

Stocking characteristics and perceived increases in sales among small food store managers/owners associated with the introduction of new food products approved by the Special Supplemental Nutrition Program for Women, Infants, and Children

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Abstract

Objective: The present study assessed the impact of the 2009 food packages mandated by the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) on perceived sales, product selection and stocking habits of small, WIC-authorized food stores.

Design: A cross-sectional study involving in-depth interviews with store managers/owners.

Setting: Small, WIC-authorized food stores in eight major cities in the USA.

Subjects: Fifty-two store managers/owners who had at least 1 year of experience in the store prior to study participation.

Results: The WIC-approved food products (fresh, canned and frozen fruits; fresh, canned and frozen vegetables; wholegrain/whole-wheat bread; white corn/whole-wheat tortillas; brown rice; lower-fat milk (<2%)) were acquired in multiple ways, although acquisition generally occurred 1–2 times/week. Factors such as customer requests (87%), refrigerator/freezer availability (65%) and profitability (71%) were rated as very important when making stocking decisions. Most managers/owners perceived increases in sales of new WIC-approved foods including those considered most profitable (wholegrain/whole-wheat bread (89%), lower-fat milk (89%), white corn/whole wheat tortillas (54%)), but perceived no changes in sales of processed fruits and vegetables. Supply mechanisms and frequency of supply acquisition were only moderately associated with perceived sales increases.

Conclusions: Regardless of type or frequency of supply acquisition, perceived increases in sales provided some evidence for the potential sustainability of these WIC policy efforts and translation of this policy-based strategy to other health promotion efforts aimed at improving healthy food access in underserved communities.

Keywords

WIC
Food assistance programmes
Food stores

Obesity continues to be a major concern in the USA. Data from the 2007–2008 National Health and Nutrition Examination Survey indicated that approximately 34% of

adults aged 20 years and older⁽¹⁾ and 17% of children and adolescents aged 2–19 years are obese⁽²⁾. Research findings suggest an inverse relationship between household

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income and obesity in children and adolescents, although this trend varies among racial and ethnic groups^(2–4). Although low-income youth do not represent the majority of children and adolescents classified as obese⁽²⁾, they, along with their family members, remain at high risk. This is due in part to living in socio-economically deprived areas, lacking access to supermarkets^(5,6) and other food stores that offer a range of healthy food products at an affordable price⁽⁷⁾. Increasing the availability of healthy food products to this population is an important complement to other health promotion efforts aimed at overcoming barriers to healthy eating.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) seeks to meet this need through the provision of supplemental foods to low-income pregnant and postpartum (breast-feeding and non-breast-feeding) women, infants and children up to 5 years old deemed by a health-care provider to be at nutritional risk (e.g. a medical risk, such as anaemia or overweight, or other dietary risks as determined by a standardized assessment tool)⁽⁸⁾. With fiscal year 2010 enrolment figures estimated at 9 175 000⁽⁹⁾, WIC represents an important programme through which healthy eating promotion strategies may be disseminated.

The original WIC food package created in 1972 consisted of milk, cheese, eggs, fruit juice, Fe-fortified cereals and infant formula, with a modification in 1980 to add legumes and limit the sugar content of breakfast cereals and another revision in 1992 to add tuna and carrots for breast-feeding mothers. In response to recommendations by a commissioned review conducted by the Institute of Medicine beginning in 2003, the US Department of Agriculture mandated changes to the WIC food packages via an interim rule in 2007. States were required to comply with the changes by October 2009, with most states implementing the changes between August and October 2009⁽¹⁰⁾. The new food package was designed to reduce barriers to healthy eating and better meet the dietary needs of WIC participants in accordance with the 2005 Dietary Guidelines for Americans and the American Academy of Pediatrics' infant feeding recommendations. These changes included the addition of fruits, vegetables and whole grains, as well as revisions to the amounts of milk, eggs, juice, cheese and infant formula provided depending on the respective age or status of the client (e.g. reduced infant formula for breast-fed infants, elimination of complementary foods for infants prior to 6 months of age). In addition, the new food package added the option to include more culturally relevant dietary items, such as corn or whole-wheat tortillas and brown rice instead of whole-wheat bread. Overall, the modifications reflect (i) an increasing effort to provide healthy foods consistent with the WIC educational messages and (ii) an acknowledgement of the diverse population served by the WIC programme in the USA⁽⁸⁾.

