U.S. DEPARTMENT OF AGRICULTURE

WIC Infant and Toddler Feeding Practices Study-2: Sixth Year Report - Final

Executive Summary

June 2024

U.S. Department of Agriculture | Food and Nutrition Service | Office of Policy Support

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The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Infant and Toddler Feeding Practices Study-2 (WIC ITFPS-2) is being conducted under the direction of the Office of Policy Support in the Food and Nutrition Service, U.S. Department of Agriculture (USDA). We would like to thank Courtney Paolicelli, Amanda Reat, Kelley Scanlon, Danielle Berman, Anne Bartholomew, Valery Soto, Lisa Southworth, and Patricia MacNeil for their guidance and support of the study. We also thank Dr. David Freidman for his comments on multivariable analysis of body mass index (BMI).

Study recruitment would not have been possible without the generous support of the 27 WIC State Agencies and the 80 WIC sites within those states and territories. Their cooperation and collaboration with the Westat team resulted in a highly successful recruitment phase and high response rates for the subsequent interviews.

Suzanne McNutt, who led the study at Westat from its inception until 2015, is the source of many of the study's strengths and innovations. We are also grateful to Dr. Gail Harrison (University of California, Los Angeles) for her insightful contributions to the study during her tenure as Principal Investigator of the study from its inception in 2011 until 2015, and to Nancy Weinfield who led the study for Westat from 2015 until 2019 with invaluable support from Crystal MacAllum on operations.

The Peer Advisory Panel offered valuable guidance on study design and analysis issues. The Advisory Panel members, experts in the fields of child development, infant feeding, and WIC research, included Maureen Black (Department of Pediatrics and Epidemiology, University of Maryland); Sally Findley (Columbia University Population Center); Larry Grummer-Strawn (formerly of the Division of Nutrition, Physical Activity, and Obesity, Centers for Disease Control and Prevention); Suzanne Murphy (Cancer Research Center of Hawaii, University of Hawaii); Zoë Neuberger (Center on Budget and Policy Priorities); Peggy Trouba (State WIC Director, Nebraska Department of Health and Human Services); and Pat Crawford (Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California).

At Westat, Janice Machado currently leads the project. Christine Borger is Principal Investigator and Deputy Director for Analysis, and Bibi Gollapudi is Deputy Project Director. Brenda Sun, a statistical programmer, supports the analytic work. Kathy Clingan provided data quality assurance guidance and coordinated data deliveries. Through the Westat Telephone Research Center (TRC), several staff members led computer-assisted telephone interview (CATI) activities, including Jacque Wernimont (TRC Manager), Kendall Butler (CATI instrument design), Shannon Evans (CATI instrument development), and Peggy Corp (CATI training and operations).

Human subjects' protections for the study are overseen by 17 institutional review boards (IRBs), including: Westat; State Department of Health IRBs in CA, CT, FL, GA, LA, MD, MI, NY, OH, OK, PA, SC, TN, and TX; and local IRBs at Arrowhead Regional Medical Center in San Bernardino, CA, and Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, CA. We appreciate the effort these IRBs have made in overseeing human subjects' protections. We also appreciate the cooperation of all participating State Departments of Health in providing WIC administrative data for the study. Use of these data does not imply that the IRBs, State Departments of Health, or WIC State Agencies and sites agree or disagree with any presentations, analyses, interpretations, or conclusions in this report.

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Overview of Study Goals and Methods

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to safeguard the health of low-income pregnant women, infants, and children who are at nutritional risk. The program was established by Congress as a pilot in 1972 and made permanent in 1974.[1] Administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA), the program provides supplemental foods, nutrition education including breastfeeding promotion and support, and healthcare referrals for low-income pregnant, breastfeeding, and nonbreastfeeding postpartum women, infants, and children up to age 5 years, all of whom are at nutritional risk.

The WIC Infant and Toddlers Feeding Practices Study-2 (WIC ITFPS-2) is a longitudinal study designed to examine the feeding practices employed by caregivers[2] and the dietary intakes and nutrition-related outcomes of children who enrolled in WIC around the time of birth. By capturing data on caregivers and study children over the first 9 years of life, the study informs a series of research questions regarding feeding practices, the association between WIC services and those practices, and the health- and nutrition-related outcomes of children currently or previously receiving WIC benefits.

