

Original Article

Use of food labels, awareness of nutritional programmes and participation in the special supplemental program for Women, Infants and Children (WIC): results from the National Health and Nutrition Examination Survey (2005–2006)

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Abstract

Use of nutritional labels in choosing food is associated with healthier eating habits including lower fat intake. Current public health efforts are focusing on the revamping of nutritional labels to make them easier to read and use for the consumer. The study aims to assess the frequency of use of nutritional labels and awareness of the United States Department of Agriculture (USDA) nutritional programmes by low-income women including those participating in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) as surveyed in the National Health and Nutrition Examination Survey 2005–2006. Many low-income women do not regularly use the nutrition facts panel information on the food label and less than half had heard of the USDA Dietary Guidelines for Americans (38.9%). In multivariate logistic regression, we found that WIC participation was associated with reduced use of the nutrition facts panel in choosing food products [odds ratio (OR) 0.45, 95% confidence interval (CI) 0.22–0.91], the health claims information (OR 0.54, 95% CI 0.32–0.28) and the information on carbohydrates when deciding to buy a product (OR 0.44, 95% CI 0.20–0.97) in comparison with WIC eligible non-participants. Any intervention to improve use of nutritional labels and knowledge of the USDA's nutritional programmes needs to target low-income women, including WIC participants. Future studies should evaluate possible reasons for the low use of nutrition labels among WIC participants in comparison with eligible non-participants.

Keywords: nutritional interventions, nutrition, obesity, maternal public health, maternal nutrition, infant and child nutrition.

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Background

Nutritional labels in the United States

The introduction of uniform nutrition labels in the United States in 1994 was part of the Nutrition Labeling and Education Act. The proposed benefits of providing increased nutritional information to consumers included the possibility that increased knowledge about the nutrition and fat content of food would be associated with a healthier overall dietary

intake in adults and children. Previous studies with adults have found that increased label use is associated with lower fat intake (Neuhouser *et al.* 1999). The use of food labels has also been associated with fat reduction efforts in adults trying to make healthful dietary changes (Kristal *et al.* 1998), and the total percentage of calories from fat has been associated with reading nutrition labels (Huang *et al.* 2004). Recent data also suggest that the use of the nutrition facts panel has increased in recent years (from 32% in 2004

to 52% in 2008) (US Department of Health and Human Services & Food and Drug Administration 2010).

Despite the proposed positive association between reading nutrition labels and increased health benefits, there have been few studies that have assessed the frequency of label use, particularly in at-risk populations such as lower-income communities that are at highest risk for obesity (Wang & Beydoun 2007; Singh *et al.* 2010). Those studies that have been conducted have had disparate results, sample sizes have been small or they have not been population based. One study conducted among lower socio-economic status, African Americans in North Carolina found that approximately 80% sometimes/always read nutritional labels (Satia *et al.* 2005), while another study with adults in food assistance programme found that approximately one third read food labels (Pérez-Escamilla *et al.* 2010). A study of the use of nutritional labels by low-income women in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in California, Ohio, Texas and Connecticut found a low percentage use of food labels regularly. Only 19.7% stated that they use them often or quite often, although a much higher 92.0% recognised the food label (McArthur *et al.* 2001).

In particular, studies need to be conducted that assess the relationship between participation in WIC and nutritional behaviour such as label reading prior to purchase. WIC provides nutritional education (in addition to supplemental nutrition) to at-risk women and children, which ideally increases disadvantaged women's abilities to buy healthy and nutritious foods for themselves and their children. WIC educational programmes have been successful in improving

healthy eating among participants including changing the consumption of key targeted foods (Ritchie *et al.* 2010). The nutrition education forms a core part of the WIC programme (Ritchie *et al.* 2010). However, WIC participants have not always been satisfied with the nutrition education that they receive (Nestor *et al.* 2001). As each WIC state and county offices provides different nutrition educational components with many nutrition areas targeted, it is possible that some women never receive nutrition label-specific educational trainings and others receive more intensive ones. As examples of nutrition label-specific educational sessions, the state of Missouri has an online training for WIC participants entitled, 'Food Label Basics' (Missouri Department of Health and Senior Services no date). The county of Riverside in California provides a 'rethink your drink' training programme which helps participants read nutrition labels in drinks and assess the amount of sugar in different drinks (County of Riverside no date).