Beyond directly impacting the dietary behaviours of WIC recipients, the WIC policy changes have implications

for the retail food environment given that 89% of state agencies distribute benefits via cheques or vouchers redeemable at authorized stores⁽⁸⁾. As Andreyeva and colleagues note⁽¹¹⁾, the revised WIC food package has the potential to create new and greater demands for healthy foods in store environments that previously did not stock such items or that stocked them in small quantities. Data collected in Connecticut among store managers and owners of non-chain small grocery and convenience stores indicated an increase in perceived demand for several healthy food items in WIC-authorized stores compared with non-WIC stores after implementation of the new WIC food package⁽¹¹⁾. Given previous research suggesting substantial variability in healthy food availability in small food stores across the USA⁽¹²⁾, the present study extended the work of Andreyeva and colleagues by examining the perceived impact of changes among small store managers/owners in eight US sites differing in WIC minimum stocking requirements. In addition, we examined the stores' supply mechanisms because we speculated that having more direct and frequent access to healthier food options (i.e. through better delivery systems) would mean that fresher produce is being presented to the customer, which in turn may be associated with a perceived increase in sales⁽¹³⁾. Understanding the opportunities and challenges to meeting this growing demand for healthy food is important for sustainable health promotion efforts.

Three research questions were examined:

1. How do stores stock their products, including selection of items, supply mechanisms and frequency of supply acquisition?
2. What specific WIC-approved food products are perceived to have increased the most in sales following implementation of the new WIC food package?
3. How are supply mechanism and frequency of supply acquisition associated with perceived increases in sales?

In the discussion, we consider the implications of the work to inform future interventions or changes in federal food assistance programmes.

Methods

Study design

For the present descriptive study, data were collected in late summer/early autumn of 2010 (approximately 1 year after implementation of the 2009 WIC food package changes) and drawn from a larger, mixed-methods study that included in-depth interviews with fifty-two store managers/owners from eight major metropolitan regions across the USA. The present paper complements another paper reporting qualitative findings of store managers/owners' perceptions of WIC policy changes (Gittelsohn *et al.*, in press).

Table 1 Small, WIC-authorized food store recruitment efforts including achievements by language of interview

Study site (city, state)	No. of stores approached	Incentive provided	Eligibility status	No. of interviews completed by language
Baltimore, MD	10	\$US 15 gift card	R: 3	4 English, 3 Korean
Chicago, IL*	25	\$US 25 gift card	I: 6; R: 8; NC: 4	7 English
Minneapolis/St. Paul, MN	40	\$US 25 gift card	I: 1; R: 19; NC: 10	10 English
New Haven, CT	15	\$US 30 cash	R: 8	7 English
New Orleans, LA	6	\$US 25 gift card	NC: 2	4 English
Oakland, CA	19	\$US 20 gift card	R: 13	3 English, 3 Spanish
Philadelphia, PA	20	\$US 15 gift card	I: 1; NC: 14	5 English
San Diego, CA	11	\$US 15 cash	I: 2; NC: 3	4 English, 2 Spanish

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; R, refused; I, ineligible; NC, never completed.

*Most WIC clients in the City of Chicago are served by WIC food centres, rather than retailers. Thus interviews for the Chicago site were conducted with WIC vendors in an immigrant neighbourhood in Chicago and low-income, predominantly African-American municipalities located within 15 miles of Chicago.

Store recruitment and data collection

Store recruitment occurred in eight urban cities (located in seven states) in the USA (see Table 1), selected based on investigators' involvement in the Robert Wood Johnson Foundation Healthy Eating Research's Corner Store Working Group.

Stores were considered for inclusion if they were WIC-authorized and fit one of the following categories of small food store: convenience store, food-gas mart, neighbourhood grocery store (one location), independent grocery store (two to five locations) or chain grocery store (more than five locations, but not including supermarket chains). Stores were considered small if they had three or fewer cash registers and the number of store aisles was collected to provide evidence for construct validity of this definition. Stores were excluded from participation if the store had previously participated in a healthy eating intervention with the investigator, given the potential for socially desirable responses. Store managers/owners were also excluded from participation if they had not worked in (and/or owned) the store for at least 1 year.

