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Comparing nutrition environments in bodegas and fast food restaurants

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Abstract

Many small grocery stores or “bodegas” sell prepared or ready-to-eat items, filling a similar niche in the food environment as fast food restaurants. However, little comparative information is available about the nutrition environments of bodegas and fast food outlets. This study compared the nutrition environments of bodegas and national chain fast food restaurants using a common audit instrument, the Nutrition Environment Measures Study in Restaurants (NEMS-R) protocol. The analytic sample included 109 bodegas and 107 fast food restaurants located in New York City neighborhoods in the upper third and lower third of the census tract poverty rate distribution. Inter-rater reliability was evaluated in 102 food outlets including 31 from the analytic sample and

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71 from a supplementary convenience sample. The analysis compared scores on individual NEMS-R items, a total summary score, and sub-scores indicating healthy food availability, nutrition information, promotions of healthy or unhealthy eating, and price incentives for healthy eating, using t-tests and chi-square statistics to evaluate differences by outlet type and neighborhood poverty. Fast food restaurants were more likely to provide nutritional information, while bodegas scored higher on healthy food availability, promotions, and pricing. Bodegas and fast food restaurants had similar NEMS-R total scores (bodegas: 13.09, fast food: 14.31, p=0.22). NEMS-R total scores were higher (indicating healthier environments) in low- than high-poverty neighborhoods among both bodegas (14.79 vs. 11.54, p=0.01) and fast food restaurants (16.27 vs. 11.60, p<.01). Results imply different policy measures to improve nutrition environments in the two types of food outlets.

Keywords

nutrition environment; restaurants; NEMS-R; fast food; corner stores

Food consumed away from home accounts for nearly half of all food expenditures.[1] Research on the food environment that shapes this consumption has focused on restaurants, highlighting the distinction between full-service and take-out or fast food restaurants.[2,3] However, many small grocery stores, particularly in urban environments, sell packaged ready-to-eat items or offer prepared food from deli counters, salad bars, or steam tables, thus filling a similar niche in the food environment as fast food or take-out restaurants.[4] Because they are classified as grocery stores, such outlets are excluded from measures of the restaurant environment.

The implications of this exclusion for measures of food environment quality are unclear. Small stores are conventionally evaluated using audit tools designed for grocery stores, and audit studies typically compare them with supermarkets or other larger stores.[5,6] Such audits do not consider the nutrition environment that small stores provide to consumers who purchase prepared or packaged ready-to-eat food. A few studies have examined the availability of energy-dense snacks in small grocery stores and the implications for those exposed to these outlets.[7–11] While these studies do consider ready-to-eat foods, they focus on snack foods and do not fully inventory healthy foods that may be available in small stores, nor do they benchmark the results against those for restaurants. A recent Baltimore-based study of food outlets selling prepared foods included corner stores and considered a broader range of healthy foods and health-promoting features, but the small sample limited comparison across food outlet type.[4]

The objective of this study was to compare the nutrition environments of national chain fast food restaurants and small grocery stores (“bodegas”) using a common instrument, the Nutrition Environment Measures Study in Restaurants (NEMS-R).[12] Hypotheses included: fast food restaurants are more likely than bodegas to post nutritional information; the nutrition environment is better in low-poverty than high-poverty neighborhoods; and differences in the nutrition environment by neighborhood poverty are smaller in fast food restaurants than in bodegas.

Methods

NEMS-R protocol

The NEMS-R protocol used in this study was designed to measure the nutrition environment in restaurants.[13] It includes indicators of healthy food availability as well as the presence of nutritional information, promotions, and pricing that promote healthy or unhealthy food choices. (For description of NEMS-R items, see http://www.med.upenn.edu/nems/measures.shtml.) The protocol has good inter-rater and test-retest reliability[12] and has been widely used.[4,14–19] Summary scores can be constructed using a NEMS-R scoring tool. Training in the NEMS protocol is available via a 20-hour online interactive course followed by data collection at four food outlets,[20] with NEMS certification available upon course completion (http://www.med.upenn.edu/nems/). Audits were conducted by five summer interns working with two field supervisors, all of whom took the NEMS training and received certification.