In the last couple of years, there has also been renewed interest in reformatting the nutritional information on food and drink labels to make them easier to read and comprehend through federal policy initiatives (Barnes 2010). Additionally, there are ongoing efforts to place nutritional labels in restaurants as advocated by state and local health policymakers (Pomeranz 2011). The White House Task Force on Obesity Prevention states that one of the benchmarks for success for the nutritional labelling in the United States is 'An increase in the number of parents who are better able to notice, understand, and use food labels' (Barnes 2010). The Institute of Medicine is currently conducting an investigation and will issue a report on front of package food labelling, and

Key messages

- Only close to half of the low-income women surveyed regularly make use of the nutritional facts panel information, with less than half using the ingredient list or serving size information on the food label.
- Participants in the Special Supplemental Program for Women, Infants and Children (WIC) were less likely than women who were eligible but did not participate in the programme to use the nutrition facts panel information including sections on calories from fat and total calories.
- Future public health and nutrition intervention programmes need to take into consideration the low use of nutrition food label information by high-risk women, specifically WIC participants, in designing obesity prevention programmes.

the food industry has also proposed changes to the food labelling system suggesting the likely possibility of imminent changes to the said system (Brownwell & Koplan 2011).

Awareness of federal nutrition programmes

Similarly, there have been recent changes to some of the US federal nutrition programmes including the Food Guide Pyramid being replaced by MyPlate in 2011, the government's primary food group symbol [US Department of Agriculture– National Agricultural Library (USDA-NAL) 2011a,b]. The Obama administration has suggested that the United States Department of Agriculture (USDA) needs to communicate more 'effective, actionable messages' for its programmes including the Dietary Guidelines for Americans and the Food Guide Pyramid, which could assist in changing behaviour, and possibly address the obesity epidemic (Barnes 2010). Past studies have shown that knowledge of the US Department of Health and Human Services (HHS) and the USDA's Dietary Guidelines for Americans (USDA 2010) and other educational programmes such as USDA's Food Guide Pyramid has been associated with healthier eating behaviour including an increased likelihood of meeting requirements for fruit, dairy and protein (Kolodinsky *et al.* 2007).

The Dietary Guidelines for Americans provides dietary recommendations and was compiled by the USDA and HHS in 2010 (US Department of Health and Human Services 2010). The USDA also designed the Food Guide Pyramid, which outlines a plan for daily food choices using the Dietary Guidelines for Americans and was recently changed to MyPlate [USDA-NAL 2011b]. Another federal nutrition programme is the 5-a-Day for Better Health Program, renamed the Fruits and Veggie-More Matters [developed by the National Cancer Institute in collaboration with the Produce for Better Health Foundation and managed by the Center for Disease Control (CDC) since 2005], which was designed to encourage fruit and vegetable consumption (CDC no date).

In this study, we sought to assess the frequency of use of nutritional package information and awareness of nutritional programmes by low-income women in

the United States and whether participation in the WIC programme was associated with differences in use and awareness in comparison with eligible non-participants (those women and girls who are eligible for participation based on criteria described in the Methods section but do not participate in the WIC programme).

Methods

In 2005–2006, the National Health and Nutrition Examination Survey (NHANES), a nationally based nutrition and health survey, added specific questions to assess diet behaviour and nutritional awareness including questions on the use of food nutrition labels. Specifically, adolescents older than 15 years and adults were asked questions on diet behaviour including questions on the frequency of use of the nutrition facts panel, the ingredient list, serving size information, health claims, and then whether they check calories on a food product or calories from fat, calories from total fat, trans fat, saturated fat, cholesterol, sodium, carbohydrates, fibre and sugars. Respondents could answer that they use the information or check the nutrient always, most of the time, sometimes, rarely or never. Specifically, participants were shown a nutrition facts panel and then asked, 'How often do you use the nutrition facts panel (or another part of the nutrition label based on the line of questioning) when deciding to buy a food product? Would you say always, most of the time, some of the time, rarely or never?' Participants were subsequently asked, 'When you use the food label to decide about a food product, how often do you look for information about calories (or saturated fats, fats or cholesterol, etc.). Would you say always, most of the time, sometimes, rarely or never?'

