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Infant Feeding Practices: The Impact of WIC Policy Changes on Rural and Urban Participants

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Abstract

The 2009 WIC Program policy changes were designed to improve breastfeeding rates and health outcomes of WIC participants. Existing research in this area found that participants shifted towards healthier feeding behavior after the changes in WIC food packages. However, little is known about the effect of these changes on the rural participants. Using the data from the National Food and Nutrition Survey (NATFAN), we examined the effects of the revised WIC food packages on breastfeeding among WIC participants in rural and non-rural areas, and food deserts. Our findings show that WIC participants were more likely to choose fully breastfeeding package after the revisions in WIC. Furthermore, we found that participants who were Hispanic, with lower degrees of education, living in the Southern region of the United States were less likely to choose full breastfeeding package. Overall, a greater proportion of rural participants utilized full breastfeeding package than non-rural participants.

Introduction

An increasing number of studies have suggested that health at birth plays an important role in individuals' long-term achievement. These studies have emphasized the value of public programs and policies that benefit women, infants, and children. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), one of the most important food assistance programs funded by the US Department of Agriculture (USDA), aims to improve the health and nutritional conditions of low-income pregnant, breastfeeding, or non-breastfeeding postpartum women, as well as infants and children up to age five who are determined to be at nutritional risk. The WIC program provides monthly federal grants to each state in the US for supplementary food, health care referrals, and nutrition education. The program has been implemented in the US for over 40 years and benefited countless families. In 2016, the total amount of grant money for the WIC program reached $6.6 billion, and the system affected more than 8 million participants.

In 2009, the WIC food package policies were revised for the first time since 1974. The revision was intended to improve the health and nutritional quality of the foods in the program by providing participants with a wider variety of choices and accommodating those with culture-based food preferences that are consistent with the Dietary Guidelines for Americans and infant feeding practice guidelines of the American Academy of Pediatrics (AAP).

Parents' feeding behaviors affect their children's long-term outcomes. The benefits of breastfeeding have been widely discussed in recent research. Breastfeeding can reduce the risk of post-neonatal deaths and decrease the likelihood of type-2 diabetes and the child becoming overweight/obese (Chen and Rogan 2004; Owen et al. 2005; Horta, Loret de Mola and Victora 2015). Breastfeeding is also associated with improved health and economic benefits since it

saves on costs for parents, insurers, employers, and society (Ball and Bennett 2001). The 2005 AAP policy statement emphasizes that breastfeeding ensures the best possible health in the child, as well as the most preferred developmental and psychosocial outcomes (Gartner et.al 2005). The AAP reaffirmed these positive effects in their policy statement of 2012 (Eidelman et.al 2012).

Considering the importance of breastfeeding, the WIC program has established its promotion as a crucial mission for many years. However, the effects of the WIC program on caregivers' breastfeeding behavior is unclear. Some studies have suggested that women who participated in WIC were more likely to breastfeed (Ryan, Wenjun and Acosta 2002). However, other research has criticized WIC for providing free infant formula to participants, arguing that the program might discourage caregivers from breastfeeding (Ponza et al. 2004; Chatterji et al. 2002).

To more efficiently promote breastfeeding, the recent WIC revision significantly adjusted the packages distributed to postpartum women and infants based on the mother's feeding behavior. These adjustments to the food packages were made to better induce and support breastfeeding by increasing the value of the WIC package for mothers who choose fully breastfeeding packages (FBP) without using formula distributed through WIC, and reducing the amount of formula for mothers who choose partially breastfeeding packages (PBP) or fully formula packages (FFP). Further, formula amounts are now calibrated for infants by age and the introduction of complementary infant foods has been postponed.

A number of studies have addressed the effects of this revision respective of caregivers' feeding practices. However, the overall conclusion to be drawn is still unclear. Some studies have considered the revised WIC package led to an increase in the use of FBP in California (Whaley et al. 2012), New York (Chiasson et al. 2013), and Los Angeles County (Langellier et

al. 2014). Wilde et al. (2012) found that in 17 local WIC agencies in 10 states (California, Florida, Georgia, Idaho, Illinois, Minnesota, Rhode Island, Tennessee, Texas, and Utah), more WIC mothers of newborns (aged up to five months) chose either FBP or FFP instead of PBP. Reat, et.al (2015) found that the average breastfeeding duration did not increase for WIC participants in South Central Texas, after the revisions in WIC.