Pilot work was undertaken to determine the feasibility of using the NEMS-R protocol, designed for restaurants, in bodegas. Field staff visited bodegas in high- and low-income neighborhoods in New York City (NYC) and noted any difficulties they faced in administering the NEMS-R inventory. Supplementary instructions were added when necessary to clarify how specific items were to be categorized in bodegas. Coders were instructed to include only single serving-sized packaged or ready-to-eat foods. To count entrees in bodegas, raters counted the total number of deli meats, the number of named sandwiches (e.g., “BLT” or “Cubano”), the number of named or combination plates, and the number of breakfast items offered all day. Coders were given examples of signage promoting healthy eating, including industry posters advertising diet soda and low-salt varieties of deli meat and NYC Department of Health and Mental Hygiene signage promoting lower-sodium foods. Because few bodegas had websites, two items gauging the availability of nutrition information online were not assessed; all other NEMS-R items were retained in the protocol.

Samples and field procedures

The study employed two overlapping samples. Sample 1 (the analytic sample) included bodegas and national chain fast food restaurants in low-income and high-income neighborhoods in NYC. A two-step procedure was followed to select food outlets for this sample. The first step was to identify areas – typically 6–8 blocks of major commercial streets – that had a high density of both fast food restaurants and bodegas and that fell within the top third or bottom third of the citywide distribution of census tract poverty rates. Project staff identified these areas by mapping bodegas and national chain fast food restaurants using Dun & Bradstreet business microdata for 2005, categorized using coding procedures employed in the authors’ previous work.[21]

Neighborhood poverty classification was based on tract-level data from the Census 2000 summary file 3. Neighborhoods more than 90 minutes away (by public transit) from the research office were excluded to limit travel time for the raters. A total of 34 areas were sampled, including 10 in the Bronx, 17 in Manhattan, and 7 in Brooklyn.

The second step was to audit bodegas and fast food outlets in the sampled commercial areas. The field staff walked along all streets within these areas and attempted to audit all national chain fast food restaurants and all bodegas (defined as small grocery stores with no more than two cash registers). To initiate data collection, a field supervisor approached the owner or manager of the establishment, accompanied by one or more interns, to describe the study and ask permission to conduct an audit; he/she provided a letter from the Project Director with information about the purpose of the study. If permission was given, the audit was conducted, with scores recorded on paper forms. The study was deemed exempt from IRB review under federal regulation 45 CFR §46.101(a) because it did not meet the definition of human subjects research.[22]

Sample 2 was employed for analysis of inter-rater reliability, and included 31 establishments from Sample 1 that were evaluated by more than one rater, as well as 71 establishments from a supplementary convenience sample of outlets located near the research office and evaluated by more than one rater. When multiple coders audited the same outlet, they completed audits on the same day and were instructed not to consult with each other or compare answers.

Statistical analysis

Means and proportions were calculated for individual NEMS-R items in Sample 1, with t-tests and chi-square statistics used to assess statistical significance. Counts of healthy food items were converted to dichotomous measures of presence or absence of those items.

Total NEMS-R scores were calculated in Sample 1 using a scoring sheet available from NEMS, which assigned weights to values of each item; details of the scoring are shown in the footnote to table 3. The total score has a hypothetical range from −27 to 59 with higher scores indicating better nutrition environments. To aid in interpretation, total scores were rescaled to have a hypothetical range of 0–100. Both original and rescaled total scores are presented. Sub-scores representing key dimensions of the nutrition environment were created by combining items related to healthy food availability, promotions, nutrition information, and pricing. Hypothetical ranges for these sub-scores were 0 to 30 for healthy food availability, −15 to 9 for promotions, 0 to 14 for nutrition information, and −12 to 6 for pricing.

Inter-rater reliability was assessed in Sample 2 using percentage agreement and kappa statistics for the dichotomous items and Spearman rank order correlations for the continuous items. Because bias and high/low prevalence can affect kappa values,23 two additional diagnostics were calculated for dichotomous items: the Bias Index, which measures the extent to which the marginals of a 2 x 2 table differ, and Prevalence Index, a measure of prevalence. A few outlets were visited by more than two raters; in those instances, two scores were randomly selected for the reliability assessment.

All analyses were conducted with Stata (version 12.1, 2012, College Station, TX).