Survey respondents were only asked additional questions about nutrition information use (e.g. if they check calories on a food product or check other nutrient information on the product) if they responded affirmatively that they used the nutrition facts panel, the ingredient list, serving size information or health claims on a package. Questioning on nutrition information use was terminated if survey participants responded that they never use nutrition information on a food package.

Additionally, questions on nutritional awareness of USDA programmes were assessed including awareness of Dietary Guidelines for Americans, My Pyramid and the CDC's 5-a-Day For Better Health Program. Respondent could answer either yes or no whether they had heard of certain programmes or not. The specific questions were, 'Have you heard of dietary guidelines? Have you heard of food guide pyramid? Have you heard about 5-a-Day program?'

Statistical analyses

Statistical analyses included means, standard deviations and percentages for univariate analyses, chi-square, *t*-tests of significance and multivariate logistic regressions for multivariate analyses. Ninety-five per cent confidence intervals (CIs) were provided for percentage estimates for total frequencies, as to provide information on the precision of the estimate. Bivariate results that were significant at $P < 0.05$ were further analysed in multivariate models. Multivariate models were adjusted for age, WIC participation status, race/ethnicity, education level, poverty-to-income ratio (PIR) and maternal body mass index (BMI) category. The primary outcome of interest was awareness of nutritional programmes (yes or no) and use of nutrition label information (defined as using sometimes, most of the time or always) from the nutrition facts panel, ingredient list, serving or specific nutrient information (e.g. calories, calories from fat, saturated fats, trans fats, etc.). We dichotomised use of nutrition label information into the aforementioned two categories based on the goal to understand predictors of frequent or occasional use in comparison with infrequent use. Our primary predictor of interest was participation in the WIC Program. All analyses adjusted for the complex survey design using NHANES supplied sampling weights and variance estimates for the years 2005–2006. All statistical analyses were conducted using Stata 11.0 (Stata-Corp, College Station, TX, USA).

We only included WIC eligible women and girls in our analyses as defined by those women and girls who were 185% at or below the federal poverty income level (a poverty income ratio ≤ 1.85) (US Depart-

ment of Agriculture – Food Nutrition Services no date). All women in the analysis met the low-income threshold as set by the WIC programme. The poverty threshold is set by the US government and a poverty income ratio of 1.0 or below is defined as being in poverty (US Census Bureau 2011). WIC eligible women must also either have a child under 5 years of age or be currently pregnant or breastfeeding.

Ethical review

This study did not need human subjects approval as it involved only de-identified data according to the University of California San Francisco's Committee on Human Research. The NHANES 2005–2006 surveys received approval from the National Center for Health Statistics Ethics Review Board (Protocol # 2005–2006) (National Center for Health Statistics 2011).

Results

There were 643 pregnant women or women with children under the age of 5 (the population that WIC serves). Among the 643 women, there were 304 WIC eligible, with 195 participating in the WIC programme and 109 eligible but not participating. Using the weights provided by NHANES, this sample size corresponds to a population size of 6 193 613. The mean age of the group was 28.1 years (95% CI 27.1–29.1) (Table 1). Almost half (49.5%) were married and 69.6% were US born, with the majority living in poverty (53.2%) and 71.3% having a high school degree or less. The majority of the group was overweight (41.9%), with 23.7% being obese (Table 1). The frequencies of demographic and health characteristics were similar between WIC participants and eligible non-participants with the exception of maternal age, the percentage living in poverty and maternal education level. The mean maternal age was 29.5 years among WIC participants and 27.0 years for eligible non-participants. A higher percentage of WIC participants were living in poverty (53.2% vs. 44.9%) and a lower percentage had an educational level higher than a high school degree (22.7% with some college vs. 36.8% of eligible non-

Table 1. Socio-demographics of WIC participants and WIC eligible non-participant mothers in the National Health and Nutrition Examination Survey 2005–2006 (n = 304)