Existing research in this area has primarily used data from only a few states or WIC agencies to analyze the impacts of these changes to the WIC food package, which could be a potential reason that made these studies reach different conclusions. The inconsistent findings of previous literature suggest that a national-level study of this question is necessary. We used information on infants provided by the National Food and Nutrition Survey (NATFAN) for WIC to identify changes in the feeding behavior of WIC participants. Based on the information in our dataset, we analyzed the effect of WIC package revision on caregivers' choices of WIC food packages. Furthermore, we conducted the analysis by rural and non-rural regions. To find the potential effect of the geographic factor, we used a measurement of the population from Census Bureau to differ the samples from urban to rural and analyzed the impact of rurality.

Existing studies found that food access had an effect on people's life. Smith and Morton (2009) find that although personal factors affect the eating behavior of rural residents, it is actually the physical and social environment that place constraints on food access with a sample of low-income rural residences. A few papers also discussed the relationship between WIC and food deserts. Wu (2016) compared the purchasing behaviors of WIC participants who lived in food deserts with whom in non-food-desert areas within Greater Los Angeles and found little differences between the two groups. Similarly, Jewell (2013) showed that the consumption of

fruits and vegetables has no significant difference between food desert and non-food-desert participants with NATFAN data.

Our objective is to examine if the differential impact of the WIC Food Package revision exists on breastfeeding practices for rural and non-rural residents, and food deserts.

Data and Empirical Methodology

NATFAN is a repeated cross-sectional survey that includes questions about food choices and frequency of consumption developed specifically for WIC participants. We used responses to items on the infant questionnaire for the NATFAN to evaluate the effects of WIC's program revisions. The NATFAN infant questionnaire contained 33 questions about infant feeding practices adapted from WIC interviews both before and after the implementation of the revisions to the WIC food packages. We used pre-revision data to present the period prior to the food package revision and post-revision information for the period after the revision. The NATFAN questionnaire addressing the pre-revision period was collected in 38 states, 10 Indian Tribal Organizations (ITOs), Washington DC, and one US Territory (50 WIC programs in total) in 2009. After the revision, 40 states, 16 ITOs, Washington DC, and one US Territory (58 WIC programs in total) re-administered the NATFAN questionnaire to WIC participants in late 2010 and early 2011.

The NATFAN data provide information on 21,768 infants during pre-revision and 22,951 infants during post-revision. Besides questions about food choice and frequency of consumption, the NATFAN also asked a series questions related to caregivers' feeding practices and information about participants' age, zip code, language, race, and education level.

Data from 2010 USDA ERS Food Access Research, which included the census tract codes and county codes of all census tracts in the US, as well as rural/urban information in each region, was used in the analysis to define the rurality. Based on the definition of the Census Bureau's urbanized area, a census tract is urban if the geographic centroid of the tract is in an area with more than 2,500 people; all other tracts are rural (USDA, ERS 2017).

Since the zip codes of respondents were provided in the NATFAN data, we merge the NATFAN data with Food Access dataset. We use the Housing and Urban Development Secretary (HUD)-USPS ZIP Crosswalk file to convert zip-code to census tract code. The two types of codes cannot be perfectly matched—an area within a zip code may overlap with more than one census tract. We use "TOTAL_RATIO" variable to solve this potential matching problem. "TOTAL_RATIO[1]" is defined as the ratio of all addresses in the zip—tract to the total number of all types of addresses in the entire zip. To avoid a sample being located in both food desert and non-food desert areas, we linked the zip code with the census tract with the highest "TOTAL_RATIO". In this way, we locate the sample to the census track which contains the most part of the specific zip code area.