All eight sites recruited a minimum of four store managers/owners with one site recruiting a total of ten (Minneapolis/St. Paul). Spanish-language interview guides were used by trained, bilingual (English/Spanish) interviewers to conduct five Spanish-language interviews in two sites (San Diego and Oakland) and a bilingual trained interviewer conducted three Korean language interviews using the English guide in one site (Baltimore). Table 1 summarizes store recruitment by site.

Manager/owner recruitment and data collection

Interviews were conducted with the managers/owners of these stores. Eligibility included 1 year of managing or owning the store to ensure some experience prior to and after the WIC changes. Trained research assistants at each site recruited managers/owners, obtained informed consent (approved by all investigators' Institutional Review Boards; see author list) and conducted the interviews. Interviews were conducted immediately after recruitment or at a later date depending on the interviewee's schedule/preference. The interview was audio-taped primarily to capture responses to a set of open-ended questions

described elsewhere (Gittelsohn *et al.*, in press). For the structured portion of the interview, which included a series of closed-ended questions, response cards were used during data collection to ease burden on recall and promote use of the full range of response options. Following completion of the interview, the store manager/owner received cash or a gift card, varying in value from \$US 15 to \$US 30 depending on the site (see Table 1).

Interview guide

The interview guide was developed through several conference calls and in-person meetings between members of the working group. The structure of the interview guide involved screening questions followed by open-ended questions on perceptions of being a store manager/owner and how the WIC changes affected sales (discussed elsewhere; Gittelsohn *et al.*, in press). Following the open-ended questions, managers/owners were asked a series of closed-ended questions as discussed in detail below. Closed-ended questions were adapted based on previous work⁽¹⁰⁾ and revised through an iterative process of group feedback and discussion, drawing particularly from extensive previous fieldwork with small store managers/owners across sites.

Supply mechanism and frequency

For each of the ten WIC-approved food products (fresh, canned and frozen fruits; fresh, canned and frozen vegetables (not including white potatoes; canned and frozen products without added sweeteners, oils, etc.); wholegrain/whole-wheat bread; white corn/whole-wheat tortillas; brown rice; and lower-fat milk (<2%)), store managers/owners were asked how they most commonly obtained each of the products using response options of self-serve/cash & carry (e.g. items are secured by the manager/owner or another store employee at a centralized location such as a supermarket, warehouse club or farmers' market), general distributor delivery (e.g. a wholesaler who delivers products from multiple brands) or direct delivery (e.g. a manufacturer/distributor of a specific brand or type of item, such as a produce distributor). The managers/owners were also asked how often they received these products on the scale from

1 = 'every day', 2 = '3–6 times per week', 3 = '1–2 times per week' to 4 = 'less than 1 time per week'.

Product profitability

Store managers/owners indicated how profitable each of the WIC-approved food products was in general using the scale from 1 = 'very little profit', 2 = 'lower than average', 3 = 'average', 4 = 'above average' to 5 = 'best of all foods'. A mean profitability score was computed and used in analyses.

Importance of factors for stocking

Store managers/owners were asked to rate how important each of the following factors was in making stocking decisions: customer requests, direct store delivery, refrigerator/freezer availability, profitability, suppliers' recommendations, how well similar foods sell, availability/prices at wholesale clubs and ability to return products to suppliers. Response options ranged from 1 = 'not at all important', 2 = 'somewhat important' to 3 = 'very important'.

Perceived changes in sales

Store managers/owners were asked if they perceived an increase, a decrease or no change in the sales of the ten

categories of WIC-approved food products since the implementation of the new food package. If a store did not carry a particular product, the item was skipped. Analyses focused on those that were perceived to increase, including computation of a summary score indicating the total number of WIC-approved food products that were perceived to increase in sales following implementation of the new WIC food package.

Data analyses

Prior to all analyses, all variables were examined to ensure that they met statistical assumptions of normality. Descriptive statistics were used to categorize the sample and answer the three research questions. These included frequencies on the various supply mechanisms and frequency of supply acquisition to answer research question 1. To examine research question 2 on perceived increases in sales of WIC-approved food products among store managers/owners, simple frequencies and counts were used. To examine research question 3, we conducted several χ^2 tests to determine whether supply mechanism and frequency of supply acquisition were associated with perceived increases in sales.