Variable	Total mean or % (95% CI)	WIC only	Non-WIC	P-value
		Mean or %	Mean or %	
Age	28.1 (27.1–29.1)	29.5	27.0	<0.01
Race/Ethnicity				
Mexican American	26.2 (18.8–35.2)	30.1	20.9	0.70
Other Hispanic	8.1 (4.8–13.2)	8.8	7.1	
White	38.1 (27.3–50.2)	33.4	44.5	
Black	22.0 (13.5–33.6)	23.1	20.5	
Other race	5.7 (2.4–12.9)	4.7	7.1	
Marital status				
Married	49.5 (41.8–57.2)	41.2	60.8	0.1
Living with partner	16.9 (12.0–23.3)	19.8	13.0	
Never married	24.9 (17.6–34.1)	29.3	19.0	
Divorced	4.2 (2.8–6.3)	5.6	2.4	
Separated	4.4 (2.0–9.5)	4.1	4.8	
US born	69.6 (58.2–79.0)	68.4	71.2	0.48
Living in poverty (PIR <1.3)	53.2 (44.5–61.8)	59.3	44.9	0.03
Education level				
College (any)	28.7 (20.5–38.5)	22.7	36.8	0.03
High school degree or fewer years	71.3 (61.5–79.5)	77.3	63.2	
Maternal BMI category				
Normal (<25)	34.4 (27.3–42.3)	37.7	29.9	0.68
Overweight ≥ 25 & <30	41.9 (34.8–49.4)	22.3	25.5	
Obese ≥ 30	23.7 (18.7–29.6)	40.0	44.6	
Participating in WIC programme	57.7 (48.2–66.6)			

BMI, body mass index; PIR, poverty-to-income ratio; WIC, Women, Infants and Children.

participants) (Table 1). The frequency of white race was also higher among eligible non-participants (44.5% vs. 33.4%) although the differences in race/ethnicity breakdown were not statistically significant (Table 1).

For the questions on nutrition awareness, there was little statistically significant difference between WIC participants and non-participants although non-participants tended to have slightly higher awareness of all programmes. Of note, while 75.2% of women had heard of the Food Pyramid programme, only 36.6% had heard of the Dietary Guidelines for Americans and 47.7% had heard of the 5-a-Day programme (Table 2).

For the questions concerning dietary behaviours, WIC participants were less likely to use the nutrition facts panel on the food label (45.2% vs. 68.7%, $P < 0.01$) (Table 2). WIC participants were also much less likely to use the ingredient list on the food label (37.1% vs. 51.7%, $P = 0.02$) or much less likely to use

health claims on the food label (39.7% vs. 58.0%, $P < 0.01$) (Table 2). WIC mothers were also less likely to check calories on the food label (50.1% vs. 77.7%, $P = 0.046$), check calories from fat (47.2% vs. 70.4%, $P = 0.02$), check carbohydrates on the food label (42.4% vs. 64.5%, $P < 0.01$), check sugar (58.0% vs. 77.3%, $P = 0.01$) and check sodium on the food label (46.7% vs. 66.0%, $P = 0.02$) (Table 2).

Adjusting for race/ethnicity, education level, WIC participation status, maternal age at interview, PIR and maternal BMI category in multivariate regressions, WIC mothers were less likely to use the nutrition facts panel [odds ratio (OR) 0.45 95% CI 0.22–0.91], use the health claims on a package when deciding to buy a food product (OR 0.54, 95% CI 0.32–0.92) and check calories from carbohydrates (OR 0.44, 95% CI 0.22–0.97) (Tables 3,4). Higher maternal age was also associated with greater likelihood to check calories from fat (OR 1.06, 95% CI 1.01–1.12) (Table 4) and women with an educational

Table 2. Nutrition awareness and behaviours by WIC participation status (*n* = 304)

