joseph Schultz, MS, 74 Boylston St #3, Jamaica Plain, MA 02130. E-mail: schudj25@gmail.com

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

None to report.

ACKNOWLEDGEMENTS

The authors thank Christopher Seitz, DrPH, for his contribution to the review.