Caregivers were recruited as they enrolled in selected eligible WIC clinics[3] during the summer or fall of 2013. To be eligible for the study, caregivers had to be at least 16 years old, enrolling themselves or their child who was less than 2.5 months old for the first time for the pregnancy or child,[4] and

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1 U.S. Department of Agriculture, Food and Nutrition Service. (2013). *About WIC: WIC's Mission.* Available at: http://www.fns.usda.gov/wic/about-wic-wics-mission. Retrieved on: June 6, 2020.

2 Over 98 percent of respondents are biological mothers. Throughout the report the terms "mother" and "caregiver" are used interchangeably.

3 Sites were excluded for operational and design reasons, including geographic location (American Samoa, Guam, Northern Mariana Islands, and U.S. Virgin Islands) and small sites that were expected, on average, to enroll less than 30 new pregnant women/newborns per month.

4 Caregivers could have other children receiving WIC benefits.

speak either English or Spanish. Study participants were recruited in person from 80 sampled WIC sites across 27 states and territories nationwide.

The primary source of data for this study is interviews with caregivers. Over the course of this study, multiple interviews are conducted by telephone in English or Spanish. For those who enroll prenatally, the prenatal interview is their first interview. For those who enroll postnatally, their first interview is either the 1- or 3-month interview, depending on the age of the study child at enrollment. Subsequent interviews are conducted when the study child is 5, 7, 9, 11, 13, 15, 18, 24, 32, 36, 42, 48, 54, 60, and 72 months old.[5]

Because one of the study's objectives is to assess children's nutrition status, the USDA Automated Multiple Pass Method (AMPM) is used to collect children's dietary intake data at interview months 1-13, 15, 18, 24, 36, 48, 60, and 72 months. Caregivers are asked to complete one 24-hour recall at the aforementioned interviews. In addition, from the 13-month interview onward, a 10 percent subsample are asked to complete a second day of recall in order to produce adjustment factors necessary for calculating usual dietary intake among the population. Dietary intake data reflect the foods, beverages, and dietary supplements that children consumed.

The focus of the *Sixth Year Report* is on nutrition, health, and feeding practices during the study child's sixth year of life, the first year the study child is no longer age-eligible for WIC. The primary data sources include the 72-month interview,[6] as well as data on the child's weight and height as measured by healthcare providers or at WIC clinics around the time of the child's sixth birthday. Data from previous years of the study are often presented to provide context or show trends.

Analyses in this report are primarily based on the 3,775 caregivers[7] who completed at least their first postnatal interview (i.e., either the 1- or 3-month interview depending on the age of the child at enrollment in the study). However, some analyses utilize a subset of the data to address subgroups of interest or longitudinal questions. One subgroup of particular interest for this report is caregiver-child dyads who received their 72-month interview (i.e., when the study child turned 6 years old)

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[5] In addition, the study is preparing to conduct data collection during the study child's ninth year of life.

[6] The data collection window for the 72-month interview spanned April 2018 through August 2020, with the last interview obtained in July 2020.

[7] The main analytic sample for this report is slightly smaller than some previous reports (3,775 vs. 3,777) due to the deletion of fraudulent cases.

after March 13, 2020, the date on which a national public health emergency was declared in response to the coronavirus disease 2019 (COVID-19) pandemic. The COVID-19 emergency declaration (COVID ED) set in motion a series of events that had a profound effect on study participants. Notably, pandemic mitigation strategies impacted employment and elementary schooling. In response to the public health emergency, the USDA issued a series of waivers for the provision of school meals and changed supplemental food benefits in efforts to help mitigate the effects on child nutrition. The full impact of pandemic-related actions is beyond the scope of this report. Moreover, the 72-month data collection window closed in August of 2020, with the last participant reporting in June. Therefore, only the very early effects of pandemic mitigation strategies were captured in the data. However, given the profound disruption caused, the *Sixth Year Report* includes select findings by the timing of the child's 72-month interview, whether it occurred on or prior to or post the COVID ED on March 13, 2020.

Regardless of the sample used, the findings are weighted to represent the national population of study-eligible caregiver-child dyads. Study findings represent the characteristics, views, behaviors, and experiences of this population. This Executive Summary highlights findings from each chapter in order of their presentation in the report.

Personal and Household Characteristics of WIC ITFPS-2 Families

When study children were 72 months old, 63 percent of study mothers had work and/or school commitments. There was a statistically significant difference in the percentages reporting work and/or school commitments by timing of the 72-month interview. Nearly two-thirds (65%) of participants interviewed pre-COVID ED indicated that they were currently working and/or going to school; post-COVID ED, 57 percent of participants interviewed indicated they were currently working and/or going to school.