Results and discussion

Few difficulties were encountered in using the NEMS-R protocol in fast food restaurants or bodegas. Cooperation with the study was good, with only 8.9% of establishments declining participation. Refusal rates did not differ significantly by neighborhood poverty, but refusal was more common for bodegas than fast food restaurants (12.5% versus 4.6%, p=.02). After exclusion of 41 cases with missing data for at least one NEMS-R item, the analytic sample included 109 bodegas and 107 fast food establishments, with 47.2% located in high-poverty neighborhoods and 52.8% in low-poverty neighborhoods. More than half (54.6%) were in Manhattan, with 24.1% in the Bronx and 21.3% in Brooklyn.

Results for inter-coder reliability are displayed in Table 1. Overall, percentage agreement was high, with 21 dichotomous items having agreement of 90% or higher and the remaining items falling between 68.6% and 89.2%. Some kappa statistics were quite low despite high levels of agreement. Inspection of Bias Index and Prevalence Index values suggested that the low kappa statistics stemmed from high and low prevalence; bias did not appear to be a problem.

Table 2 compares results for fast food restaurants and bodegas. Fast food restaurants were more likely to offer healthy entrees, but bodegas were more likely to offer most other kinds of healthy foods. Nearly all fast food restaurants provided nutritional information in some form, while very few bodegas did. Results were more mixed for promotions, with fast food restaurants more likely to post signs encouraging healthy eating, but also more likely to use signage or menu notations to encourage overeating or unhealthy eating. By most indicators, fast food restaurants were more likely than bodegas to use pricing to encourage over-eating; notably, most fast food outlets offered combination meals that were less expensive than if the items were bought separately.

Table 3 examines differences in the NEMS-R total score and sub-scores by food outlet type and neighborhood poverty. Bodegas scored higher on healthy food availability, promotions, and pricing, while fast food restaurants had higher scores for provision of nutrition information. Total scores did not differ. The mean rescaled total scores fell below 50 for both bodegas and fast food outlets. Outlets in low-poverty neighborhoods had higher total scores and higher sub-scores for all dimensions except pricing. Fast food outlets in low-poverty neighborhoods had better total scores and better healthy food availability than fast food outlets in high-poverty neighborhoods. Bodegas in low-poverty neighborhoods had better total scores and better scores for healthy food availability, nutrition information, and promotions than bodegas in high-poverty neighborhoods.

Discussion

Evaluation of the nutrition environment of bodegas and fast food restaurants in NYC finds that both outlet types have mean total NEMS-R scores in the middle range, indicating substantial room for improvement in the support provided for healthy eating. This study highlights the importance of disaggregating the multiple dimensions of the NEMS-R inventory. Although total scores did not differ for the two types of outlets, fast food

restaurants were more likely than bodegas to provide nutrition information, but had lower scores on healthy food availability, promotions, and pricing. Results for these disaggregated scores inform policy recommendations tailored to outlet type; priorities for bodegas include providing more healthy entrees and posting nutrition information, while priorities for fast food restaurants including expanding healthy menu options and modifying pricing and promotions strategies to encourage healthy eating.

Consistent with prior research,[5,6,23,24] bodegas in low-poverty neighborhoods provided a better nutrition environment than those in high-poverty neighborhoods, although mean differences were not large. Mean scores for fast food restaurants also differed by neighborhood poverty. This finding was unexpected; corporate franchising policies and city regulations were expected to produce relative uniformity among the city's fast food restaurants. The difference in fast food NEMS-R scores by neighborhood poverty appears to reflect neighborhood differences in the mix of fast food restaurants rather than within-chain differences. High-poverty neighborhoods had more hamburger and fried chicken restaurants, while low-poverty neighborhoods had more sandwich and coffee shops.

