HHS Public Access

Author manuscript

J Acad Nutr Diet. Author manuscript; available in PMC 2021 August 01.

Published in final edited form as:

J Acad Nutr Diet. 2020 August ; 120(8): 1288–1294. doi:10.1016/j.jand.2020.02.013.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Spillover Effect: Do Siblings Reap the Benefits?

Stephanie Steeves, MS, **Francesco Acciai, PhD [Postdoctoral Research Associate]**, **Natasha Tasevska, PhD, MD [Assistant Professor]**, **Robin S DeWeese, PhD, RDN [Research Assistant Professor]**, **Punam Ohri-Vachaspati, PhD, RDN [Professor]**

Arizona State University, 550 N 3rd St, Phoenix, AZ 85004-0698

Michael J Yedida, PhD [Professor]

Rutgers University, 112 Paterson Street, 5th Floor, New Brunswick, NJ 08901-1293

Abstract

Background: Participation in the Special Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC) among 0–5-year-old children is associated with healthier diets. Extension of dietary benefits to older, age-ineligible children (5–18 years-old) residing in WIC households has not been fully investigated.

Objective: Examine the association between household WIC participation and dietary behaviors of age-ineligible children.

Design: Cross-sectional secondary analysis of data collected from two independent panels (2009–10 and 2014) of the New Jersey Child Health Study, using household surveys. Questions derived from national surveys assessed consumption frequency of specific foods among 5–18-year-old children.

Participants/Setting: The analytic sample included 616 age-ineligible children from households with incomes below 200% of the Federal Poverty Level, 398 of whom were from WIC-participating households.

Main outcome measures: Eating behaviors were measured as frequency of daily consumption of fruit, vegetables, 100% juice, sugar sweetened beverages (SSBs), and sweet and salty snacks.

Corresponding author: Robin DeWeese, PhD, RDN; Robin.Deweese@asu.edu.

Author contributions:

SS wrote the first draft and completed the analysis. POV conceptualized the study and helped in interpretation of data, and writing of the manuscript. FA aided in the data analysis, interpretation of findings, and writing the manuscript. All authors reviewed and commented on subsequent drafts of the manuscript. POV and MY designed the NJCHS from which data for the current study were drawn, and obtained funding for the NJCHS.

Conflicts of Interest: There are no conflicts of interest to disclose.

Statistical Analysis: Multivariable negative binomial models examined the association between eating behaviors and household WIC participation status adjusting for child's age, sex, and race, mother's education, city of residence, household size, and panel. Results are expressed as Incidence Rate Ratios (IRRs).

Results: Household WIC participation was not associated with dietary behaviors among age-ineligible (5–18-year-old) children in the overall sample. However, healthier dietary patterns were observed for specific demographic groups. Compared to age-ineligible children in non-WIC households, age-ineligible children in WIC households had (1) a higher frequency of vegetable consumption among 12–18-year-old children (IRR=1.29; 95% CI [1.05, 1.58]; p=0.015); (2) a marginally significant higher frequency of 100% juice consumption among females (IRR=1.27; 95% CI [1.00, 1.62]; p=0.053); and (3) a lower frequency of SSBs consumption among Hispanic children (IRR=0.61; 95% CI [0.43, 0.86]; p =0.004).

Conclusions: Household WIC participation may positively influence dietary behaviors of age-ineligible children, suggesting a possible WIC spillover effect. Revisions to WIC package composition should consider the possible dietary implications for all children in the household.

Keywords

Special Supplemental Nutrition Assistance Program for Women; Infants and Children (WIC); age-ineligible children; dietary behaviors; spillover effect

Introduction

Healthy eating behaviors are essential to ensure adequate growth and development in children, and the early years of life play a critical role in establishing these behaviors.[1] Diet consumption trends consistently show that children fail to meet dietary recommendations for fruits, vegetables, and whole grains,[2,3] while their consumption of empty calories from saturated and trans fats and added sugars (e.g. from sugar sweetened beverages) is excessive.[4,5] Total fruit and vegetable consumption tends to be higher among female children,[2,6] while males consume larger amounts of sugar-sweetened beverages (SSBs) and sweet and salty snacks (hereafter, snacks).[4,7] Younger children (4–8 years-old), compared to adolescents (14–18 years-old), usually have better diet quality and higher consumption of fruit and 100% juice.[3,8] Black children have poorer dietary quality[8] and the highest intake of caloric snacks of all racial/ethnic groups,[5] while Hispanic children have higher intakes of added sugars and fats compared to their non-Hispanic black and non-Hispanic white counterparts.[3,9] In general, children from lower socioeconomic status (SES) households, regardless of their age, sex, and race/ethnicity, have lower dietary quality.[10,11]