Table 2 Demographic characteristics of participating WIC-authorized stores and managers/owners (*n* 52)

	%, median or mean	<i>n</i> *, range or sd
Store characteristics		
Type of store (% , <i>n</i>)		
Convenience	55.8	29
Food-gas market	5.8	3
Grocery store – neighbourhood (1 location)	17.3	9
Grocery store – independent (2–5 locations)	19.2	10
Grocery store – chain (>5 locations)	1.9	1
Full-time employees (% , <i>n</i>) (<i>n</i> 49)		
0	2.0	1
1 or 2	55.1	27
3–5	30.6	15
6–10	–	–
>10	12.2	6
Part-time employees (% , <i>n</i>) (<i>n</i> 49)		
0	24.5	12
1 or 2	53.1	26
3–5	10.2	5
6–10	8.2	4
>10	4.1	2
Store size		
Number of cash registers (median, range) (<i>n</i> 47)	1	1–3
Number of store aisles (median, range) (<i>n</i> 48)	3	1–11
Number of WIC customers/week (median, range) (<i>n</i> 41)	30	5–800
% of clientele who are WIC customers (median range) (<i>n</i> 46)	21–30	
Store managers/owners		
Age (mean, sd) (<i>n</i> 34)	37.00	9.75
Males (% , <i>n</i>) (<i>n</i> 49)	83.7	41
Level of education (median, range) (<i>n</i> 38)	Some college	<High school to college graduate
Ethnicity (% <i>n</i>) (<i>n</i> 43)		
Latino, Hispanic, Mexican, Central American	34.9	15
Asian, Asian American	27.9	12
White, Caucasian	18.6	8
Other	14.0	6
African American	2.3	1

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

*Sample sizes for individual items (indicated in parentheses) vary due to missing data.

Results

Store and manager/owner characteristics

The majority of the stores included in our sample were convenience stores (56%), followed by independent grocery stores (19%). Overall, half of the stores (55%) had one or two full-time employees and 53% had one or two part-time employees. The median number of store aisles was three (range: one to eleven) and the median number of cash registers was one (range: one to three; see Table 2). Store managers/owners identified approximately 21–30% of customers as WIC participants. The store managers/owners themselves were primarily male (84%), self-identified as Latino/Hispanic (35%) or Asian/Asian American (28%), and completed interviews in English (85%), Spanish (10%) or Korean (5%).

Given the variability observed, we conducted several preliminary analyses to examine whether store type and store size (number of cash registers and number of aisles) potentially confounded perceived increases in sales. Preliminary analyses indicated that there was no relationship between perceived increases in sales and either store type or store size (measured by the number of aisles or cash registers; both NS). Thus, subsequent analyses did not control for these sources of variance.

Research question 1: Supply mechanism and frequency of supply acquisition

WIC-approved food products were acquired in multiple ways (see Table 3) varying from self-serve/cash & carry for fresh produce (over half of the stores) to direct delivery distributors for bread, tortillas and milk. On the other hand, frozen and canned produce and brown rice were delivered by a general delivery distributor in approximately half of stores. For the most part, WIC-approved products were delivered 1–2 times/week, and perceived mean profitability was similar for all food products, ranging from a low score of 2.6 for fresh vegetables to a high of 3.3 for wholegrain/whole-wheat bread (with possible scores ranging from 1 to 5, and high scores indicating greater profitability).

Factors that influence stocking decisions

There were clear influential factors shared by many store managers/owners (see Table 4). Customer requests, refrigerator/freezer availability, profitability, availability/prices at wholesale clubs and ability to return products to suppliers were rated as very important among a majority of the store managers/owners. Factors that were rated less important were suppliers' recommendations, direct store delivery and how well similar products sell.

