WIC IS A CRITICAL ECONOMIC, NUTRITION, AND HEALTH SUPPORT FOR CHILDREN AND FAMILIES

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Poverty and food insecurity have detrimental impacts on infant, child, and maternal health and well-being in both the short and long terms.[1] One critical strategy to address these issues is connecting vulnerable families to the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Decades of research have demonstrated the effectiveness of WIC in reducing food insecurity, and improving health, nutrition, development, and well-being.[2,3]

This paper will provide background information on WIC; briefly summarize the harmful impacts of poverty and food insecurity; and highlight research demonstrating the effective role of WIC in improving food and economic security, dietary intake, weight outcomes, health, and learning.

Background of WIC

WIC provides low-income pregnant women, breastfeeding women, non-breastfeeding postpartum mothers, infants, and children up to the age of 5 with nutritious foods, nutrition education and counseling, and referrals to health care and social services.[4] Women and children are eligible for the program if they meet the statutory income guidelines (i.e., at or below 185 percent of the federal poverty line) or are income-eligible based on participation in other programs, such as Medicaid, the Supplemental Nutrition Assistance Program (SNAP), or Temporary Assistance for Needy Families (TANF). In addition to being income-eligible, applicants must be at nutritional risk (e.g., underweight, overweight, anemic, poor dietary intake) as determined through a nutrition assessment conducted by a health professional. In fiscal year 2018, WIC provided services to approximately 1.6 million women, 1.7 million infants, and 3.5 million children in an average month.[5]

How Poverty and Food Insecurity Impact Health and Well-Being*

Poor nutrition during the critical first five years of a child's life can negatively impact child health and development in both the short and long terms and hinder adult achievement and productivity.[6] In addition, a considerable amount of research demonstrates that people living in or near poverty have disproportionately worse health outcomes and less access to health care than those who do not.[7,8,9,10] During childhood, for example, low-income children are more likely to experience food insecurity,[11] obesity,[12,13] lead exposure,[14] poor growth (e.g., low birth weight, short stature),[15] asthma,[16] developmental risk,[17] behavioral and emotional problems,[18] and unintentional injury.[19]

Food insecurity is linked to poor health and development as well. Food insecurity — even marginal food security (a less severe level of food insecurity) — is associated with some of the most common and costly health problems among adults and pregnant women, including fair or poor health

* For a comprehensive review of this topic, see FRAC's *The Impact of Poverty, Food Insecurity, and Poor Nutrition on Health and Well-Being* at www.frac.org.

status,[20] obesity (primarily among women),[21,22,23] pregnancy complications (e.g., gestational diabetes, iron deficiency),[24,25] and depression (including maternal depression).[26,27] The consequences of food insecurity — and, again, even marginal food security[28,29] — are especially detrimental to the health, development, and well-being of infants and children.[30,31,32,33] For instance, research shows a link for young children between food insecurity and low birth weight,[34,35] birth defects,[36] iron deficiency anemia,[37] more frequent colds and stomachaches,[38] asthma,[39] untreated dental caries (i.e., tooth decay),[40] development risk,[41] behavioral and social-emotional problems,[42,43] increased hospitalizations,[44] and higher special education and health care costs.[45,46]

The WIC program:

- reduces food insecurity;
- alleviates poverty;
- supports economic stability;
- improves dietary intake;
- protects against obesity;
- improves birth outcomes;
- improves health outcomes;
- supports learning and development;
- reduces health care and other costs; and
- improves retail food environments.

WIC Improves Health and Well-Being

A large body of research shows that WIC is a profoundly important program with well-documented benefits to the health and well-being of infants, children, pregnant women, and their families. The following selection of studies demonstrates these points.