The United States Department of Agriculture (USDA)'s Special Supplemental Nutrition Program for Women, Infants and Children (WIC) program is designed to mitigate poor diet quality among young children from low-income households (i.e. households whose income is at or below 185% of the Federal Poverty Line (FPL)). WIC provides vouchers for specific foods, nutrition education, and health care referrals to low-income pregnant or post-partum women, and to infants and children up to the age of 5, who are considered at nutritional risk.[12] The WIC program is designed to bridge the gap between dietary recommendations and

actual intake of specific food groups; WIC supplemental food packages include items like whole grains, dairy, fruits, vegetables, 100% juice, fish, eggs, and infant formula and foods.[12]

Research has consistently demonstrated that WIC participation positively impacts dietary quality. Specifically, WIC participants, compared to non-participants, tend to consume more fruits, vegetables, whole grains, and milk, and less fat and added sugars.[13,14,15] However, only a few studies have explored how household WIC participation may influence diet and health of age-ineligible children (5–18 years-old) residing in those households. Ver Ploeg[16] observed higher Healthy Eating Index (HEI) scores among 5–17-year-old children residing in WIC households compared to children in non-participating households. Similarly, Woodward and Ribar[17] found that consumption of milk and cereal—both components of the WIC package—was higher among 10–17-year-old children residing in a WIC household. Lastly, Robinson[18] found that residing in a WIC household was associated with a higher score on physician rated overall health status among older males (12–18 years-old).

Building on previous research, this study assessed the association between household WIC participation in the prior year and consumption frequencies of fruit, vegetables, 100% juice, SSBs, and snacks among age-ineligible (5–18-year-old) children in the household. We also explored disparities in these associations based on race/ethnicity, gender, and age groups. Children in WIC households were hypothesized to have higher frequencies of fruit, vegetable, and 100% juice consumption, as well as lower frequencies of SSBs and snack consumption when compared to similar-aged children in non-participating households.

Materials & Methods

Participant Data

Data for this secondary analysis were obtained from two independent cross-sectional panels (2009–10 and 2014) of the New Jersey Child Health Study, a longitudinal study conducted to examine the role of the food and physical activity environment on children's health. Using a telephone survey (landline and mobile phones), a random sample of households from low-income cities with predominately Hispanic and non-Hispanic black residents were interviewed. The respondent was an adult with at least one child between the ages of 3 and 18, and who was responsible for food purchasing decisions in the household. In 94% of the cases this was the parent. The survey collected information on the respondent and one of their randomly selected children, and included questions on demographics, height/weight, health status, food and physical activity environments, health behaviors, health care, employment, income, and participation in food assistance programs. The data for these analyses were obtained from responses to survey questions capturing adult and child-level demographics, child dietary behaviors, and household WIC participation.

Data collected for panel 1 (2009–10) included 1,708 households from Camden, New Brunswick, Newark, Trenton, and Vineland; data for panel 2 (2014) included 803 households from Camden, New Brunswick, Newark, and Trenton. The survey was administered in either Spanish or English and took approximately 30 minutes to complete.

Oral consent was obtained prior to the start of the interview. The Rutgers and Arizona State University Institutional Review Boards approved the study protocol.

Study Sample

The analytical sample derived from the two panels included 616 WIC-eligible households that also had a 5–18-year-old child. WIC eligible households by definition were those with either a child under 5 years of age or a pregnant woman, or both. These households were at or below 200% of the Federal Poverty Level (FPL). Of these, 398 households reported participating in WIC in the previous year and 218 household that did not.