Variable	All women*	WIC %	Non-WIC (<i>N</i> /total) %	<i>P</i> -value
Nutrition awareness				
Heard of Dietary Guidelines	38.9 (31.1–47.4)	36.6	42.2	0.36
Heard of Food Pyramid	79.7 (69.9–86.8)	75.2	85.8	0.34
Heard of 5-a-Day				
Health programme	48.4 (41.6–55.2)	47.7	49.4	0.42
Diet behaviours				
Use nutrition facts panel on food label	55.1 (45.0–64.8)	45.2	68.7	<0.01
Use ingredient list on food label	43.3 (34.4–52.6)	37.1	51.7	0.02
Use serving size on food label	44.5 (36.9–52.4)	40.5	50.0	0.28
Use health claims on food packages	47.5 (37.2–58.0)	39.7	58.0	<0.01
Check calories on food label	63.0 (55.8–69.6)	50.1	77.7	0.046
Check calories from fat on food label	58.0 (49.0–66.5)	47.2	70.4	0.02
Check total fat on food label	58.3 (49.6–66.5)	52.2	65.2	0.12
Check trans fat on food label	43.8 (35.2–52.7)	36.1	52.6	0.10
Check cholesterol on food label	48.6 (39.2–58.2)	48.0	49.4	0.88
Check saturated fat on food label	51.2 (43.4–58.9)	44.0	59.4	0.058
Check carbohydrates on food label	52.7 (45.2–60.0)	42.4	64.5	0.02
Check fiber on food label	55.4 (48.2–62.3)	49.7	61.8	0.18
Check sugar on food label	66.9 (58.2–74.7)	58.0	77.3	0.01
Check sodium on food label	55.7 (47.0–64.0)	46.7	66.0	0.02

*All WIC-eligible women. This includes participating and eligible non-participating women. WIC, Women, Infants and Children.

Table 3. Use of nutrition facts panel, ingredient list and health claims on a package when deciding to buy a food product: results of multivariate analysis

Variable	Nutrition fact panel Odds ratio (95% CI)	Ingredient list Odds ratio (95% CI)	Health claims Odds ratio (95% CI)
Race/Ethnicity			
Mexican-American	1.00	1.00	1.00
Other Hispanic	1.71 (0.49–6.00)	1.94 (0.46–8.18)	0.91 (0.13–6.45)
White	0.88 (0.33–2.38)	1.27 (0.62–2.61)	1.38 (0.67–2.84)
African American	1.05 (0.36–3.03)	0.89 (0.34–2.32)	0.94 (0.34–2.54)
Other race	0.40 (0.10–1.70)	3.86 (1.58–9.42)	4.12 (0.54–31.32)
Education			
Some college or more	1.00	1.00	1.00
High school or less	0.45 (0.18–1.12)	1.92 (0.78–4.76)	0.60 (0.27–1.33)
Socio-economics			
WIC participation	0.45 (0.22–0.91)	0.58 (0.32–1.07)	0.54 (0.32–0.92)
Age at interview	1.02 (0.96–1.08)	1.04 (0.99–1.11)	1.03 (0.97–1.09)
Maternal BMI category			
Normal	1.00	1.00	1.00
Overweight	1.57 (0.58–4.29)	1.11 (0.44–2.78)	0.91 (0.44–1.86)
Obese	1.16 (0.53–2.52)	0.82 (0.45–1.49)	1.22 (0.57–2.61)
Poverty income ratio	1.16 (0.65–2.04)	1.23 (0.57–2.64)	0.81 (0.44–1.48)

BMI, body mass index; CI, confidence interval; WIC, Women, Infants and Children.

Table 4. Use of calories from fat, total calories and carbohydrates on food label when deciding to buy a food product: results of multivariate analysis

Variable	Calories from fat Odds ratio (95% CI)	Total calories Odds ratio (95% CI)	Carbohydrates Odds ratio (95% CI)
Race/Ethnicity			
Mexican American	1.00	1.00	1.00
Other Hispanic	4.31 (0.89–20.83)	2.93 (0.74–11.64)	1.71 (0.49–6.00)
White	0.58 (0.20–1.69)	0.80 (0.32–2.00)	0.88 (0.33–2.38)
African American	0.81 (0.22–3.03)	0.50 (0.15–1.67)	1.05 (0.36–3.03)
Other race	2.62 (0.45–15.29)	2.06 (0.35–12.18)	0.40 (0.10–1.70)
Education			
Some college or more	1.00	1.00	1.00
High school or less	0.98 (0.34–2.81)	0.88 (0.40–1.92)	0.29 (0.15–0.56)
Socio-economics			
WIC participation	0.35 (0.19–1.01)	0.29 (0.07–1.12)	0.44 (0.20–0.97)
Poverty income ratio	0.68 (0.34–1.36)	0.68 (0.31–1.49)	0.87 (0.49–1.55)
Age at interview	1.06 (1.01–1.12)	1.04 (0.97–1.12)	1.03 (0.97–1.09)
Maternal BMI category			
Normal	1.00	1.00	1.00
Overweight	0.62 (0.19–2.03)	1.18 (0.23–6.17)	1.96 (0.62–6.17)
Obese	1.47 (0.50–4.35)	1.89 (0.76–4.67)	1.42 (0.67–3.00)