The current study was conducted after the implementation of two policies intended to improve the nutrition environment in the food outlets under study. In 2008, NYC began to require chain fast food restaurants to post calorie counts for items sold. In 2009, New York State adopted the new "food package" for the Special Supplemental Nutrition Program for Women, Infants and Children (WIC); the change was intended to support purchase of fruits and vegetables, whole grain products, soy products, and low-fat milk, and has been associated with healthy food availability in small stores that accept WIC.[10,25] These policy changes are likely to have influenced the results of the current study, which was conducted in 2010. Comparison of these results with those for an earlier Atlanta-based study indicated that fast food restaurants in NYC were more likely to provide nutritional information than fast food restaurants in Atlanta, which had no calorie-posting regulations.[12] As these results suggest, the quality of food outlet nutrition environments may vary across place or over time due to national policy changes such as the modified WIC "food package" or the Affordable Care Act's calorie-posting requirements (expected to go into effect in 2014), or to local initiatives such as the "healthy corner store" efforts underway in a number of cities.[26–29]

The current study informs research in several ways. First, it provides information about how small grocery stores affect the "restaurant environment." Although these stores are not conventionally classified as restaurants, studies that exclude small grocery stores from measures of the restaurant environment will significantly understate the availability of ready-to-eat foods. A recent study of food outlets near NYC schools found that the density of bodegas was approximately 10 times that of national chain fast food restaurants.[30] Second, the results inform efforts to develop comprehensive measures of the neighborhood food environment. Previous work has classified both fast food restaurants and bodegas as "BMI-unhealthy," and the results of the current study support that classification.[21,31,32] Third, the study adds to the growing number of studies using NEMS protocols to evaluate food outlets, thus building a base of evidence for comparison across place and outlet type.[4,12,14–19]

The primary strengths of this study include its use of NEMS-R, a well-documented and widely used audit tool, and the novelty of its comparison of fast food outlets and bodegas using a common instrument. Limitations include the lack of information in the NEMS-R protocol on availability and prices of unhealthy food; the lack of validation studies for the use of NEMS-R in grocery stores; and the exclusion of food outlets in areas with low commercial density. In addition, the study does not examine other types of food outlets that offer inexpensive prepared or ready-to-eat foods. Future research should consider take-out restaurants other than national chain fast food, including ethnic restaurants, which are prevalent in many inner-city areas.[4,33,34]

Conclusion

Audit tools such as NEMS-R provide resources for assessing nutrition environments and identifying policy changes to improve these environments. The current study implies different policies for fast food restaurants and small grocery stores or bodegas. Priorities for fast food restaurants are to change pricing to reduce incentives to over-eat and increase availability of healthy food. For bodegas, provision of healthy entrees, healthy food promotion, and nutrition information are more appropriate foci. NEMS-R scores were lower in high-poverty neighborhoods, indicating a particular need for intervention to support healthy eating in high-poverty neighborhoods, whose residents are at higher risk for obesity.

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Table 1

Measures of inter-rater reliability for NEMS-R items for all outlets, fast food restaurants, and bodegas (n=102)[a]

	All outlets		Fast food		Bodegas	
Categorical measures	**Kappa**	**Percent agree**	**Kappa**	**Percent agree**	**Kappa**	**Percent agree**
Availability of healthy foods						
Healthy entrée	0.807	97.0	0.767	94.3	1.000	100.0
Healthy main-dish salads	0.560	91.2	0.415	85.2	0.846	97.9
Fruit without added sugar/syrup	0.592	80.4	0.203	74.1	0.735	87.5
Nonfried vegetable	0.832	94.1	N/A[b]	98.2	0.792	89.6
Baked chips	0.910	96.1	0.930	98.2	0.875	93.8
Whole-grain bread	0.588	79.4	0.435	75.9	0.612	83.3
Diet soda	1.000	100.0	1.000	100.0	1.000	100.0
100% fruit juice	0.441	81.2	0.348	69.8	0.368	93.8
1% or nonfat milk	0.473	75.5	0.259	63.0	0.744	89.6
Salad bar	0.245	84.0	0.149	78.8	0.388	89.6
Low-fat salad dressing	0.653	97.0	0.485	96.2	0.143	97.9
Nutrition information						
Nutrition information available at visit	0.824	91.2	0.153	87.0	−0.021	95.8
Nutrition information at point-of- purchase	0.073	68.6	−0.226	40.7	N/A[b]	100.0
Nutrition information on menu	0.941	97.1	0.372	94.4	N/A[b]	100.0
Healthy entrees identified on menu	0.293	92.2	0.253	85.2	N/A[b]	100.0
Facilitators/barriers to healthy eating						
Healthy requests encouraged (menu)	0.492	98.0	0.485	96.2	N/A[b]	100.0
Large portions encouraged (menu)	−0.013	97.1	−0.025	94.4	N/A[b]	100.0
Special requests discouraged (menu)	N/A[b]	100.0	N/A[b]	100.0	N/A[b]	100.0
Healthy options highlighted (signs)	0.261	95.1	0.294	92.6	N/A[b]	97.9
Healthy eating encouraged (signs)	−0.041	91.2	−0.080	83.3	N/A[b]	100.0
Unhealthy eating encouraged (signs)	0.362	89.2	0.298	79.6	N/A[b]	100.0