WIC Reduces Food Insecurity, Alleviates Poverty, and Supports Economic Stability

- WIC reduces the prevalence of household food insecurity in recipient households with children under 5 years old by at least 20 percent.[47]
- Pregnant women experiencing household food insecurity with hunger who enroll in WIC in the first or second trimester (versus the third trimester) have a reduced risk of any food insecurity post-partum.[48]
- Nationally, WIC lifted 279,000 people above the poverty line in 2017, based on Census Bureau data on poverty and income in the U.S.[49]
- Families receiving housing subsidies, SNAP, and WIC benefits were 72 percent more likely to be housing-secure, compared to those families receiving housing subsidies alone, based on a study of low-income caregivers of children younger than 3 years old.[50] (Housing secure is defined as living without overcrowding or frequent moves within the last year.)
- WIC, along with other social safety net programs, is a buffer against the harmful impacts of economic hardship and responsive to increased need during economic downturns. For example, program participation increased among eligible children before and during the Great Recession.[51]

WIC Improves Dietary Intake

- WIC participation is associated with better dietary intake and overall dietary quality, including increased iron density of the diet, increased consumption of fruits and vegetables, greater variety of foods consumed, and reduced added sugar intake.[52,53,54]

- The overall diets of young children enrolled in WIC are more nutrient-rich and lower in calories from solid fats and added sugars than the diets of income-eligible non-participants.[55]
- Compared to low-income non-participants, young children participating in SNAP, WIC, or both programs have lower rates of anemia and nutritional deficiency.[56]
- Breastfeeding rates have increased substantially over the past two decades among WIC participants. For instance, breastfeeding initiation rates among participants were 83 percent in 2013, compared to 56 percent in a 1994 study.[57] (Breastfeeding is itself linked to a host of beneficial health outcomes for infants and children.[58])
- Multiple studies link the revised WIC food packages with improvements in the retail food environment, healthful food purchases, overall dietary quality, and the consumption of fruits, vegetables, whole-grains, and lower-fat milk.[59,60] Research also finds improvements in infant feeding practices in terms of the appropriate introduction of solid foods as well as increases in breastfeeding initiation.

WIC Protects Against Obesity

- A growing body of evidence suggests that the WIC food package revisions are associated with favorable impacts on the prevalence of obesity among young children.[61,62,63] For example, in a study using data from 2000 through 2014, obesity rates among 2-to-4-year-old WIC participants were increasing by 0.23 percentage points per year before the 2009 revisions, but obesity rates declined by 0.34 percentage points per year after the revisions.[64]
- Other research suggests WIC may protect against obesity among young children in families facing multiple stressors (i.e., household food insecurity and caregiver depressive symptoms).[65]
- In a small sample of preschoolers, children in households receiving WIC benefits weighed significantly less and had lower LDL ("bad") cholesterol levels than children from nonparticipating households.[66] The study's authors conclude that the results "indicate WIC may be a piece of public health efforts to combat the childhood obesity epidemic and reduce other cardiovascular risk factors, such as blood lipids and blood pressure."
- A study set in eight New York City-area primary care practices found that food insecurity was significantly associated with increased body mass index only among those women who were *not* receiving food assistance (SNAP or WIC), suggesting that food assistance program participation plays a protective role against obesity among food-insecure women.[67]

WIC Improves Birth Outcomes

- Investing $1 in prenatal WIC services saves about $2.48 in medical, educational, and productivity costs over a newborn's lifetime by preventing preterm birth, based on simulations of WIC participation in California.[68]
- WIC enrollment and greater WIC food package utilization during pregnancy are associated with improved birth outcomes, including lower risk of preterm birth, low birth weight, being small for gestational age, and perinatal death.[69,70]
- A study in South Carolina found that WIC participation is associated with an increase in birth weight and length of gestation as well as a lower probability of low birth weight, preterm birth, and neonatal intensive care unit (NICU) admission.[71] In this study, the positive effects of participation were larger for African American mothers.
- Prenatal WIC participation is associated with lower infant mortality rates, especially for African Americans.[72] Similarly, WIC participation is associated with lower odds of stillbirth among African American women.[73]
- Based on administrate data in Missouri and Oklahoma, mothers who receive WIC during pregnancy are more likely to breastfeed their infant at hospital discharge than nonparticipants. In addition, fee-for-service Medicaid costs from birth through 60 days postpartum are significantly lower for WIC participants in Missouri ($6,676 for WIC participants versus $7,256 for similar nonparticipants).[74]