Research question 2: Perceived increases in sales

Across the fifty-two stores, a mean of five of the ten product types were perceived to have increased in sales following implementation of the 2009 WIC food packages changes (see Table 5). Most of the store managers/owners reported

Table 3 Supply mechanism and frequency of supply by category of WIC-authorized food product (*n* 52)*

	No. of stores not offering	Supply mechanism						Frequency of supply								Profitability†			
		Self-serve or cash & carry			General delivery			Direct delivery			Every day		3–6 × /week		1–2 × /week			<1 × /week	
		%	<i>n</i>	%	%	<i>n</i>	%	%	<i>n</i>	%	%	<i>n</i>	%	%	<i>n</i>	%	%	<i>n</i>	Mean
Fresh fruit	4	56.3	27	14.6	7	29.2	14	14.6	7	29.2	14	52.1	25	4.2	2	2.7	1.1		
Fresh vegetables	3	55.1	27	14.3	7	30.6	15	14.3	7	20.4	10	57.1	28	8.2	4	2.6	0.9		
Frozen fruit	9	27.9	12	48.8	21	23.3	10	2.3	1	–	–	58.1	25	39.5	17	2.7	0.7		
Frozen vegetables	6	32.6	15	39.1	18	28.3	13	–	–	–	–	52.2	24	47.8	22	2.8	0.7		
Canned, unsweetened fruit	2	28.0	14	48.0	24	24.0	12	–	–	2.0	1	61.2	30	36.7	18	2.7	0.8		
Canned, plain vegetables	1	27.5	14	45.1	23	27.5	14	–	–	–	–	56.9	29	43.1	22	2.7	0.7		
White corn/whole-wheat tortillas	6	28.9	13	28.9	13	42.2	19	13.0	6	13.0	6	41.3	19	32.6	15	3.0	0.9		
Wholegrain/whole-wheat bread	–	26.9	14	19.2	10	53.8	28	7.7	4	28.8	15	61.5	32	1.9	1	3.3	0.8		
Brown rice	2	30.0	15	44.0	22	26.0	13	–	–	4.0	2	50.0	25	46.0	23	2.8	0.6		
Lower-fat milk	–	25.0	13	17.3	9	57.7	30	5.9	3	31.4	16	58.8	30	3.9	2	3.0	1.0		

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

*Sum of frequencies do not always equal 52 given missing data across variables.

†Mean profitability based on a 5-point scale from 1 = 'very little profit' to 5 = 'best of all foods'. In addition, one store in Baltimore did not provide any profitability information.

Table 4 Level of importance of various sources of influence for stocking produce and overall mean level of importance in small, WIC-authorized food stores (*n* 52)

	Not at all important		Somewhat important		Very important		Overall importance	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	Mean	SD
Customer requests	—	—	13.5	7	86.5	45	2.87	0.35
Refrigerator/freezer availability	9.6	5	25.0	13	65.4	34	2.56	0.67
Profitability	3.8	2	25.0	13	71.2	37	2.67	0.55
Availability/prices at wholesale clubs	9.6	5	28.8	15	61.5	32	2.52	0.67
Ability to return products to suppliers*	23.5	12	15.7	8	60.8	31	2.40	0.83
Suppliers' recommendations	19.2	1	48.1	25	32.7	17	2.13	0.72
Direct store delivery*	29.4	15	35.3	18	35.3	18	2.06	0.81
How well similar foods sell	23.1	12	48.1	25	28.8	15	2.06	0.73

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

*Data from one store missing.

Table 5 Percentage of WIC-authorized food products* that were observed to increase, decrease or stay the same in terms of sales following the 2009 WIC changes

	No. of stores not offering*	Increased		Decreased		Stayed the same	
		%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Fresh fruit	4	75.0	36	4.2	2	20.8	10
Fresh vegetables (not white potatoes)	3	69.4	34	4.1	2	26.5	13
Frozen fruit	9	27.9	12	4.7	2	67.4	29
Frozen vegetables	6	30.4	14	8.7	4	60.9	28
Canned unsweetened fruit	2	38.0	19	8.0	4	54.0	27
Canned, plain vegetables	1	31.4	16	5.9	3	62.7	32
White corn/whole-wheat tortillas	6	54.3	25	6.5	3	39.1	18
Wholegrain/whole-wheat bread	—	88.5	46	1.9	1	9.6	5
Brown rice	2	62.0	31	—	—	38.0	19
Lower-fat milk (<2%)	—	88.5	46	—	—	11.5	6