	All outlets		Fast food		Bodegas	
Categorical measures	**Kappa**	**Percent agree**	**Kappa**	**Percent agree**	**Kappa**	**Percent agree**
Overeating encouraged (signs)	N/A[b]	98.0	N/A[b]	96.3	N/A[b]	100.0
Low-carbohydrate promotion	N/A[b]	100.0	N/A[b]	100.0	N/A[b]	100.0
Pricing						
Combination meal cheaper than sum of prices of individual items	1.000	100.0	1.000	100.0	1.000	100.0
Healthy entrees cost more than regular entrees	−0.115	72.5	−0.225	55.6	N/A[b]	91.7
Charge for shared entrée	−0.037	92.8	−0.069	86.8	N/A[b]	100.0
Reduced-sized portions available	−0.020	96.0	−0.026	94.3	N/A[b]	97.9
Designated smaller portion costs less than regular portion	−0.014	97.0	−0.019	96.2	N/A[b]	97.8
“All-you-can-eat” or “unlimited” available	N/A[b]	98.0	N/A[b]	96.3	N/A[b]	100.0
% of entrees that are healthy	0.784		0.743		1.000	
% of main-dish salads that are healthy	0.566		0.419		0.856	

[a]Measures of inter-rater reliability are based on data from Sample 2, which includes 31 food outlets from Sample 1 that were assessed by more than one rater and an additional 71 food outlets from a supplementary convenience sample. Sample 1 includes bodegas and fast food restaurants sampled from high-density commercial streets in high- and low-poverty neighborhoods in New York City. High-poverty neighborhoods are census tracts in the top third of poverty rates city-wide; low-poverty neighborhoods are census tracts in the bottom third of poverty rates.

[b]Kappa statistic could not be calculated.

[c]For continuous variables, Spearman correlation coefficients were reported. All correlation coefficients had a p-value less than 0.01.

Table 2

Comparison of NEMS-R nutrition environment items for fast food restaurants and bodegas in Sample 1[a]

Item	Fast food	Bodega	p value
Number of food outlets	107	109	
Healthy main dishes and salads			
% of entrees that are healthy	6.6	2.6	0.036
% of main-dish salads that are healthy	25.9	34.4	0.284
Availability of healthy foods % of outlets with:			
Healthy entrée	31.1	11.9	0.001
Healthy main-dish salad	26.4	16.5	0.077
Fruit without added sugar/syrup	17.0	49.5	<0.001
Nonfried vegetable	2.8	34.9	<0.001
Baked chips	19.8	33.9	0.020
Whole-grain bread	44.3	60.6	0.017
Diet soda	80.2	97.2	<0.001
100% fruit juice	60.4	94.5	<0.001
1% or nonfat milk	48.1	63.3	0.025
Salad bar	15.2	22.2	0.192
Low-fat salad dressing	3.8	9.2	0.109
Nutrition information % of outlets with:			
Nutrition information available at visit	89.6	4.6	<0.001
Nutrition information at point-of-purchase	45.3	1.8	<0.001
Nutrition information on menu	92.4	3.7	<0.001
Healthy entrees identified on menu	9.4	3.7	0.087
Facilitators/barriers to healthy eating % of outlets with:			
Healthy requests encouraged (menu)	2.8	1.8	0.628
Large portions encouraged (menu)	16.0	2.8	0.001
Special requests discouraged (menu)	0.9	1.8	0.577
Healthy options highlighted (signs)	8.5	4.6	0.246
Healthy eating encouraged (signs)	7.6	1.8	0.047
Unhealthy eating encouraged (signs)	34.0	1.8	<0.001
Overeating encouraged (signs)	12.3	0.9	0.001
Low-carbohydrate promotion (signs)	0.0	0.0	N/A
Pricing % of outlets with:			
Combination meal cheaper than sum of prices of individual items	72.6	26.6	<0.001
Healthy entrees cost more than regular entrees	10.4	0.9	0.003
Charge for shared entrée	1.9	0.0	0.150