WIC Improves Health Outcomes

- Prenatal WIC participation is associated with increased infant health care utilization in the first year of life, in terms of increased well-child visits and vaccinations, based on a study using South Carolina Medicaid claims data.[75] Prenatal participation also is linked to decreases in the average number of days an infant is hospitalized in the first year of life.
- Low-income children who currently participate in WIC have immunization rates that are comparable to higher-income children that are ineligible for the program (e.g., 94 and 92 percent, respectively, for the measles vaccination), whereas low-income children who never participated in the program have the lowest vaccination rates (e.g., 83 percent for the measles vaccination).[76]
- Children who participate in WIC are more likely to have well-child and emergency room visits than similar nonparticipants, and also more likely to be diagnosed and treated for common childhood illnesses (e.g., ear infection, upper respiratory infection, asthma). The results, based on administrative data in Missouri and Oklahoma, demonstrate "that child WIC participants are better connected to the health care system than nonparticipants."[77]
- Young children participating in SNAP, WIC, or both programs have lower rates of failure to thrive and lower risk of abuse and neglect, when compared to low-income non-participants.[78]
- Even in the face of family stressors, such as household food insecurity and maternal depressive symptoms, children who receive WIC, compared to those who do not, are less likely to be in fair or poor health and more likely to meet well-child criteria.[79] (For this particular study, children met "well-child" criteria if they were in good or excellent health per parent report, were developing normally, were not overweight or underweight, and had not been hospitalized.)
- When compared to their non-WIC-siblings, children whose mothers participate in WIC during the prenatal period are less likely to be diagnosed with attention deficit hyperactivity disorder (ADHD) and less likely to have a moderate-to-severe infection as of 6–11 years of age.[80]

WIC Supports Learning and Development

- Children whose mothers participate in WIC during the prenatal period are less likely to repeat a grade later in childhood, compared to their non-WIC-siblings.[81]
- Among low-income families, households participating in WIC have more homework routines and consistent bed times than non-WIC households.[82] These favorable family routines could be the result of the educational and service component of WIC.
- Maternal participation in WIC has a strong and direct effect on early childhood language development, especially for receptive communication outcomes (e.g., pointing to common objects or pictures of actions in a picture book).[83]
- Prenatal and early childhood participation in WIC is associated with stronger cognitive development at 2 years old, and better performance on reading assessments in elementary school, leading researchers to conclude that "these findings suggest that WIC meaningfully contributes to children's educational prospects."[84]

Conclusion

Protecting and improving the public's health is critically important. Children, communities, and the nation are facing levels of poverty, food insecurity, inadequate dietary intake, and obesity that are far too high. Research shows that WIC can alleviate these problems for children, mothers, and their families, and improve overall health and well-being. Increasing access to, and strengthening, WIC would further the program's role in improving the health of the nation.

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Endnotes

[1] Food Research & Action Center and Children's HealthWatch. (2015). *Early Childhood Nutrition Sets the Trajectory for Lifelong Health and Well-Being: WIC and the Child and Adult Care Food Program (CACFP) are Key Sources of Quality Early Nutrition*. Available at: http://org2.salsalabs.com/o/5118/p/salsa/web/common/public/content?content_item_KEY=12853. April 30, 2019.

[2] Colman, S., Nichols-Barrer, I. P., Redline, J. E., Devaney, B. L., Ansell, S. V., & Joyce, T. (2012). *Effects of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): A Review of Recent Research*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Research and Analysis.

[3] Fox, M. K., Hamilton, W., & Lin, B. H. (2004). *Effects of Food Assistance and Nutrition Programs on Nutrition and Health: Volume 3, Literature Review*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Rural and Food Economics Division.