Based on self-reported values, just over half (52%) of study participants reported household income at or below 100 percent of the 2019 Federal Poverty Guidelines (FPG). The analysis did not find a significant association between household income and the timing of the 72-month interview; however, this may reflect the fact that the survey asked about income in the prior month, which for the last few respondents was still relatively early in the pandemic, June 2020.

At the time of their 72-month interview, the vast majority of study children (91%) were in school as kindergartners or rising first-graders (Figure 1) (i.e., they had finished kindergarten and would be entering first grade in the fall). Less than 1 percent of study children were not in school.

Figure 1. Percentage of study children by school grade

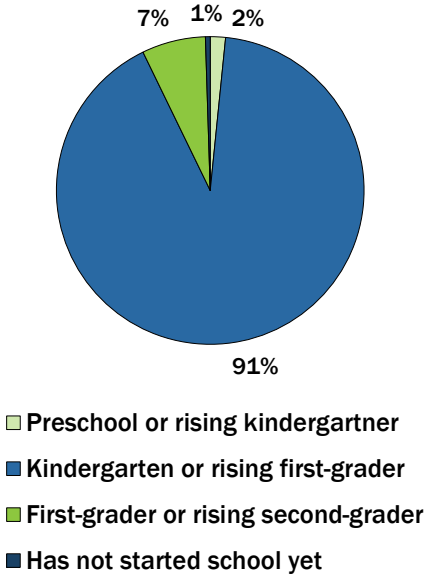
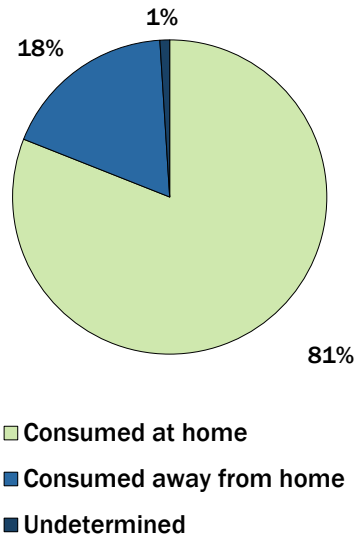


Figure 2. Percentage of caloric intake on a given day at 72 months by place consumed



On a given day, at 72 months, study children consumed an average of about 81 percent of daily dietary energy (calories) at home and about 18 percent away from home (Figure 2).[8] The average percentage of total energy consumed at home and the percentage consumed away from home on a given day differed significantly pre- and post-COVID ED. Pre-COVID ED, the mean percentage of total dietary energy consumed at home on a given day was 77 percent; post-COVID ED, the mean was 97 percent. Pre-COVID ED, the mean percentage of energy consumed away from home on a given day was 22 percent; post-COVID ED, it was 3 percent.

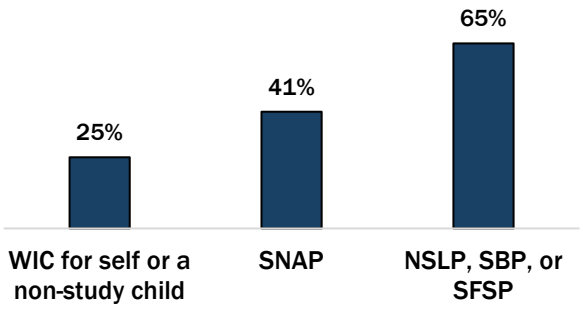
More than half (57%) of study children in kindergarten or higher grades received breakfast foods most school days (i.e., 4-5 days per week) from home and about 40 percent received breakfast foods most school days from school. For lunch, slightly more than one-quarter (26%) of study children in kindergarten or higher grades received lunch foods from home most days, and about two-thirds

[8] There were a small number of foods consumed for which the respondent did not report where the foods were eaten; hence, the percentages of daily dietary energy consumed at home and away from home may not sum to 100 percent.

(66%) received lunch foods from school most days. This study found that about 37 percent of caregivers reported that their children received both breakfast and lunch foods from school on most school days (i.e., 4-5 days per week).

Study families reported participating in a variety of Federal nutrition programs at child age 72 months. Nearly two-thirds (65%) reported participating in school or summer meal programs (Figure 3), a significant increase from the percentage at study child age 60 month (52%, not shown). Similar to the percentage at 60 months (43%), 41 percent of study families reported participation in the Supplemental Nutrition Assistance Program (SNAP). About one-quarter (25%) of caregivers indicated that either they or a non-study child were participating with WIC when the study child was 72 months old

Figure 3. Percentage of study families reporting select sources of



[a] Unweighted *n*=2,136; weighted *n*=439,041.