Outcome Variables

The study focused on frequency of consumption of five food items – fruits, vegetables, 100% juice, SSBs and snacks. Fruits, vegetables, and 100% juice are part of the WIC package, and therefore likely to be present in participating households. Snacks and SSBs, which are not WIC eligible items, are markers of energy dense foods and may be more frequently consumed by non-participants as an alternative to foods available in WIC packages.

The adult respondent reported on the child's food and beverage consumption frequency using questions adapted from the fruit and vegetable screener section of the Behavior Risk Factor Surveillance Survey and dietary screener questions from the 2009–10 National Health and Nutrition Examination Survey (NHANES).[19,20] Response options for all questions were per day, week, or month; consumption frequency was then converted into number of times per day using an established algorithm.[20] Frequency of 100% juice consumption was determined separately from fruit by the question, "How often did the index child drink 100% PURE fruit juices such as orange, apple, or grape juice? Do NOT include fruit-flavored drinks with added sugar like Hi-C, Gatorade, or fruit punch." Similar questions measured frequency of fruit and vegetable consumption. Respondents were asked to count fresh, frozen, and canned fruits in their responses. Total vegetable consumption was a composite of four questions asking participants to report on frequency of consumption of lettuce/salad, potato, beans, and other vegetables. SSBs consumption was determined by two questions that focused on fruit flavored drinks such as lemonade, Sunny Delight, Kool-Aid, Gatorade, or sweet iced teas and regular carbonated soda or soft drinks such as Coke, Pepsi, or 7UP. Respondents were instructed to not include diet drinks and 100% fruit juice in their responses. Frequency of consumption of snacks was determined using questions that examined consumption of salty snacks like chips, Doritos, and nachos, and sweet items like cookies, cakes, candy, or pies.[21,22]

To ensure consistency of responses across age groups and households, we relied upon parents to report child-level measures for all ages and behaviors, including dietary intake. Parent-report of both young children's and adolescents' dietary intake has been found to be similar to intake reported by the child or adolescent,[23,24] and the measures used were consistent with previous analyses conducted using data from the same study.[25]

Explanatory Variables

Child's race/ethnicity was categorized as "Non-Hispanic White," "Non-Hispanic Black," "Hispanic," or "Other." Children's age was recoded into a younger (5–11 years-old) or older (12–18 years-old) age group. Mother's education was categorized into "less than high school," "high school or equivalent," "some college," or "college graduate." Household income was calculated as a percentage of the Federal Poverty Level (corresponding to the year of data collection) and accounted for household size. Participation in WIC was determined by the question, "Did anyone in your family living there receive WIC last year?" Respondents were asked to report on family household size, and if any females in the household were pregnant.

Statistical Analysis

All analyses were conducted using Stata 15. Chi-square tests were used to compare differences in demographic categories and city of residence between WIC-participants and non-participants. Independent two-tailed t-tests were conducted to compare mean consumption frequency of food items between WIC participants and non-participants.

The outcome variables were frequency counts of consumption with over-dispersed data. As a result, negative binomial regression models were used to estimate the association between household WIC participation status from the previous year and daily mean frequency of food consumption, while adjusting for child's race/ethnicity, sex, age category, mother's education, city of residence, household size, survey panel, and survey design, including clustering at the city level. Adding variables capturing household income and additional food assistance program participation (Supplemental Nutrition Assistance Program and school meal program) did not change the results and were not retained in the final model for parsimony. Incidence rate ratios (IRRs), calculated for each dietary variable from the multivariable models, can be interpreted as a relative risk ratio. For example, an IRR equal to 1.5 for the exposure variable 'WIC participation' (coded 0=no; 1=yes) would indicate that compared to non-participants, participants consume the outcome variable 50% more frequently, on average.

Models for each outcome were first run on the overall analytical sample. To determine subgroup differences, we expanded each model by adding two-way interaction terms between WIC participation and sex, age, and race, respectively. Using the margins command in Stata after the model with the interaction terms, we were able to obtain an estimated IRR for each demographic subgroup. For instance, the IRR for females indicates the ratio in the expected consumption frequency between female children from WIC-participating households and their counterparts in non-participating households. When a WIC effect was detected within a subgroup, further exploratory stratified analyses were run to examine if these associations were driven by the other demographic variables within the subgroups. These results are only reported in the text. Significance level was set at $p<.05$.