[4] USDA Food and Nutrition Service. (2018). *Frequently Asked Questions about WIC*. Available at: https://www.fns.usda.gov/wic/frequently-asked-questions-about-wic. Accessed on April 30, 2019.

[5] U.S. Department of Agriculture. (2019). *WIC Data Tables: Monthly Data - National Level*. (FY 2012 through February 2019). Available at: https://www.fns.usda.gov/pd/wic-program. Accessed on May 15, 2019.

[6] Food Research & Action Center and Children's HealthWatch. (2015). *Early Childhood Nutrition Sets the Trajectory for Lifelong Health and Well-Being: WIC and the Child and Adult Care Food Program (CACFP) are Key Sources of Quality Early Nutrition*. Available at: http://org2.salsalabs.com/o/5118/p/salsa/web/common/public/content?content_item_KEY=12853. April 30, 2019.

[7] Woolf, S. H., Aron, L., Dubay, L., Simon, S. M., Zimmerman, E., & Luk, K. X. (2015). *How are Income and Wealth Linked to Health and Longevity?* Washington, DC: The Urban Institute; Richmond, VA: Virginia Commonwealth University, Center on Society and Health.

[8] Berchick, E. R., Hood, E., & Barnett, J. C. (2018). *Health Insurance Coverage in the United States: 2017*. U.S. Census Bureau, Current Population Reports, P60–264. Washington, DC: U.S. Government Printing Office.

[9] National Center for Health Statistics. (2018). *Health, United States, 2017: With Special Feature on Mortality*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

[10] Martinez, M. E., & Ward, B. W. (2016). Health care access and utilization among adults aged 18–64, by poverty level: United States, 2013–2015. *NCHS Data Brief*, 262, 1–8.

[11] Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2018). Household food security in the United States in 2017. *Economic Research Report*, 256. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

[12] Lee, H., Andrew, M., Gebremariam, A., Lumeng, J. C., & Lee, J. M. (2014). Longitudinal associations between poverty and obesity from birth through adolescence. *American Journal of Public Health*, 104(5), e70–e76

[13] Datar, A., & Chung, P. J. (2015). Changes in socioeconomic, racial/ethnic, and sex disparities in childhood obesity at school entry in the United States. *JAMA Pediatrics*, 169(7), 696–697.

[14] Ekono, M., Jiang, Y., & Smith, S. (2016). *Young Children in Deep Poverty*. New York, NY: National Center for Children in Poverty, Mailman School of Public Health, Columbia University.

[15] Pascoe, J. M., Wood, D. L., Duffee, J. H., & Kuo, A. (2016). Mediators and adverse effects of child poverty in the United States. *Pediatrics*, 137(4), 20160340.

[16] National Center for Health Statistics. (2018). *Health, United States, 2017: With Special Feature on Mortality*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

[17] Ekono, M., Jiang, Y., & Smith, S. (2016). *Young Children in Deep Poverty*. New York, NY: National Center for Children in Poverty, Mailman School of Public Health, Columbia University.

[18] Perou, R., Bitsko, R. H., Blumberg, S. J., Pastor, P., Ghandour, R. M., Gfroerer, J. C., Hedden, S. L., Crosby, A. E., Visser, S. N., Schieve, L. A., Parks, S. E., Hall, J. E., Brody, D., Simile, C. M., Thompson, W. W., Baio, J., Avenevoli, S., Kogan, M. D., & Huang, L. N. (2013). Mental health surveillance among children – United States, 2005–2011. *Morbidity and Mortality Weekly Report*, 62(Supplement 2), 1–35.

[19] Consumer Federation of America. (2013). *Child Poverty, Unintentional Injuries and Foodborne Illness: Are Low-Income Children at Greater Risk?* Washington, DC: Consumer Federation of America.

[20] Pruitt, S. L., Leonard, T., Xuan, L., Amory, R., Higashi, R. T., Nguyen, O. K., Pezzia, C., & Swales, S. (2016). Who is food insecure? Implications for targeted recruitment and outreach, National Health and Nutrition Examination Survey, 2005–2010. *Preventing Chronic Disease*, 13, e143.