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

*Percentages based on stores that offered these products (e.g. Louisiana does not include tortillas and processed produce in its WIC food packages).

increases in sales of wholegrain/whole-wheat bread (89%), lower-fat milk (89%), fresh fruits (75%), fresh vegetables (69%) and brown rice (62%). In addition, 54% indicated that white corn/whole-wheat tortillas also increased in sales. On the other hand, in a majority of the stores, managers/owners reported no changes in sales of canned or frozen fruits and vegetables. Importantly, three of the products that were observed to increase were among those considered most profitable for these stores (wholegrain/whole-wheat bread, lower-fat milk, white corn/whole-wheat tortillas). Few store managers/owners reported decreased sales for any of the product types assessed.

Research question 3: Supply mechanism and frequency of supply acquisition by perceived increases in sales

Chi-square tests were conducted to examine whether supply mechanism and frequency of supply acquisition were associated with perceived increases in sales across the various WIC products. It was hypothesized that store managers/owners with frequent and direct delivery of these products would be more likely to report increases in perceived sales of these products. Findings indicate that there were few differences between supply mechanisms in terms of perceived increases in sales for most of the WIC-approved food products (see Fig. 1). Store managers/owners who reported

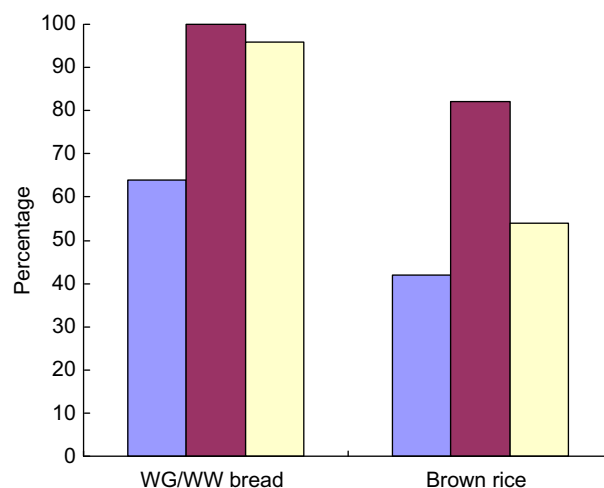


Fig. 1 (colour online) Percentage of small, WIC-authorized food store managers/owners who perceived an increase in wholegrain/whole-wheat (WG/WW) bread and brown rice sales as a result of the new WIC food package by supply mechanism (■, self-supply; ■, general distributor; □, direct delivery). Data from in-depth interviews with store managers/owners (*n* 52) in eight major US cities, late summer/early autumn 2010 (WIC, Special Supplemental Nutrition Program for Women, Infants, and Children)

having whole-grain/whole-wheat bread delivered (whether through a general distributor or direct delivery from the

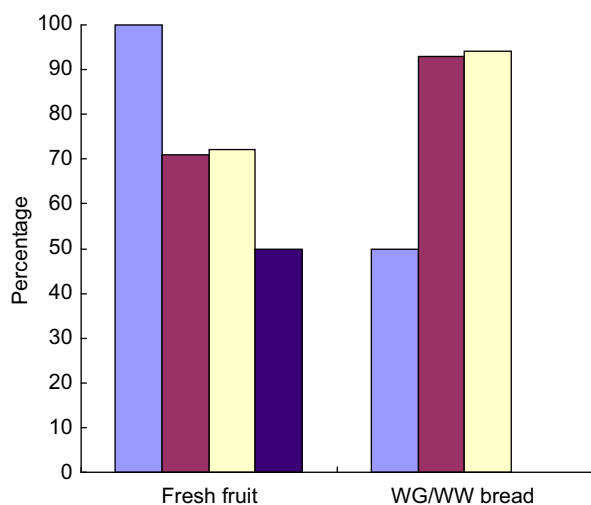


Fig. 2 (colour online) Percentage of small, WIC-authorized food store managers/owners who perceived an increase in sales of fresh fruit and wholegrain/whole-wheat (WG/WW) bread* as a result of the new WIC food package by frequency of supply acquisition (■, every day; ■, 3–6 times/week; ■, 1–2 times/week; ■, <1 time/week). Data from in-depth interviews with store managers/owners (n 52) in eight major US cities, late summer/early autumn 2010 (WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; *no stores reported receiving WG/WW bread less than once weekly)

distributor) perceived greater increases in sales than stores that acquired bread through self-supply ($P \leq 0.05$). In addition, stores that obtained brown rice from general distributors reported greater perceived increases in sales compared with stores that acquired this product through direct delivery or through self-supply ($P \leq 0.05$).