Results

Table 1 presents demographic and dietary outcome variables by household WIC participation status among all children in the analytic sample. Of the total 616 children, 398 resided in WIC households and 218 in income-qualifying non-WIC households. Most WIC households were comprised of Hispanic residents, while most non-WIC households were comprised of non-Hispanic black residents. All other sociodemographic variables were comparable across the two groups. Approximately 66% of children were between the ages of 5–11 years-old; the average household family size was 5; and roughly 43% of mothers had a high school degree or equivalent. In the bivariate analyses, no significant differences were observed in the mean frequency of consumption of fruits, vegetables, 100% juice, SSBs, and snacks among 5–18-year-olds in WIC versus non-WIC households (Table 1).

Table 2 shows results from the negative binomial regression models comparing daily mean consumption frequencies of age ineligible children in WIC vs. non-WIC households, after controlling for covariates. We found no difference in consumption frequencies by prior year WIC participation status in the overall sample. Subgroup analyses excluded non-Hispanic whites because of small sample size (n=20), and showed that WIC participation status in the previous year was not associated with fruit or snack consumption frequencies, but was significantly associated with frequencies of vegetable, fruit juice, and SSB consumption in selected demographic subgroups (Table 2). Main findings are described below, along with further exploratory analyses within each subgroup. All results from exploratory analyses are available upon request.

Vegetable Consumption

Vegetable consumption reported for older children aged 12–18 years from households that participated in WIC the previous year was 29% higher than the vegetable intake reported for similar-aged children from households that did not participate in WIC in the previous year (p=0.015) (Table 2). Further exploratory stratified analysis by sex and race among 12–18-year-olds showed that the difference within this age group was mostly driven by males (IRR=1.47; p=0.008; n=95) and blacks (IRR=1.46; p=0.013; n=104) (data not shown).

100% Fruit Juice Consumption

Juice consumption reported for girls from households that participated in WIC the previous year was 27% higher than the juice intake reported for girls from households that did not participate in WIC in the previous year (p=0.055) (Table 2). In exploratory stratified analysis by age and race, the difference in frequency of juice consumption was primarily driven by younger (5–11-year-old) girls (IRR=1.43: p=0.012; n=189) and black girls (IRR=1.45; p=0.032; n=147) (data not shown).

SSBs Consumption

SSB consumption reported for Hispanic children from household that participated in WIC the previous year was 39% lower than the SSB intake reported for Hispanic children from households that did not participate in WIC in the previous year (p=0.005) (Table 2). This association was observed for both younger (5–11-year-old) (IRR=0.58; p=0.018; n=178) and

older (12–18-year-old) children (IRR=0.66; p=0.048; n=93), and was particularly strong for Hispanic boys (IRR=0.55; p=0.008; n=146) (data not shown).

DISCUSSION

In this sample of 5–18-year-old children from low-income cities in New Jersey, household WIC participation in the previous year did not demonstrate a significant impact on intakes of fruit, vegetables, 100% juice, SSBs, and snacks in the overall sample. However, significant associations were observed for specific demographic groups, for whom living in WIC-participating households was associated with healthier dietary behaviors. This suggests a possible spillover effect of household WIC participation on consumption patterns of age-ineligible (5–18-year-old) children.

Among older boys, living in WIC households was associated with a significantly higher frequency of consuming vegetables. WIC food packages were revised in 2009 to include Cash Value Vouchers (CVV) that provide $8 for children and $11 for women for produce purchase. However, CVVs have not been associated with increased whole fruit or total vegetable consumption among participating children.[26,27] Higher consumption of foods included in the WIC package among older males may be an indication of differences in how household resources are allocated among family members. This may contribute to the previously reported positive spillover effect on physician-rated health only among older male children in WIC households.[18]

Available literature shows that WIC participants have higher intakes of 100% juice.[26,28] In the current study, age-ineligible girls in WIC households consumed juice more frequently than did their peers in non-WIC households. In exploratory analysis this difference was significant for 5–11-year-old girls only. This is consistent with previous research showing that, typically, consumption of 100% juice decreases with age.[29] In fact, the higher availability of juice in WIC homes may not result in older children consuming higher amounts.