[21] Martin, M. A., & Lippert A. M. (2012). Feeding her children, but risking her health: the intersection of gender, household food insecurity, and obesity. *Social Science Medicine*, 74(11), 1754–1764.

[22] Pruitt, S. L., Leonard, T., Xuan, L., Amory, R., Higashi, R. T., Nguyen, O. K., Pezzia, C., & Swales, S. (2016). Who is food insecure? Implications for targeted recruitment and outreach, National Health and Nutrition Examination Survey, 2005–2010. *Preventing Chronic Disease*, 13, e143.

[23] Pan, L., Sherry, B., Njai, R., & Blanck, H. M. (2012). Food insecurity is associated with obesity among US adults in 12 states. *Journal of the Academy of Nutrition and Dietetics*, 112(9), 1403–1409.

[24] Laraia, B. A., Siega-Riz, A. M., & Gundersen, C. (2010). Household food insecurity is associated with self-reported pregravid weight status, gestational weight gain, and pregnancy complications. *Journal of the American Dietetic Association*, 110(5), 692–701.

[25] Park, C. Y., & Eicher-Miller, H. A. (2014). Iron deficiency is associated with food insecurity in pregnant females in the United States: National Health and Nutrition Examination Survey 1999–2010. *Journal of the Academy of Nutrition and Dietetics*, 114(12), 1967–1973.

[26] Leung, C. W., Epel, E. S., Willett, W. C., Rimm, E. B., & Laraia, B. A. (2015). Household food insecurity is positively associated with depression among low-income Supplemental Nutrition Assistance Program participants and income-eligible nonparticipants. *Journal of Nutrition*, 145(3), 622–627.

[27] Munger, A. L., Hofferth, S. L., & Grutzmacher, S. K. (2016). The role of the Supplemental Nutrition Assistance Program in the relationship between food insecurity and probability of maternal depression. *Journal of Hunger and Environmental Nutrition*, 11(2), 147–161.

[28] Cook, J. T., Black, M., Chilton, M., Cutts, D., Ettinger de Cuba, S., Heeren, T. C., Rose-Jacobs, R., Sandel, M., Casey, P. H., Coleman, S., Weiss, I., & Frank, D. A. (2013). Are food insecurity's health impacts underestimated in the U.S. population? Marginal food security also predicts adverse health outcomes in young U.S. children and mothers. *Advances in Nutrition*, 4(1), 51–61.

[29] Lee, J. S., Gundersen, C., Cook, J., Laraia, B., & Johnson, M. A. (2012). Food insecurity and health across the lifespan. *Advances in Nutrition*, 3(5), 744–745.

[30] Nord, M., & Parker, L. (2010). How adequately are food needs of children in low-income households being met? *Children and Youth Services Review*, 32(9), 1175–1185.

[31] Gundersen, C., & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health Affairs*, 34(11), 1830–1839.

[32] American Academy of Pediatrics. (2015). Promoting food security for all children. *Pediatrics*, 136(5), e1431–e1438.

[33] Shankar, P., Chung, R., & Frank, D. A. (2017). Association of food insecurity with children's behavioral, emotional, and academic outcomes: a systematic review. *Journal of Developmental and Behavioral Pediatrics*, 38(2), 135–150.

[34] Borders, A. E., Grobman, W. A., Amsden, L. B., & Holl, J. L. (2007). Chronic stress and low birth weight neonates in a low-income population of women. *Obstetrics and Gynecology*, 109(2 Part 1), 331–338.

[35] Hromi-Fiedler, A., Bermudez-Millan, A., Chapman, D., Segura-Perez, S., Damio, G., Melgar-Quinonez, H., & Perez-Escamilla, R. (2008). Household food security status before pregnancy as a risk factor for delivering a low birthweight infant [abstract]. *The FASEB Journal*, 22, 36.1.