BMI, body mass index; CI, confidence interval; WIC, Women, Infants and Children.

level of high school or less were less likely to check carbohydrates (OR 0.29, 95% CI 0.15–0.56) and sodium (OR 0.30, 95% CI 0.14–0.66) (Tables 4,5).

Discussion

We found important differences in the use of the nutritional facts panel information and other product nutritional information by WIC participants in comparison with eligible non-WIC participants even after adjusting for race/ethnicity, PIR, educational level, maternal age and BMI category. We did not find any statistically significant differences in the awareness of nutrition programmes based on WIC participation status for the Dietary Guidelines for Americans, the Food Pyramid and 5-a-Day Programmes.

For the overall group of WIC eligible women, we found that near half regularly (always, most of the time or sometimes) make use of the nutritional facts panel information (55.1%), with a slightly lower percentage using the ingredient list (43.3%) or the serving size on the food label (44.4%). The relatively low use of nutritional labels is concerning in this population group given the high risk for obesity and should be taken into consideration given ongoing efforts to revamp nutritional labels and potentially place them

Table 5. Use of sugar and sodium on nutrition label when deciding to buy a food product: results of multivariate analysis

Variable	Sugar Odds ratio (95% CI)	Sodium Odds ratio (95% CI)
Race/Ethnicity		
Mexican American	1.00	1.00
Other Hispanic	0.73 (0.19–2.88)	1.89 (0.46–7.67)
White	1.27 (0.55–2.95)	1.06 (0.41–2.73)
African American	0.72 (0.34–1.51)	1.22 (0.43–3.50)
Other race	0.54 (0.13–2.19)	2.24 (0.12–40.78)
Education		
Some college or more	1.00	1.00
High school or less	0.41 (0.11–1.56)	0.30 (0.14–0.66)
Socio-economics		
Eligible non-participants	1.00	1.00
WIC participation	0.51 (0.20–1.29)	0.54 (0.25–1.15)
Maternal age at interview	1.03 (0.97–1.10)	1.05 (0.97–1.13)
Maternal body mass index		
Normal	1.00	1.00
Overweight	1.43 (0.53–3.83)	1.75 (0.46–6.70)
Obese	1.11 (0.40–3.07)	1.27 (0.44–3.64)
Poverty income ratio	1.47 (0.65–3.33)	0.98 (0.48–2.02)

CI, confidence interval; WIC, Women, Infants and Children.

on the front of packages or in a manner that is easier to read and understand by the consumer (Brownwell & Koplan 2011). The differences that we found between WIC participants and non-participants are

additionally disconcerting given the nutritional educational component of the WIC programme and federal funds spent in this area. Specifically, the more limited use of the nutritional facts panel and the ingredient list by WIC participants in comparison with the eligible non-participants should be investigated in future quantitative and qualitative studies.

As not all food items can be purchased under the WIC programme, it is possible that participants develop a routine where they only purchase certain items. As the routine develops and participants select only certain items, they may no longer look at nutrition facts panel or other nutrition label information and develop complacency when shopping. If this is the pattern of purchase for WIC participants, then future interventions should target these types of behaviors, which ultimately will not serve the WIC population. As WIC is a supplemental food programme, it is not meant to satisfy all the nutritional needs of participants, and participants still need to make food purchasing choices. Additionally, within the WIC food package, there are a variety of options available to participants, who ideally should be evaluating the nutritional content of different food items. Future studies need to be conducted to verify the possibility that WIC participants stop reading nutrition labels when they make WIC-supported purchases and/or other food purchases.