Item	Fast food	Bodega	p value
Reduced-sized portions available	12.3	1.8	0.003
Designated smaller portion costs less than regular portion	15.1	1.8	<0.001
“All-you-can-eat” or “unlimited” available	4.7	0.0	0.022

[a]Sample 1 includes 216 bodegas and fast food restaurants sampled from high-density commercial streets in high- and low-poverty neighborhoods in New York City. High-poverty neighborhoods are census tracts in the top third of poverty rates city-wide; low-poverty neighborhoods are census tracts in the bottom third of poverty rates.

Table 3

Comparison of NEMS-R total scores and sub-scores by food outlet type and neighborhood poverty level in Sample 1[a]

	n	Mean total score[b]		Mean sub-scores[b]			
		Original	Rescaled[c]	Food availability	Nutrition information	Promotions	Price
All outlets	216	13.69	47.3	10.58	5.12	−0.61	−1.39
Bodega	109	13.09	46.6	13.27	0.54	0.08	−0.80
Fast food	107	14.31	48.0	7.84	9.78	−1.32	−1.99
P value for difference by outlet type		0.220		<0.001	<0.001	<0.001	<0.001
High-poverty	102	11.57	44.8	9.68	4.19	−1.00	−1.29
Low-poverty	114	15.60	49.5	11.39	5.95	−0.26	−1.47
P value for difference by poverty		<0.001		0.036	0.012	0.042	0.573
Fast food							
High-poverty	45	11.60	44.9	6.38	9.42	−2.00	−2.20
Low-poverty	62	16.27	50.3	8.90	10.03	−0.82	−1.84
P value for difference by poverty		0.002		0.013	0.244	0.073	0.512
Bodegas							
High-poverty	57	11.54	44.8	12.28	0.05	−0.21	−0.58
Low-poverty	52	14.79	48.6	14.35	1.08	0.40	−1.04
P value for difference by poverty		0.013		0.047	0.003	0.026	0.126

[a] Sample 1 includes 216 bodegas and fast food restaurants sampled from high-density commercial streets in high- and low-poverty neighborhoods in New York City. High-poverty neighborhoods are census tracts in the top third of poverty rates city-wide; low-poverty neighborhoods are census tracts in the bottom third of poverty rates.

[b] For NEMS total score and sub-scores, higher scores indicate a nutrition environment more conducive to healthy eating. The total NEMS sub-score is equivalent to the sum of the four sub-scores. The food availability sub-score is the sum of: (1) 3 points for: baked chips, whole grain bread, fruit without added sugar, non-fried vegetables, 100% fruit juice, low-fat or skim milk, and diet soda; (2) count of healthy main dishes (1=1 choice, 2=2–4 choices, 3=5+ choices); (3) count of healthy main dish salads (1=1 choice, 2=2–4 choices, 3=5+ choices); (4) count of low-fat or fat-free salad dressings (1=1 choice, 2=2 choices, 3=3+ choices). The nutrition information sub-score is the sum of: 3 points for nutrition information during the site visit; 3 points for nutrition information on the menu; 3 points for nutrition information on signs/brochures; 2 points for identification of healthier menu items; and 3 points for either nutrition information or identification of healthier items on the menu. The promotions sub-score allots 3 points each for menus encouraging healthy requests, signs highlighting healthy options, and signs encouraging healthy eating; 3 points each are deducted for menus encouraging large portions, menus discouraging special requests, signs encouraging unhealthy eating, signs encouraging overeating, and presence of a “low-carb” promotion. The pricing sub-score allots 3 points each for availability of reduced-size portions and charging less for smaller portions; 3 points each are deducted for charging less for combination meals than for individual items, all-you-can-eat or unlimited refills, charging more for healthy options, and charging more for shared entrees.

[c] The rescaled total NEMS-R scores have been transformed to have a hypothetical range from 0–100.