[36] Carmichael, S. L., Yang, W., Herring, A., Abrams, B., & Shaw, G. M. (2007). Maternal food insecurity is associated with increased risk of certain birth defects. *Journal of Nutrition*, 137(9), 2087–2092.

[37] Metallinos-Katsaras, E., Colchamiro, R., Edelstein, S., & Siu, E. (2016). Household food security status is associated with anemia risk at age 18 months among low-income infants in Massachusetts. *Journal of the Academy of Nutrition and Dietetics*, 116(11), 1760–1766.

[38] Alaimo, K., Olson, C. M., Frongillo, E. A. Jr., & Briefel, R. R. (2001). Food insufficiency, family income, and health in U.S. preschool and schoolaged children. *American Journal of Public Health*, 91(5), 781–786.

[39] Mangini, L. D., Hayward, M. D., Dong, Y. Q., & Forman, M. R. (2015). Household food insecurity is associated with childhood asthma. *Journal of Nutrition*, 145(12), 2756–2764.

[40] Angelopoulou, M. V., Shanti, S. D., Gonzalez, C. D., Love, A., & Chaffin, J. (2018). Association of food insecurity with early childhood caries. *Journal of Public Health Dentistry*, published online ahead of print.

[41] Rose-Jacobs, R., Black, M. M., Casey, P. H., Cook, J. T., Cutts, D. B., Chilton, M., Heeren, T., Levenson, S. M., Meyers, A. F., & Frank, D. A. (2008). Household food insecurity: associations with at-risk infant and toddler development. *Pediatrics*, 121(1), 65–72.

[42] King, C. (2018). Food insecurity and child behavior problems in fragile families. *Economics and Human Biology*, 28, 14–22.

[43] Johnson, A. D., & Markowitz, A. J. (2018). Associations between household food insecurity in early childhood and children's kindergarten skills. *Child Development*, 89(2), e1–e17.

[44] Ettinger de Cuba, S., Casey, P. H., Cutts, D., Heeren, T. C., Coleman, S., Bovell-Ammon, A. R., Frank, D. A., & Cook, J. T. (2018). Household food insecurity positively associated with increased hospital charges for infants. *Journal of Applied Research on Children*, 9(1), Article 8.

[45] Cook, J. T., Bovell, A., Poblacion, A., Cutts, D., Ettinger de Cuba, S., Pasquariello, J., Sheward, R., & Chung, R. (2016). *The $1.2 Billion Child Health Dividend*. Boston, MA: Children's HealthWatch.

[46] Ettinger de Cuba, S., Casey, P. H., Cutts, D., Heeren, T. C., Coleman, S., Bovell-Ammon, A. R., Frank, D. A., & Cook, J. T. (2018). Household food insecurity positively associated with increased hospital charges for infants. *Journal of Applied Research on Children*, 9(1), Article 8.

[47] Kreider, B., Pepper, J. V., & Roy, M. (2016). Identifying the effects of WIC on food insecurity among infants and children. *Southern Economic Journal*, 82(4), 1106–1122.

[48] Metallinos-Katsaras, E., Gorman, K. S., Wilde, P., & Kallio, J. (2011). A longitudinal study of WIC participation on household food insecurity. *Maternal and Child Health Journal*, 15, 627–633.

[49] Fox, L. (2018). *The Supplemental Poverty Measure: 2017.* Current Population Reports, P60–265. U.S. Census Bureau.

[50] Sandel, M., Cutts, D., Meyers, A., Ettinger de Cuba, S., Coleman, S., Black, M. M., Casey, P. H., Chilton, M., Cook, J. T., Shortell, A., Heeren, T., & Frank, D. (2014). Co-enrollment for child health: how receipt and loss of food and housing subsidies relate to housing security and statutes for streamlined, multi-subsidy application. *Journal of Applied Research on Children: Informing Policy for Children at Risk*, 5(2), Article 2.

[51] Jackson, M. I., & Mayne, P. (2016). Child access to the nutritional safety net during and after the Great Recession: the case of WIC. *Social Science and Medicine*, 170, 197–207.