Interestingly, our results indicated significant differences in frequency of SSBs consumption among Hispanic children; consumption of SSBs was found to be lower among those residing in a WIC household. The lower frequency of consumption of SSBs among Hispanic youth is important because Hispanic youth in general are likely to consume more SSBs,[30] and experience higher rates of obesity than are non-Hispanic white children.[31] In the current analysis, although not all coefficients reach statistical significance, trends suggest that for most groups, age-ineligible children in WIC households may consume SSBs less frequently compared to their non-WIC counterparts, and consume 100% juice more frequently. This suggests that in WIC households, even for age-ineligible children, SSBs may potentially be substituted with 100% fruit juice. Any proposed changes to quantities of 100% juice included in WIC packages[32] should include consideration of the implications for consumption of other foods, such as SSBs. Opportunities for educational efforts, such as promoting consumption of water in place of SSBs or juice, should also be considered.

The positive association with household WIC participation and spillover of benefits to age-ineligible children is consistent with previous research, which indicates that older children from WIC households have higher HEI scores[16] and consume more milk and cereal,[17] both WIC food package items. Older, age-ineligible children may benefit from WIC household participation through three possible mechanisms:[16] 1) nutrition education provided through WIC may affect the diets and dietary behaviors of other family members if the adult recipient uses what they learned to purchase and prepare healthier foods and meals; 2) supplemental foods from the WIC package are shared with other family members; 3) an income effect, whereby money that would have been previously allocated to infant food or formula could be spent on other foods that may be available for everyone in the household.[16] The results of the current study suggest that components of supplemental food packages may have been shared among ineligible family members, as evidenced by observations of increased frequency of consumption of vegetables and 100% juice, both available in WIC packages. However, it is possible that the benefit of sharing with non-participants comes at the expense of participants; therefore, future research should explore the underlying mechanism of a potential health spillover among household members.

Strengths and limitations

A major strength of this study was the large and comparable sample of children from WIC and income-qualifying non-WIC households from low-income, diverse communities. Other strengths include availability of frequency of consumption data on a variety of energy and nutrient dense food categories, including those that are part of the WIC package. This study is not without limitations. First, given the cross-sectional design, causality cannot be inferred. Further, the outcomes were based on secondary data analysis; therefore, adequacy of sample size to address the question posed in this manuscript was not determined. However, n=93 was the minimum subgroup sample size. Additionally, food consumption was based on frequencies, not quantities. And respondents may underreport consumption of unhealthy foods and overreport healthy food consumption. Even though both factors represent a source of error, our results would be biased only if misreporting is related to WIC participation status. We did not ask respondents to identify the household member(s) participating in WIC; while nutrition education and income effects could still result in spillover, package composition and monetary value differs with each package, affecting how WIC participation would influence dietary behaviors of ineligible children. Moreover, as in other studies, respondents were asked about their WIC participation from the previous year, precluding knowledge of current participation. Lastly, self-selection into the WIC program due to increased health consciousness or other motivators presents a potential bias.

Conclusion

In some subgroups, household WIC participation was associated with a higher frequency of vegetable and 100% juice consumption, as well as a lower frequency of consumption of SSBs. Vegetables and 100% juice are components of supplemental food packages and results suggest that the benefits of household WIC participation may spill over to age-ineligible children. Revisions to WIC package compositions should consider the possible dietary implications for all children in the household.

Policy Implications

We found some evidence that age-ineligible children from WIC households consumed healthier foods more frequently and consumed unhealthy foods less frequently. These findings are important to consider for the future redesign of WIC food packages, in light of recommendations from the National Academies of Sciences, Engineering and Medicine.[32] Available literature demonstrates that changing package composition has implications for what participants consume,[33–35] and if package benefits "spill over" to age-ineligible children, as suggested by our findings, similar dietary consequences could be observed.