Note: WIC=Special Supplemental Nutrition Program for Women, Infants, and Children. SNAP= Supplemental Nutrition Assistance Program. NSLP=National School Lunch Program. SBP=School Breakfast Program. SFSP=Summer Food Service Program.

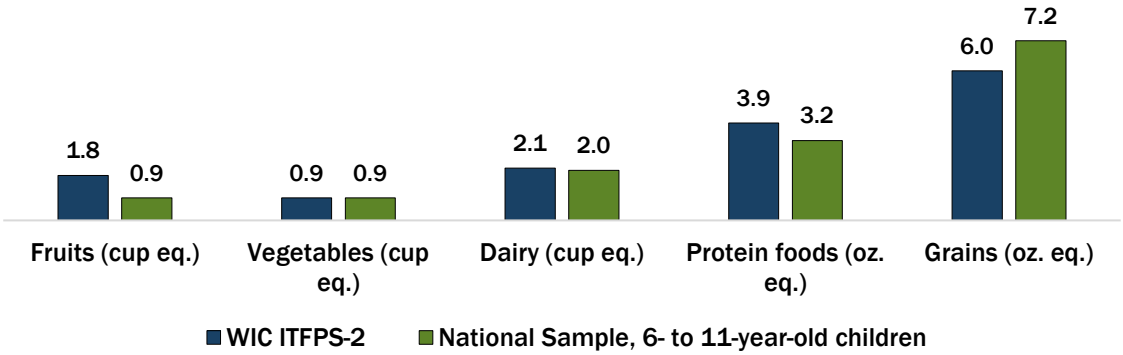
Nearly 80 percent of study respondents reported high or marginal household food security at 72 months based on the USDA six-item instrument. About 12 percent indicated low food security and about 8 percent of respondents indicated very low food security. There was not a significant difference in the percentage of households reporting high or marginal household food security pre-/post-COVID ED. Multivariable logistic regression assessed factors independently associated with household food insecurity (i.e., low or very low household food security status). The model did not find an independent association with WIC status at 72 months but did find associations between very low food security status and SNAP participation, regardless of income, after accounting for sociodemographic characteristics.

Food Intake and Diet Quality

On a given day at age 72 months, almost all study children ate breakfast, lunch, and dinner, and 88 percent consumed at least one snack. In most cases, study children's intakes of fruits, vegetables,

dairy, protein foods, and grains were comparable with intakes from a national sample of 6- to-11-year-old children based on data from the National Health and Nutrition Examination Survey (NHANES) (Figure 4).

Figure 4. Usual intake of study children at 72 months and a national sample of 6- to 11-year-old children[a]



[a] 2015-2018 National Health and Nutrition Examination Survey (NHANES).

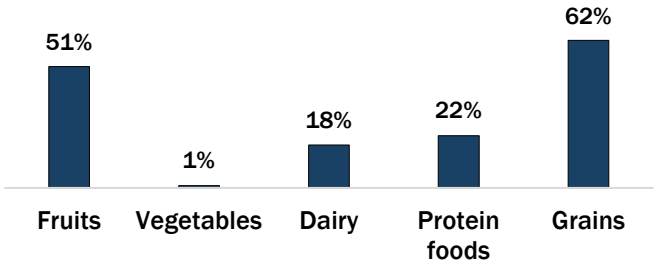
Note: cup eq.=cup equivalents; oz. eq.=ounce equivalents.

There were no significant differences in major food group intake by the study child's pattern of WIC participation through age 5. However, bivariate analysis of select foods within these larger groups revealed that a significantly larger proportion of dairy intake on a given day at 72 months came from plain skim and 1 percent fat milk for children who consistently participated with WIC into their fifth year of life than for children who left WIC after their first year. This suggested that longer term exposure to the WIC food package may have engendered a preference for these milks over higher fat milk. As discussed subsequently, this difference in milk intakes may have contributed to favorable findings involving saturated fat intake on the given day at 72 months.