The outcome variables are the choices of WIC packages among FBP, PBP, and FFP. Based on the responses of the participants, we generated the variables which clarified their choices. The participants were specified to use FBP if they were still breastfeeding and feeding no formula to their infants, specified to use PBP if they breastfed and formula-fed their infants and specified to use FFP if they never breastfed their infants when interviewed by WIC clinics. As the dependent variables are measured on a scale that is binary, a probit model was used to estimate the

[1] The definition is from Housing and Urban Development Secretary Data: https://www.huduser.gov/portal/datasets/usps_crosswalk.html#codebook.

probability that a WIC participant would choose one of the packages. The explanatory variables are the gender and the age of the infants, the education level and the age of the caregivers, and the race and the region of each participated household.

We retained only those participants whose questionnaires had no missing values for demographic information and feeding practices. After eliminating individuals with missing information, we had a sample of 9,956 participants for pre-revision and 11,104 participants for post-revision.

Results

Our final sample has 21,060 WIC participants, of which 47.27% were from the pre-revision period and 52.73% were from the post-revision period. Table 1 shows summary statistics of the participants' and infants' characteristics. In the first part, we described the characteristics of all participants by pre-and post-WIC revision periods. The average age of the caregivers was around 25 years old. Approximately 32% of the participants were Hispanic. Most had achieved a high school level of education or attended some college and lived in South region. The characteristics of the participants were very similar for both pre-and post WIC revisions. We then separated the sample by region and by food access. About 16% of the participants were located in rural areas. Comparing the participants by region, more urban participants were Hispanic and had an education level lower than high school. When considering the food access, participants living in the food desert and non-desert areas have similar characteristics.

The summary statistics of outcome variables provided a direct comparison of the changes in the caregivers' choice of packages among FBP, PBP, and FFP. We observed that compared to the participants in the pre-revision period, the post-revision participants were more likely to use FBP and less likely to use PBP. The change of FFP was not significant. This phenomenon

suggests that overall caregivers were more willing to breastfeeding after the revision. When comparing the use of WIC packages by region and by food access, a higher percentage of rural participants preferred to use FBP and FFP in both periods compared with urban participants. Relative to participants in the non-food deserts, participants living in the food deserts were more likely to use FBP and less likely to choose FFP after the WIC revision.

In table 2, we described the characteristics of all participants by package type. Older caregivers would prefer to breastfeed compared to younger caregivers. Hispanic participants were less like to choose FBF, and participants with higher education were more likely to choose FBF. Further, the choice of packages was significantly different in the four regions.

Table 3 and 4 presented the results of probit regression for different package types. Table 3 reported the coefficient estimates. The effect of WIC revision is captured by the variable "post". Participants were more likely to use FBP and less likely to use PBP after the revision. Older caregivers were more likely to choose FBP and PBP. Participants with higher education level and rural participants were more likely to choose FBP, while Hispanic participants were more likely to use PBF. Table 4 reported the marginal effects. After the WIC package revision, around 3.9% participants were more likely to choose FBP and 3.5% participants were less likely to choose PBP. The effect of revision on the choice of FFP was not significant. Hispanic participants were 2.4% less likely to used FBP and 7.18% less likely to use FFP relative to non-Hispanic participants. They were 9.02% more likely to choose PBP. Consistent with the finding from table 1 and 2, participants with a higher degree of education would prefer FBP to other packages. Relative to participants with an education level that was lower than high school, participants who had a high school degree were 2.84% more likely to use FBP and 3.02% less likely to use PBP, who had some college education were 6.41% more likely to use FBP and

6.05% less likely to use FFP, and who had a degree of college or higher degree were 15.8% more likely to use FBP and 22.53% less like to use FFP. In comparison with participants in South region, participants in West region were 9.81% more likely to use FBP and 10.69% less likely to use FFP, in Midwest region were 3.41% more likely to use FBP and 2.12% less likely to use PBF, an in Northeast region were 4.31% more likely to use FBP and 4.10% less likely to use FFP.