We also had a relatively low percentage of women surveyed who had heard of the USDA Dietary Guidelines for Americans (38.9%) and the CDC's 5-a-Day program (48.4%). A higher percentage had heard of the Food Pyramid (79.76%), but this was lower than the 92.2% of WIC participants who were aware of the Food Pyramid in the study by Pérez-Escamilla *et al.* (2010). Our results also differed from those by Pérez-Escamilla *et al.* (2010) in the frequency of food label use; they had a much higher percentage of WIC participants (19.7%) who stated that they often or quite often use food labels and 80.3% saying they only rarely or sometimes use them. The differences in results could be explained by the differences in population surveyed. In contrast with our study which was drawn from a population-based survey, the study by Pérez-Escamilla *et al.* (2010) was based on an exclusively Latina sample and was drawn from popu-

lations in Connecticut, Ohio, Texas and California. Low-income Latinas may have a higher use of nutrition information in comparison with other population groups captured by the NHANES.

Limitations

Our data analysis was based on data collected by NHANES in 2005–2006, which is approximately 6 years ago from the time period of doing the analysis for this article. It is possible that there have been recent changes in public awareness of federal programmes and nutrition label reading behaviours because of policy changes that have added labels to restaurants and ongoing public discourse in the media concerning nutrition issues (US Department of Agriculture, Learning Center (USDA-LC) 2011; USDANAL 2011a). These potential changes in awareness and behaviours would not have been picked up by the NHANES 2005–2006.

Another limitation of our study is that while we adjusted for WIC participation status and income levels using the PIR, statistical adjustment may have not fully accounted for differences between WIC participants and non-participants. There likely was selection bias in terms of unobservable differences between WIC participants and non-participants that drive enrollment in the WIC programme that may not have been accounted for by the statistical methods used in this analysis. Previous researchers have suggested that the costs and benefits associated with enrolling in the WIC programme are associated with significant maternal differences that could impact health outcomes and erroneously be associated with the WIC programme (Ludwig and Miller 2005; Gueorguieva *et al.* 2009). Meanwhile, the results of our study, which indicate significant differences between WIC participants and eligible non-participants in use of nutritional labels, should be the impetus for future studies to systematically investigate diet-related behaviours and attitudes in low-income women.

Future directions

Future studies need to be conducted, specifically qualitative studies or focus groups to assess why WIC

participants may be less inclined to use the information on the nutrition facts panel. Previous reviews of the WIC programme have cited its effectiveness in reducing the prevalence of iron deficiency anaemia among toddlers and preschool children and a slightly higher birthweight and a higher mean gestational age among participants (Owen and Owen 1997). The content of the educational component of the WIC programme is something that varies by site, with each WIC state agency responsible for developing nutritional programmes that comply with WIC's overarching aims (Missouri Department of Health and Senior Services no date; USDA-LC 2011), which may make it difficult to assess comprehensively.

With the current administration's recommendations to revamp the nutritional labelling programme, make the USDA's nutrition programmes more accessible, and the more widespread availability of nutrition labelling in restaurants and fast food locations (Elbel 2011), studies need to be conducted to assess the impact of these changes on WIC women, a high-risk group, in addition to low-income women in general. If women in WIC programme tend to use nutrition labels less, in spite of additional educational counselling on reading nutrition labels, because their purchases are limited to WIC purchases with WIC dollars, additional studies are needed to assess whether these behaviours translate to other food purchases.

We also suggest that further larger-scale studies be conducted to investigate possible differences found in this study between WIC participants and eligible non-participants. Future studies should use statistical techniques that include the use of instrumental variables (Bitler and Currie 2005) or other techniques such as propensity function methods to control for selection bias in the enrollment in the WIC programme (Gueorguieva *et al.* 2009). The current sample size was too small to include an instrumental variable or to use other methods and could have resulted in additional statistical adjustments to the study (Martens *et al.* 2006).

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

JMW conceived of the idea for the study, did the analysis and wrote up the manuscript, and MBH conceived of the study and assisted with the writing of the manuscript.

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