Analysis of study children's food group intakes relative to the 2020-2025 *Dietary Guidelines for Americans* (DGA) recommendations revealed notable variation in the percentages meeting the

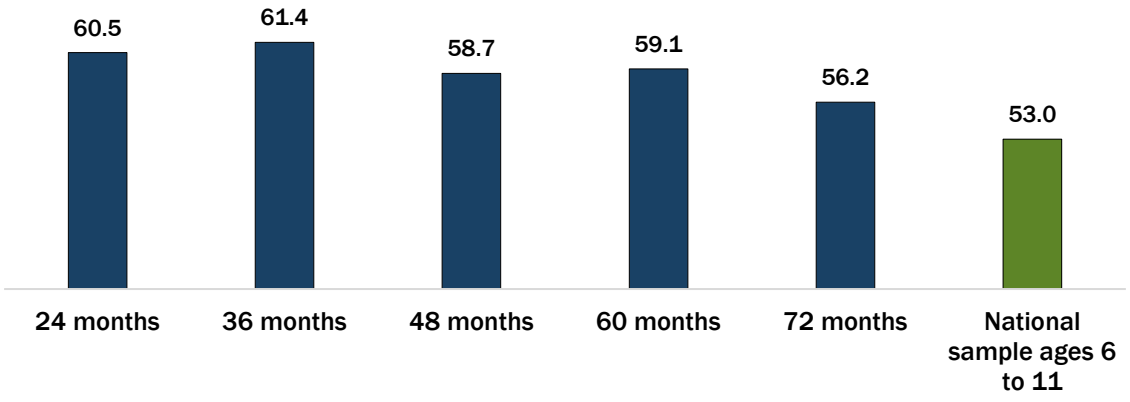
recommendation for each food group. Figure 5 presents the percentages of study children meeting DGA recommendations for food groups assessed, assuming total calorie intake was appropriate. Slightly more than half (51%) met the DGA recommendation for fruits, and 62 percent met the recommendation for grains. However, less than one-quarter met the DGA recommendations for protein foods (22%) and dairy (18%), and only 1 percent met the recommendation for vegetable intake.

Figure 5. Percentage of study children meeting Dietary Guidelines for Americans (DGA) recommendations for major food group intake



Overall diet quality was assessed using the Healthy Eating Index-2015 (HEI-2015) total scores. HEI-2015 scores range from 0 to 100 with higher scores indicating better alignment with 2015-2020 DGA recommendations. Based on usual intakes, the average total HEI-2015 score for study children at 72 months was 56.2. Like their 6- to 11-year-old peers nationally, this score indicates room for improvement (Figure 6).

Figure 6. Average total Healthy Eating Index-2015 (HEI-2015) scores[a] for study children[b] and a nationally representative sample[c]



[a] HEI-2015 scores are based on estimates of usual intake; however, beginning with the 60-month estimates, the methodology for calculating scores was updated to reflect updated guidance from the National Cancer Institute.

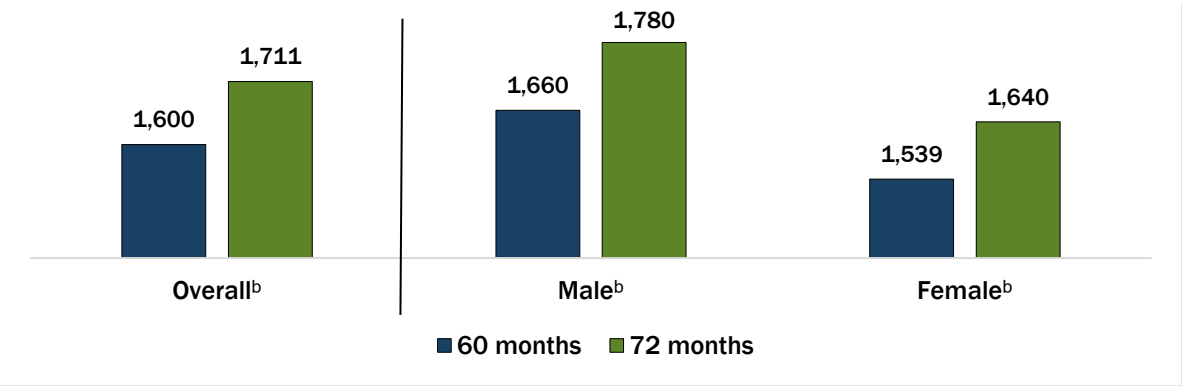
[b] Age 24 months unweighted *n*=2,199 and weighted *n*=371,245. Age 36 months, unweighted *n*=2,586 and weighted *n*=438,319. Age 48 months, unweighted *n*=2,562 and weighted *n*=439,736. Age 60 months, unweighted *n*=2,496 and weighted *n*=436,443. Age 72 months, unweighted *n*=2,120 and weighted *n*=438,408.

[c] 2015-2018 National Health and Nutrition Examination Survey (NHANES).