[52] Colman, S., Nichols-Barrer, I. P., Redline, J. E., Devaney, B. L., Ansell, S. V., & Joyce, T. (2012). *Effects of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): A Review of Recent Research*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Research and Analysis.

[53] Gu, X., & Tucker, K. L. (2017). Dietary quality of the US child and adolescent population: trends from 1999 to 2012 and associations with the use of federal nutrition assistance program. *American Journal of Clinical Nutrition*, 105(1), 194–202.

[54] Hamner, H. C., Paolicelli, C., Casavale, K .O., Haake, M., & Bartholomew, A. (2019). Food and beverage intake from 12 to 23 months by WIC status. *Pediatrics*, 143(3), e20182274.

[55] Cole, N. & Fox, M. K. (2008). Diet quality of American young children by WIC participation status: Data from the National Health and Nutrition Examination Survey, 1999–2004. *Report No. WIC-08-NH*. Alexandria, Virginia: U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition, and Evaluation.

[56] Lee, B. J., Mackery-Bilaver, L., & Chin, M. (2006). Effects of WIC and Food Stamp Program participation on child outcomes. *Contractor and Cooperator Report*, 27. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

[57] May, L., Borger, C., Weinfield, N., MacAllum, C., DeMatteis, J., McNutt, S., Whaley, S., Ritchie, L., & Sallack, L. (2017). *WIC Infant and Toddler Feeding Practices Study 2: Infant Year Report*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Policy Research.

[58] American Academy of Pediatrics. (2012). Breastfeeding and the use of human milk – policy statement. *Pediatrics*, 129, e827–e841.

[59] Hartline-Grafton, H. (2019). *Impact of the Revised WIC Food Packages on Nutrition Outcomes and the Retail Food Environment.* Washington, DC: Food Research & Action Center. (Updated from September 2014.)

[60] Schultz, D. J., Byker Shanks, C., & Houghtaling, B. (2015). The impact of the 2009 Special Supplemental Nutrition Program for Women, Infants, and Children food package revisions on participants: a systematic review. *Journal of the Academy of Nutrition and Dietetics*, 115(11), 1832–1846.

[61] Chaparro, M. P., Anderson, C. E., Crespi, C. M., Whaley, S. E., & Wang, M. C. (2019). The effect of the 2009 WIC food package change on childhood obesity varies by gender and initial weight status in Los Angeles County. *Pediatric Obesity*, published online ahead of print.

[62] Chaparro, M. P., Crespi, C. M., Anderson, C. E., Wang, M. C., & Whaley, S. E. (2019). The 2009 Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) food package change and children's growth trajectories and obesity in Los Angeles County. *American Journal of Clinical Nutrition*, published online ahead of print.

[63] Chiasson, M. A., Findley, S. E., Sekhobo, J. P., Scheinmann, R., Edmunds, L. S., Faly, A. S., & McLeod, N. J. (2013). Changing WIC changes what children eat. *Obesity*, 21(7), 1423–1429.

[64] Daepp, M. I. G., Gortmaker, S. L., Wang, Y. C., Long, M. W., & Kenney, E. L. (2019). WIC food package changes: trends in childhood obesity prevalence. *Pediatrics*, published online ahead of print.

[65] Black, M. M., Quigg, A. M., Cook, J., Casey, P. H., Cutts, D. B., Chilton, M., Meyers, A., Ettinger de Cuba, S., Heeren, T., Coleman, S., Rose-Jacobs, R., & Frank, D. A. (2012). WIC participation and attenuation of stress-related child health risks of household food insecurity and caregiver depressive symptoms. *Archives of Pediatrics and Adolescent Medicine*, 166(5), 444–451.

[66] Johnson, P., Montgomery, M., & Ewell, P. (2016). Federal food assistance programs and cardiovascular risk factors in low-income preschool children. *Journal of Community Health*, 41(3), 626–634.