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Table 1: Sample Means of Characteristics of Infants and Caregiver and Packages by Region and by Food Access

	Overall		By Region				By Food Access			
			Urban		Rural		Non-Food Deserts		Food Deserts	
Variable	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Explanatory variables										
Female	0.502	0.498	0.504	0.499	0.490	0.492	0.503	0.499	0.498	0.496
Less than 4 months old	0.440	0.424	0.447	0.424	0.409	0.424	0.436	0.424	0.456	0.426
4 to 6 months old	0.189	0.200	0.185	0.199	0.206	0.204	0.193	0.203	0.172	0.187
7 to 11 months old	0.371	0.376	0.368	0.377	0.385	0.371	0.371	0.373	0.371	0.387
Age of the caregivers	25.343	25.190	25.377	25.254	25.169	24.846	25.441	25.309	25.000	24.739
Hispanic	0.323	0.320	0.350	0.344	0.182	0.187	0.322	0.316	0.326	0.334
Education: Less than high school	0.250	0.226	0.262	0.235	0.189	0.183	0.245	0.223	0.269	0.240
Education: High school or GED	0.330	0.328	0.319	0.320	0.387	0.368	0.326	0.328	0.344	0.327
Education: Some college	0.358	0.371	0.355	0.370	0.373	0.379	0.364	0.375	0.338	0.357
Education: College+	0.062	0.075	0.064	0.076	0.050	0.070	0.065	0.075	0.050	0.076
Region: West	0.260	0.256	0.271	0.259	0.202	0.236	0.271	0.255	0.223	0.257
Region: Midwest	0.206	0.222	0.208	0.228	0.195	0.191	0.211	0.229	0.188	0.196
Region: Northeast	0.206	0.222	0.138	0.126	0.116	0.082	0.151	0.133	0.076	0.066
Region: South	0.377	0.379	0.366	0.367	0.435	0.438	0.348	0.362	0.479	0.441
Dependent variables										
Fully Breastfeeding Package	0.096	0.139	0.090	0.134	0.126	0.168	0.100	0.138	0.084	0.141
Partially breastfeeding package	0.234	0.196	0.245	0.203	0.178	0.159	0.238	0.196	0.220	0.197
Fully formula feeding package	0.670	0.665	0.664	0.663	0.697	0.673	0.662	0.666	0.697	0.662
Number of observations	9,956	11,104	8,325	9,356	1,631	1,748	7,741	8,789	2,215	2,315

Table 2: Summary Statistics: Characteristics of Infants and Caregiver by Package Type

	FBP				PBP				FFP			
	Pre-revision		Post-revision		Pre-revision		Post-revision		Pre-revision		Post-revision	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.522	0.500	0.543	0.498	0.510	0.500	0.477	0.500	0.496	0.500	0.495	0.500
Less than 4 months old	0.581	0.494	0.546	0.498	0.581	0.493	0.587	0.493	0.371	0.483	0.351	0.477
4 to 6 months old	0.152	0.360	0.165	0.371	0.137	0.344	0.160	0.367	0.212	0.409	0.219	0.413
7 to 11 months old	0.266	0.442	0.289	0.453	0.281	0.450	0.253	0.435	0.417	0.493	0.430	0.495
Age of the caregivers	26.553	5.499	25.580	6.175	26.363	6.084	26.236	6.498	24.812	6.030	24.800	6.020
Hispanic	0.235	0.424	0.244	0.429	0.434	0.496	0.418	0.493	0.297	0.457	0.306	0.461
Education: Less than high school	0.157	0.364	0.122	0.328	0.274	0.446	0.264	0.441	0.255	0.436	0.237	0.425
Education: High school or GED	0.281	0.450	0.260	0.439	0.285	0.451	0.292	0.455	0.353	0.478	0.352	0.478
Education: Some college	0.426	0.495	0.422	0.494	0.367	0.482	0.356	0.479	0.345	0.475	0.365	0.481
Education: College+	0.137	0.344	0.195	0.396	0.074	0.261	0.088	0.283	0.047	0.211	0.046	0.209
Region: West	0.397	0.489	0.400	0.490	0.279	0.449	0.257	0.437	0.234	0.423	0.225	0.418
Region: Midwest	0.205	0.404	0.205	0.404	0.176	0.381	0.203	0.402	0.217	0.412	0.232	0.422
Region: Northeast	0.137	0.344	0.126	0.332	0.142	0.349	0.122	0.328	0.132	0.338	0.117	0.322
Region: South	0.240	0.427	0.252	0.434	0.387	0.487	0.398	0.489	0.394	0.489	0.399	0.490
Rural	0.214	0.410	0.190	0.392	0.124	0.330	0.128	0.334	0.170	0.376	0.159	0.366
Number of observations	958		1,544		2,331		2,176		6,667		7,384	