Energy and Nutrient Intake

At 72 months, median daily usual intake of energy was 1,780 kcal/day and 1,640 kcal/day for male and female study children, respectively (Figure 7). These levels were higher than at age 60 months (1,660 kcal/day for males and 1,539 kcal/day for females).

Figure 7. Study children's median energy intake by sex[a]



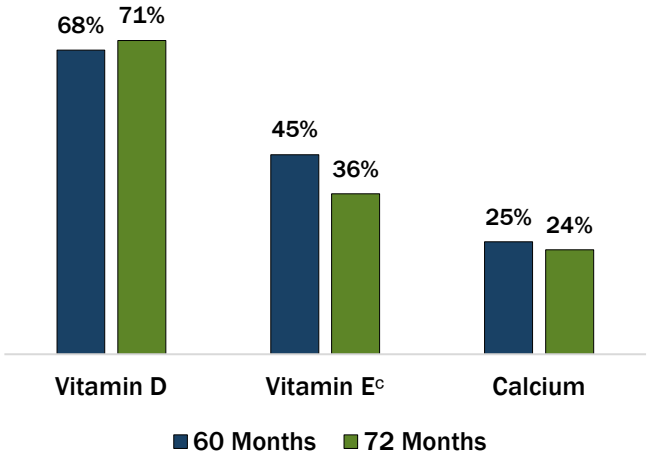
[a] The sample underlying these estimates is reported in Chapter 3, Table 3-1. The National Cancer Institute method used for usual intakes estimates involved generating a distribution of 500 pseudo-individual intakes around each observation, so weighted and unweighted sample sizes (*n*'s) do not accurately reflect the number of observations used in these estimates. Nonetheless, sample sizes are offered for informational purposes. At 60 months, unweighted *n*=2,496 and weighted *n*=436,443. At 72 months, unweighted *n*=2,120 and weighted *n*=438,408.

[b] Within each category, percentages at 60 and 72 months are significantly different at $p \leq 0.05$.

Analysis of macronutrient intakes indicated that the mean percentages of energy from fat, carbohydrate, and protein were within their Acceptable Macronutrient Distributions Ranges (AMDRs). However, median fiber intake was below the Adequate Intake (AI) level. Comparison of study children's usual intake by sex with those from 2015-2018 NHANES data, found that the typical study child consumed significantly less fat and more protein at child age 72 months than the typical 4- to 8-year-old child nationally, based on 2015-2018 NHANES data. Regardless of child sex, median fiber intake of WIC ITFPS-2 children exceeded median intake of 4- to 8-year-old children nationally; however, median intake by study children was less than recommended. Additional bivariate analysis of macronutrient intakes revealed that children who consistently participated with WIC into their fifth year of life had lower total fat intake and higher protein intake than children who left WIC after their first year of life.

Analysis of select micronutrient intakes of male and female study children indicated that with the exception of folate, median usual intakes of WIC ITFPS-2 children were similar to or exceeded sex-specific median intake estimates of 4- to 8-year-old children nationally based on 2015-2018 NHANES. Despite comparing favorably with the sex-specific nationally representative subpopulations of children, the prevalence of inadequate intake of vitamin D, vitamin E, and calcium were high among study children (Figure 8). The prevalence of inadequacy of all other micronutrients assessed was low.

Figure 8. Percentage of inadequate intakes[a] of vitamins D and E and calcium[b]



[a] Intakes are based on usual intake.

[b] At 60 months, unweighted *n*=2,496 and weighted *n*=436,443. At 72 months, unweighted *n*=2,120 and weighted *n*=438,408.

[c] Percentages within the designated category are significantly different at $p \leq 0.05$.

Median usual sodium intake was 2,737 mg/day, well above the Chronic Disease Risk Reduction (CDRR) recommended level of 1,500 mg/day. Only 3 percent of study children had intakes below the CDRR limit.

The DGA recommends upper limits for added sugars and saturated fat intake (<10% of energy intake). At 72 months, an average of about 11 percent of children's calories came from added sugars, and slightly less than half (48%) of study children met the DGA recommendation to limit added sugars to less than 10 percent of energy intake. Less than one-third (31%) of study children met the DGA recommendation to limit saturated fat to less than 10 percent of energy intake. Multivariable regression analysis identified an independent association between the study child's pattern of WIC participation over the first 5 years of life and saturated fat intake as a percentage of total energy on a given day at 72 months after controlling for sociodemographic factors, SNAP participation, and feeding practices. Children who left WIC after their first, second, or third years of life had higher saturated fat as a percentage of energy intake on a given day at 72 months than children who consistently participated into their fifth year.