Among the key findings of the study is higher frequency of 100% juice consumption and lower frequency of SSBs consumption in subgroups of age-ineligible children. If the WIC package is changed to reduce the amount of 100% juice, as has been proposed, the nutrition education component of the program should compensate for the potentially negative effects on beverage consumption among all household members by encouraging substitution of 100% juice with a healthier option like water rather than SSBs. Future research should be conducted with larger samples, seek to identify the mechanisms for the spillover effect, and design nutrition and education programs that amplify these effects for all members of the household.

Funding/financial disclosures:

Funding support was provided by the Robert Wood Johnson Foundation and the National Institute of Child Health and Human Development 1R01HD071583-01A1.

References

1. Zarnowiecki DM, Dollman J, Parletta N. Associations between predictors of children's dietary intake and socioeconomic position: A systematic review of the literature. Obes Rev. 2014;15(5):375–91. [PubMed: 24433310]
2. Kim SA, Moore LV, Galuska D, et al. Vital signs: Fruit and vegetable intake among children - United States, 2003–2010. MMWR Morb Mortal Wkly Rep. 2014;63(31):671–6. [PubMed: 25102415]
3. Banfield EC, Liu Y, Davis JS, Chang S, Frazier-Wood AC. Poor adherence to US Dietary Guidelines for children and adolescents in the National Health and Nutrition Examination Survey Population. J Acad Nutr Diet. 2015;116(1):21–7. [PubMed: 26391469]
4. Powell ES, Smith-Taillie LP, Popkin BM. Added sugars intake across the distribution of US children and adult consumers: 1977–2012. J Acad Nutr Diet. 2016;116(10):1543–1550. [PubMed: 27492320]
5. Dunford EK, Popkin BM. 37-year snacking trends for US children 1977–2014. Pediatr Obes. 2018;13(4):247–255. [PubMed: 28508580]
6. Acar tek N, Yildiran H, Akbulut G, et al. Evaluation of dietary quality of adolescents using Healthy Eating Index. Nutr Res Pract. 2011;5(4):322–8. [PubMed: 21994527]
7. Bailey RL, Fulgoni VL, Cowan AE, Gaine PC. Sources of added sugars in young children, adolescents, and adults with low and high intakes of added sugars. Nutrients. 2018;10(1).
8. Gu X, Tucker KL. Dietary quality of the US child and adolescent population: Trends from 1999 to 2012 and associations with the use of federal nutrition assistance programs. Am J Clin Nutr. 2017;105(1):194–202. [PubMed: 27881390]
9. Rosinger A, Herrick K, Gahche J, Park S. Sugar-sweetened beverage consumption among U.S. youth, 2011–2014. NCHS Data Brief. 2017;(271):1–8.