Table 3. Coefficient Estimates of Probit Regressions for Package Type

VARIABLES	(1) FBP	(2) PBP	(3) FFP
Post	0.2209***	-0.1257***	-0.0181
	(0.0238)	(0.0199)	(0.0185)
Female	0.0971***	-0.0129	-0.0435**
	(0.0235)	(0.0199)	(0.0184)
Less than 4 months old	0.3161***	0.4440***	-0.5345***
	(0.0326)	(0.0277)	(0.0254)
7 to 11 months old	-0.0492	-0.0500*	0.0636**
	(0.0348)	(0.0295)	(0.0266)
Age of the caregivers	0.0062***	0.0201***	-0.0192***
	(0.0020)	(0.0016)	(0.0015)
Hispanic	-0.1349***	0.3203***	-0.2003***
	(0.0278)	(0.0220)	(0.0208)
High school or GED	0.1597***	-0.1072***	0.0206
	(0.0357)	(0.0273)	(0.0257)
Some college	0.3607***	-0.0092	-0.1687***
	(0.0347)	(0.0270)	(0.0254)
College+	0.8895***	0.0654	-0.6283***
	(0.0474)	(0.0434)	(0.0404)
West	0.5524***	-0.0132	-0.2983***
	(0.0296)	(0.0252)	(0.0233)
Midwest	0.1919***	-0.0751***	-0.0281
	(0.0334)	(0.0275)	(0.0254)
Northeast	0.2425***	-0.0054	-0.1144***
	(0.0390)	(0.0321)	(0.0299)
ITOs	0.1395*	-0.0645	-0.0019
	(0.0824)	(0.0707)	(0.0643)
Rural	0.1926***	-0.1314***	-0.0116
	(0.0309)	(0.0287)	(0.0256)
Constant	-2.1619***	-1.4694***	1.4476***
	(0.0687)	(0.0548)	(0.0513)
Observations	21,060	21,060	21,060

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 Marginal Effects of Probit Regressions for Package Type

VARIABLES	(1) FBP	(2) PBP	(3) FFP
Post	0.0392***	-0.0354***	-0.0065
	(0.0042)	(0.0056)	(0.0066)
Female	0.0173***	-0.0036	-0.0156**
	(0.0042)	(0.0056)	(0.0066)
Less than 4 months old	0.0561***	0.1250***	-0.1917***
	(0.0058)	(0.0078)	(0.0091)
6 to 11 months old	-0.0087	-0.0141*	0.0228**
	(0.0062)	(0.0083)	(0.0095)
Age of the caregivers	0.0011***	0.0057***	-0.0069***
	(0.0004)	(0.0005)	(0.0005)
Hispanic	-0.0240***	0.0902***	-0.0718***
	(0.0049)	(0.0062)	(0.0075)
High school or GED	0.0284***	-0.0302***	0.0074
	(0.0063)	(0.0077)	(0.0092)
Some college	0.0641***	-0.0026	-0.0605***
	(0.0061)	(0.0076)	(0.0091)
College+	0.1580***	0.0184	-0.2253***
	(0.0084)	(0.0122)	(0.0145)
West	0.0981***	-0.0037	-0.1069***
	(0.0052)	(0.0071)	(0.0083)
Midwest	0.0341***	-0.0212***	-0.0101
	(0.0059)	(0.0077)	(0.0091)
Northeast	0.0431***	-0.0015	-0.0410***
	(0.0069)	(0.0090)	(0.0107)
ITOs	0.0248*	-0.0182	-0.0007
	(0.0146)	(0.0199)	(0.0231)
Rural	0.0342***	-0.0370***	-0.0041
	(0.0055)	(0.0081)	(0.0092)
Observations	21,060	21,060	21,060

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1