Feeding Beliefs and Practices

Restrictive feeding practices attempt to decrease the amount of food the child consumes, such as controlling how much the child eats and being careful not to feed the child too much (Thompson, Adair, & Bentley, 2013). Pressuring feeding practices attempt to increase the amount of food the child consumes, such as having the child finish all of his or her food on the plate or eating even when the child is not hungry. Pressuring and restrictive feeding practices have been associated with unhealthy weight gain in children. Among the feeding practices assessed in this report, 36 percent of study mothers indicated that they always used at least one pressuring feeding practice, and 39 percent indicated that they always used at least one restrictive feeding practice. None of the feeding practices examined in this report was associated with the household's WIC status at the 72-month interview based on bivariate analysis.

Research indicates that the environment in which a child eats food is associated with dietary intake. WIC ITFPS-2 explored frequency of meals eaten together as a family during the course of the week and frequency of having the television (TV) on during meals. Study families reported eating meals together regularly, with approximately two-thirds (67%) of families reporting that they ate at least five meals together during the past week. For 77 percent of these study families, this practice was adopted when the child was 15 months old. At 72 months, nearly half (49%) of caregivers reported that the TV was *rarely* or *never* on during meals. Analysis indicated that many caregivers who used this practice adopted it over time (i.e., between child ages 15 and 54 months).

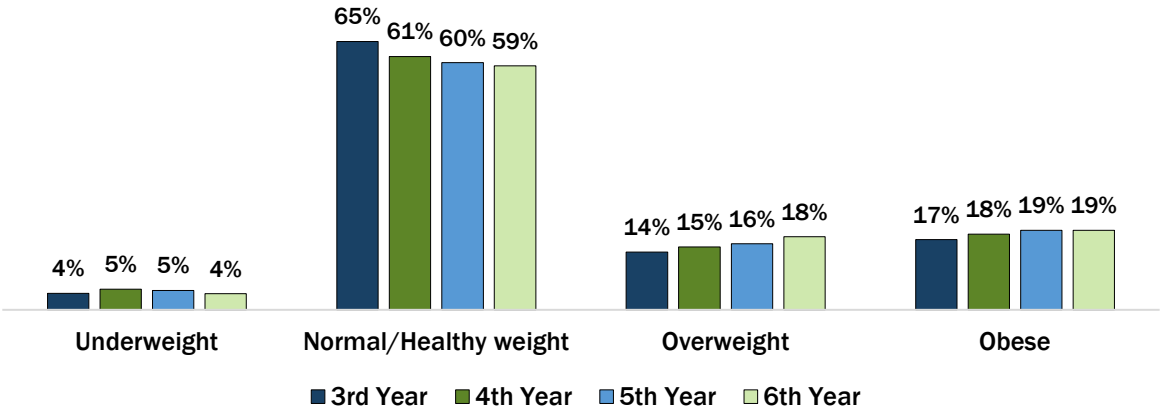
Multivariable regression analysis revealed an independent association between the study child's pattern of WIC participation over the first 5 years of life and HEI-2015 total scores on a given day at 72 months. Compared with children who consistently participated with WIC over the first 5 years of life, children who left WIC after the first year had HEI-2015 total scores that were 3.4 points lower, on average, after accounting for sociodemographic characteristics and feeding practices. All else being equal in the model, eating five or more meals together as a family in the past week improved scores by 2.9 points, while introducing sugar-sweetened beverages in the first year of the child's life reduced scores by 4.1 points, on average.

Child Health, Lifestyle Characteristics, Development, and Weight

WIC ITFPS-2 included measures of children's health, development, and physical and sedentary activity as these can affect the child's growth. About 6 percent of caregivers reported that study children had health conditions that affected their eating. About 9 percent of caregivers reported that a doctor had told them that the study child had a condition that affected his or her development and learning. Most study children played outdoors at least 1 hour on a typical weekday (79%) or a typical weekend (88%) day. Median weekly outdoor playtime for study children was 12.8 hours per week. Median time spent watching TV or playing video games over the course of a week was 14.5 hours.

The analysis of children's weight used sex- and age-adjusted measures of body mass index (BMI)-for-age percentiles and weight status categories developed by the Centers for Disease Control and Prevention. Around age 6 years, 59 percent of study children had healthy weight status. As shown in Figure 9, 4 percent of study children were underweight, 18 percent were overweight, and 19 percent were obese at age 6 years.