[67] Karnik, A., Foster, B. A., Mayer, V., Pratomo, V., McKee, D., Maher, S., Campos, G., & Anderson, M. (2011). Food insecurity and obesity in New York City primary care clinics. *Medical Care*, 49(7), 658–661.

[68] Nianogo, R. A., Wang, M. C., Basurto-Davila, R., Nobari, T. Z., Prelip, M., Arah, O. A., & Whaley, S. E. (2019). Economic evaluation of California prenatal participation in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) to prevent preterm birth. *Preventive Medicine*, published online ahead of print.

[69] Fingar, K. R., Lob, S. H., Dove, M. S., Gradziel, P., & Curtis, M. P. (2017). Reassessing the association between WIC and birth outcomes using a fetuses-at-risk approach. *Maternal and Child Health Journal*, 21(4), 825–835.

[70] Chorniy, A. V., Currie, J., & Sonchak, L. (2018). Does prenatal WIC participation improve child outcomes? *NBER Working Paper Series*, 24691.

[71] Sonchak, L. (2016). The impact of WIC on birth outcomes: new evidence from South Carolina. *Maternal and Child Health Journal*, 20(7), 1518–1525.

[72] Khanani, I., Elam, J., Hearn, R., Jones, C., & Maseru, N. (2010). The impact of prenatal WIC participation on infant mortality and racial disparities. *American Journal of Public Health*, 100(S1), S204–S209.

[73] Angley, M., Thorsten, V. R., Drews-Botsch, C., Dudley, D. J., Goldenberg, R. L., Silver, R. M., Stoll, B. J., Pinar, H., & Hogue, C. J. R. (2018). Association of participation in a supplemental nutrition program with stillbirth by race, ethnicity, and maternal characteristics. *BMC Pregnancy and Childbirth*, 18(1), 306.

[74] Kranker, K., Fox, M., K., & Caronongan, P. (2018). *WIC-Medicaid II Feasibility Study: Final Report*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Policy Support.

[75] Bersak, T., & Sonchak, L. (2018). The impact of WIC on infant immunizations and health care utilization. *Health Services Researc*h, 53 (Supplement 1), 2952–2969.

[76] Thomas, T. N., Kolasa, M. S., Zhang, F., & Shefer, A. M. (2014). Assessing immunization interventions in the Women, Infants, and Children (WIC) program. *American Journal of Preventive Medicine*, 47(5), 624–8.

[77] Kranker, K., Fox, M., K., & Caronongan, P. (2018). *WIC-Medicaid II Feasibility Study: Final Report*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Policy Support.

[78] Lee, B. J., Mackery-Bilaver, L., & Chin, M. (2006). Effects of WIC and Food Stamp Program participation on child outcomes. *Contractor and Cooperator Report*, 27. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

[79] Black, M. M., Quigg, A. M., Cook, J., Casey, P. H., Cutts, D. B., Chilton, M., Meyers, A., Ettinger de Cuba, S., Heeren, T., Coleman, S., Rose-Jacobs, R., & Frank, D. A. (2012). WIC participation and attenuation of stress-related child health risks of household food insecurity and caregiver depressive symptoms. *Archives of Pediatric & Adolescent Medicin*e, 166(5), 444–451.

[80] Chorniy, A. V., Currie, J., & Sonchak, L. (2018). Does prenatal WIC participation improve child outcomes? *NBER Working Paper Series*, 24691.

[81] Chorniy, A. V., Currie, J., & Sonchak, L. (2018). Does prenatal WIC participation improve child outcomes? *NBER Working Paper Series*, 24691.

[82] Ribar, D. C., & Zapata, D. (2017). Food assistance and family routines in three American Cities. *Review of Economics of the Household*, 15, 223–238.

[83] Bolbocean, C., Tylavsky, F. A., & West, J. E. (2018). U.S. safety net programs and early life skills formation: results from a prospective longitudinal cohort study. *NBER Working Paper Series*, 24832.

[84] Jackson, M. (2015). Early childhood WIC participation, cognitive development and academic achievement. *Social Science and Medicine*, 126, 145–153.