10. Ansem WJ, Lenthe FJ, Schrijvers CT, Rodenurg G, Mheen DV. Socio-economic inequalities in children's snack consumption and sugar-sweetened beverage consumption: The contribution of home environmental factors. Br J Nutr. 2014;112(03):467–476. Doi:10.1017/s0007114514001007. [PubMed: 24833428]
11. Ranjit N, Wilkinson AV, Lytle LM, Evans AE, Saxton D, Hoelscher DM. Socioeconomic inequalities in children's diet: The role of the home food environment. Int J Behav Nutr Phys Act. 2015;12 Suppl 1(Suppl 1):S4. doi:10.1186/1479-5868-12-S1-S4 [PubMed: 26222785]
12. United States Department of Agriculture. Food and Nutrition Service. Women, Infants, and Children (WIC), About WIC- WIC at a glance. 2017 Retrieved from fns.usda.gov/wic/about-wic-wic-glance
13. Tester JM, Leung CW, Crawford PB. Revised WIC food package and children's diet quality. J Pediatr. 2016;137(5):e20153557.
14. Chiasson MA, Findley SE, Sekhobo JP, et al. Changing WIC changes what children eat. Obesity (Silver Spring). 2013;21(7):1423–9. [PubMed: 23703806]
15. Morshed AB, Davis SM, Greig EA, Myers OB, Cruz TH. Effect of WIC food package changes on dietary intake of preschool children in New Mexico. Health Behav Policy Rev. 2015;2(1):3–12. [PubMed: 27668264]
16. Ver Ploeg M Do benefits of U.S. food assistance programs for children spillover to older children in the same household? J Fam Econ Iss. 2009;30(4): 412–427
17. Woodward J & Ribar D. Is individually-targeted food assistance shared among family members? Food Nutr Sci. 2012;3(6): 747–759.
18. Robinson C Younger siblings can be good for your health: An examination of spillover benefits from the Supplemental Nutrition Program for Women, Infants, and Children (WIC). J Fam Econ Iss. 2013;34(2): 172–184.
19. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System (BRFSS) Survey. Atlanta, Georgia: U.S. Department of Health and Human Services; 2005.
20. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Questionnaire.: Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2014.
21. Townsend MS, Kaiser LL, Allen LH, Joy AB, Murphy SP. Selecting items for a food behavior checklist for a limited-resource audience. J Nutr Educ Behav. 2003;35(2):69–77 [PubMed: 12725713]
22. Murphy SP, Kaiser LL, Townsend MS, Allen LH. Evaluation of validity of items for a food behavior checklist. J Am Diet Assoc. 2001;101(7):751–61. [PubMed: 11478471]
23. Persson Osowski C, Fjellström C, Olsson U, Göranzon H. Agreement between child and parent reports of 10- to 12-year-old children's meal pattern and intake of snack foods. J Hum Nutr Diet. 2012;25(1):50–58. doi:10.1111/j.1365-277X.2011.01169.x [PubMed: 21615554]
24. Lamb MM, Ross CA, Brady HL, Norris JM. Comparison of children's diets as reported by the child via the Youth/Adolescent Questionnaire and the parent via the Willett food-frequency questionnaire. Public Health Nutr. 2007;10(7):663–70. [PubMed: 17381935]
25. Tasevska N, Delia D, Lorts C, Yedidia M, Ohri-Vachaspati P. Determinants of sugar-sweetened beverage consumption among low-income children: Are there differences by race/ethnicity, age, and sex? J Acad Nutr Diet. 2017;117(12):1900–1920. [PubMed: 28495478]
26. Morshed AB, Davis SM, Greig EA, Myers OB, Cruz TH. Effect of WIC food package changes on dietary intake of preschool children in New Mexico. Health Behav Policy Rev. 2015;2(1):3–12. [PubMed: 27668264]
27. Vercammen KA, Moran AJ, Zatz LY, Rimm EB. 100% juice, fruit, and vegetable intake among children in the Special Supplemental Nutrition Program for Women, Infants, and Children and nonparticipants. Am J Prev Med. 2018;55(1):e11–e18. [PubMed: 29776784]
28. Watowicz RP & Taylor CA. A comparison of beverage intakes in US children based on WIC participation and eligibilty. J Nutr Educ Behav. 2014; 5(3):S59–64
29. Drewnowski A, Rehm CD. Socioeconomic gradient in consumption of whole fruit and 100% fruit juice among US children and adults. Nutr J 2015;14(1).

30. Bleich SN, Wolfson JA. Trends in SSBs and snack consumption among children by age, body weight, and race/ethnicity. Obesity (Silver Spring). 2015;23(5):1039–46. [PubMed: 25919923]

31. Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of obesity among adults and youth: United States, 2011–2014. NJCHS Data Brief. 2015;(219):1–8.

32. National Academies of Sciences, Engineering, and Medicine. Review of WIC food packages: Improving balance and choice: Final report. Washington, DC: The National Academies Press;2017.

33. Andreyeva T, Luedicke J. Incentivizing fruit and vegetable purchases among participants in the Special Supplemental Nutrition Program for Women, Infants, and Children. Public Health Nutr. 2015;18(1):33–41. [PubMed: 24809502]

34. Andreyeva T, Luedicke J, Henderson KE, Schwartz MB. The positive effects of the revised milk and cheese allowances in the Special Supplemental Nutrition Program for Women, Infants, and Children. J Acad Nutr Diet. 2014;114(4):622–30. [PubMed: 24210878]

35. Tester JM, Leung CW, Crawford PB. Revised WIC food package and children's diet quality. Pediatrics. 2016;137(5).

Research Snapshot

Research Question:

Is there an association between household WIC participation and dietary patterns of age-ineligible children (5–18 years-old) in the household?