Figure 9. Percentage of study children by body mass index (BMI)-for-age categories[a,b]

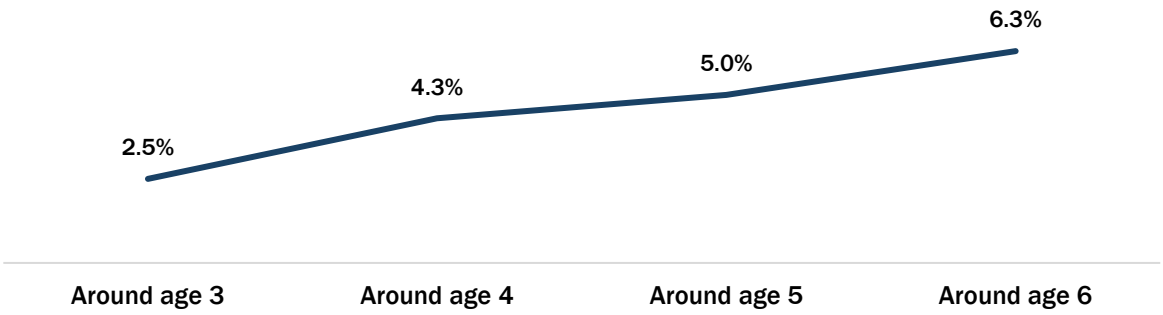


[a] Percentages may not sum to 100 due to rounding.

[b] Around age 3 years, unweighted *n*=1,885 and weighted *n*=442,274. Around age 4 years, unweighted *n*=2,115 and weighted *n*=442,085. Around age 5 years, unweighted *n*=1,825 and weighted *n*=441,932. Around age 6 years, unweighted *n*=1,386 and weighted *n*=441,932.

The study also assessed the percentage of study children living with severe obesity (i.e., BMI≥ 120% of the 95th percentile). Six percent of study children were living with severe obesity around age 6. This was a significant increase from the initial 36-month finding of 2.5 percent (Figure 10).

Figure 10. Percentage of study children living with severe obesity[a,b]



[a] Severe obesity is body mass index (BMI) ≥120 percent of the age- and sex-adjusted 95th percentile.

[b] Around age 3 years, unweighted *n*=1,885 and weighted *n*=442,274. Around age 4 years, unweighted *n*=2,115 and weighted *n*=442,085. Around age 5 years, unweighted *n*=1,825 and weighted *n*=441,932. Around age 6 years, unweighted *n*=1,386 and weighted *n*=441,932.

Multivariable regression analysis assessed factors independently associated with children's BMI around age 6 years expressed as a percentage of the age- and sex-adjusted 95th percentile. The only contemporary feeding practice (i.e., a practice assessed during the 72-month interview) that was independently associated with BMI was being very careful not to feed the child too much. Compared to caregivers who *never* used this feeding practice, caregivers who used it *always* or *usually* had children with significantly higher BMI after adjustment for other factors in the model. It was unclear whether this practice was adopted in response to a higher BMI. Pattern of WIC participation during the first 5 years of the child's life was also independently associated with BMI expressed as a percentage of the 95th percentile. The association was inverse: Compared to children who consistently participated with WIC during the first 5 years of the study child's life, children who left WIC during the child's first year of life or participated intermittently had lower BMI.

The inverse association between duration of participation with WIC and BMI may reflect self-selection. The 54-month interview revealed that among those receiving WIC at that time, 92 percent of study families indicated that one of the reasons they stayed with WIC was that WIC staff listened to their thoughts about their child's health. Those who left prior to the child's fifth year may not have felt the need for this support.

Taken together, the multivariable results assessing the independent relationships between the study child's pattern of WIC participation and HEI-2015 total scores and the study child's BMI suggest that continuous participation in WIC from infancy to age 5 years is associated with higher diet quality but not lower obesity at age 6 years. Improved diet quality 1 year after WIC eligibility ended

suggests that WIC's nutrition assistance with supplemental healthy foods and nutrition education may influence behaviors that last into the child's sixth year. However, because childhood obesity is associated with multiple factors, including patterns of physical activity and sedentary behavior, all of which cannot be addressed by WIC, program participation may not prevent obesity among WIC-eligible children. Additional work exploring the nuanced relationship between caregiver attitudes toward child overweight and obesity and reasons for staying with WIC as a child grows older may be needed to accurately interpret associations between pattern of participation in WIC and a child's BMI.