Chi-square tests were conducted to examine whether frequency of supply acquisition was associated with perceived increases in sales across the WIC-approved food products. Few differences were observed (see Fig. 2). Store managers/owners who reported delivery of fresh fruit daily were more likely to perceive an increase in sales ($P \leq 0.05$). On the other hand, acquiring wholegrain/whole-wheat bread 1–6 times/week, as compared with daily, was associated with the greatest perceived increases in sales ($P \leq 0.05$).

Discussion

WIC and other food assistance programmes are among a set of strategies to reduce nutritional risk in vulnerable populations in the USA⁽¹⁴⁾. Implementation of the 2009 WIC food package has been one of the latest attempts to modify the dietary intake of low-income pregnant and postpartum women and their infants and children⁽⁸⁾. Policy changes such as these have downstream implications; in this case, WIC-authorized store managers/owners had to modify their stock to meet the demands of

their WIC customers and to maintain their WIC authorization. The present study is one of the first to examine how store managers/owners stocked ten WIC-approved food products, whether they perceived an increase in sales in these products following implementation of the new food package and whether stocking characteristics (supply mechanism and frequency of supply acquisition) were associated with perceived increases in sales of WIC-approved food products.

Overall, store managers/owners of small food stores in eight US cities indicated that they obtained most of their ten WIC-approved food products once or twice weekly through a variety of supply mechanisms, depending on the product. Five of the ten WIC-approved food products were perceived as increasing in sales, the majority of which were perceived as items that were among the most profitable to the stores. Importantly, very few store managers/owners perceived decreases in sales for any items. Further, few differences were observed in perceived increases in sales by supply mechanism and frequency of supply acquisition. These findings suggest that regardless of the type of supply mechanism used and the frequency with which the supply is received, the majority of store managers/owners perceived an increase in sales for these products. Overall, these findings provide evidence for the potential to sustain these efforts by store managers/owners and to translate this strategy of increasing demand through policy change to other health-related areas. Assuming store sales translate to customer intake, it would appear that implementation of the new WIC food package may ultimately change the dietary habits of store customers.

Limitations

The primary limitation of the present study is the lack of sales data and reliance on perceived sales changes. Quantification of changes will clearly determine the true impact of the WIC food package changes. The purpose of the study was to examine perceptions of changes among the primary stakeholders, the store managers/owners, to better understand their willingness to remain a WIC vendor. Nevertheless, recall bias remains a threat given the methods used to collect the data. Additional limitations relate to generalizability. Stores represented a convenience sample; this differs from Andreyeva and colleagues' use of a systematic sampling approach in Connecticut⁽¹¹⁾. However, fifty-two stores were recruited from seven different states in the USA, providing some support for generalizability. Differences in the percentage of store managers/owners who agreed to participate across sites may reflect differences in the amount of field experience that individual sites have working with store managers/owners. Finally, data collected from small store managers/owners may not generalize to larger food stores including supermarkets and warehouse stores. Nevertheless, given that we found no differences in perceived sales by store

type or store size, the data suggest that some degree of variability on these dimensions is not as important as one might imagine. Overall, the diversity of the sites and the languages included are strengths of the present study.

Implications for research

The relationship between supply mechanism and perceived increases in sales suggests several other research questions. For example, it is possible that use of a general distributor for specific products (such as whole-wheat bread and/or brown rice) reflects a more efficient store in general and thus one that is more likely to have better sales overall. In addition, data on what is important to store managers/owners in terms of stocking may have implications for future intervention efforts. For example, increasing the demand for healthier products through customer requests is a salient motivator to store managers/owners in the current study. In addition, ensuring that store managers/owners have the equipment they need may solve some of the problems with stocking perishable products. Loan programmes such as those provided by the California Endowment⁽¹⁵⁾, a programme designed to provide loans to stores to build their infrastructure to offer healthy foods, may address this barrier.