Key Findings:

In this observational study, household WIC participation was not associated with dietary behaviors among age-ineligible (5–18-year-old) children in the overall sample. However, healthier dietary patterns were observed among sub-groups of such children living in WIC households compared to their counterparts in non-WIC households, suggesting a possible WIC spillover effect.

Table 1.

Demographic and dietary outcome variables by household WIC participation status among age ineligible children (5–18 years) (N=616)

Demographic Variables	WIC (N=398)	%	Non-WIC[a] (N=218)	%	p-value
Sex[b]					0.090
Male	211	53	100	46	
Female	187	47	118	54	
Age[b]					0.520
5–11-years-old	260	65	148	68	
12–18-years-old	138	35	70	32	
Race/Ethnicity[b]					0.032
Non-Hispanic White	13	3	7	3	
Non-Hispanic Black	175	44	122	56	
Hispanic	198	50	82	38	
Other	12	3	7	3	
Mother's Education[b]					0.176
Less than High School	109	27	42	19	
High School or Equivalent	168	42	99	45	
Some College	90	23	52	24	
College degree or more	22	6	18	8	
Residence[b]					0.357
Newark	110	27	75	34	
Camden	112	28	62	28	
Trenton	94	24	47	22	
New Brunswick	48	12	21	10	
Vineland	34	9	13	6	
Household Family Size	**Mean**	**SD**	**Mean**	**SD**	
	5.0	1.8	5.0	1.75	0.528
Food group (times/day)[c]					
Vegetables	1.85	1.58	1.80	1.27	0.681
Fruits	1.28	1.27	1.29	1.24	0.900
100% juice	1.61	1.66	1.50	1.60	0.420
Sugar Sweetened Beverages	1.18	1.62	1.32	1.92	0.337
Sugary and Salty Snacks	1.01	1.30	1.06	1.19	0.697

[a] Included income-qualifying (200% FPL) non-WIC households

[b] Chi-square analyses

[c] Independent two tailed t-tests

Table 2.

Adjusted incidence rate ratios (IRR) and 95% CI[a,b] of mean consumption (frequency per day) of food and beverage items among age ineligible 5–18-year-olds in WIC vs. Non-WIC households and by age, sex, and race

	Fruit	Vegetables	100% Juice	SSBs[c]	Snacks[d]
ALL CHILDREN	1.01 (0.86, 1.19)	1.06 (0.93, 1.20)	1.10 (0.92, 1.31)	0.87 (0.70, 1.09)	0.99 (0.82, 1.21)
BY SEX[e]					
Males	1.18 (0.95, 1.47)	1.13 (0.96, 1.34)	0.97 (0.76, 1.23)	0.83 (0.60, 1.15)	0.88 (0.66, 1.18)
Females	0.89 (0.70, 1.12)	1.00 (0.83, 1.19)	1.27^ (1.00, 1.62)	0.90 (0.68, 1.21)	1.12 (0.88, 1.44)
BY AGE[e]					
5–11	1.00 (0.83, 1.21)	0.97 (0.83, 1.13)	1.08 (0.88, 1.33)	0.89 (0.65, 1.20)	1.11 (0.88, 1.40)
12–18	1.08 (0.79, 1.47)	1.29* (1.05, 1.58)	1.10 (0.79, 1.53)	0.83 (0.61, 1.14)	0.80 (0.58, 1.12)
BY RACE[e]					
African Americans	1.03 (0.82, 1.29)	1.13 (0.94, 1.35)	1.09 (0.86, 1.38)	1.11 (0.84, 1.46)	0.96 (0.75, 1.23)
Hispanics	1.03 (0.80, 1.33)	1.03 (0.85, 1.24)	1.01 (0.77, 1.32)	0.61** (0.43, 0.86)	1.09 (0.78, 1.51)
N	602	616	592	590	599

[a] IRR incidence rate ratios for negative binomial regression

[b] Adjusted for city of residence, panel, sex, age, mother's education, race, household family size

[c] Sugar Sweetened Beverages

[d] Sugary and Salty Snacks

[e] Estimates from models with interaction terms between WIC participation and sex, age, and race, respectively.

^ p<0.10;

* p<0.05;

** p<0.01