Overall, the new WIC food package represents an important stride in ensuring that federal food assistance programmes meet the nutritional needs of low-income recipients. Further, the provision of foods aligned with current adult/child dietary recommendations and recommended infant feeding practices serves to reinforce tangibly what was once communicated primarily through WIC's educational materials⁽⁸⁾. Additional research on the impact of the WIC food package on other retail environments and on the actual dietary intake of WIC recipients is needed, but the preliminary results demonstrated by the current study seem to indicate a step in the right direction.

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References

1. Flegal KM, Carroll MD, Ogden CL *et al.* (2010) Prevalence and trends in obesity among US adults, 1999–2008. *JAMA* **303**, 235–241.
2. Ogden CL, Lamb MM, Carroll MD *et al.* (2010) *Obesity and Socioeconomic Status in Children: United States 1988–1994 and 2005–2008. NCHS Data Brief* no. 51. Hyattsville, MD: National Center for Health Statistics; available at <http://www.cdc.gov/nchs/data/databriefs/db51.pdf>
3. Gordon-Larsen P, Adair LS & Popkin BM (2003) The relationship of ethnicity, socioeconomic factors, and overweight in US adolescents. *Obes Res* **11**, 121–129.
4. Murasko JE (2011) Trends in the associations between family income, height and body mass index in US children and adolescents: 1971–1980 and 1999–2008. *Ann Hum Biol* **38**, 290–306.
5. Giskes K, van Lenthe F, Avendano-Pabon M *et al.* (2011) A systematic review of environmental factors and obesogenic dietary intakes among adults: are we getting closer to understanding obesogenic environments? *Obes Rev* **12**, e95–e106.
6. Larson NI, Story MT & Nelson MC (2009) Neighborhood environments: disparities in access to healthy foods in the US. *Am J Prev Med* **36**, 74–81.
7. Emond JA, Madanat HN & Ayala GX (2012) Do Latino and non-Latino grocery stores differ in the availability and affordability of healthy food items in a low-income, metropolitan region? *Public Health Nutr* **15**, 360–369.
8. Cole N, Jacobson J, Nichols-Barrer I *et al.* (2011) *WIC Food Packages Policy Options Study, WIC-11-FOOD*. Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, Office of Research Analysis; available at <http://www.fns.usda.gov/ora/menu/Published/WIC/FILES/WICFoodPackageOptions.pdf>
9. US Department of Agriculture, Food and Nutrition Service (2011) WIC Program Participation and Costs, National Level Annual Summary, FY 1974–2010. <http://www.fns.usda.gov/pd/wisummary.htm> (accessed August 2011).
10. Gleason S, Morgan R, Bell L *et al.* (2011) *Impact of the Revised WIC Food Package on Small WIC Vendors: Insight from a Four-State Evaluation*. Portland, ME: Altarum Institute; available at http://www.altarum.org/files/pub_resources/FourStateWICFoodPackageEvaluation-Full%20Report-20May11.pdf
11. Andreyeva T, Middleton AE, Long MW *et al.* (2011) Food retailer practices, attitudes and beliefs about the supply of healthy foods. *Public Health Nutr* **14**, 1024–1031.
12. Laska MN, Borradaile KE, Tester J *et al.* (2010) Healthy food availability in small urban food stores: a comparison of four US cities. *Public Health Nutr* **13**, 1031–1035.

13. Gittelsohn J, Suratkhar S, Song HJ *et al.* (2010) Process evaluation of Baltimore Healthy Stores: a pilot health intervention program with supermarkets and corner stores in Baltimore City. *Health Promot Pract* **11**, 723–732.
14. Coleman-Jensen A, Nord M, Andrews M *et al.* (2011) *Household Food Security in the United States in 2010*. *Economic Research Report* no. ERR-125. Washington, DC: US Department of Agriculture, Economic Research Service; available at <http://www.ers.usda.gov/Publications/ERR125/ERR125.pdf>
15. California FreshWorks Fund (2011) FreshWorks™ home page. <http://www.cafreshworks.com/> (accessed September 2011).