Associations between Consumer Behavior Habits and Dietary Inflammatory Potential using Data from the National Health and Nutrition Examination Survey (2005-2016)

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Background and Hypotheses

- Chronic inflammation has been associated with numerous chronic diseases including cardiovascular disease and cancer[1]
- Diet is one of the strongest moderators of chronic inflammation in the body[2,3]

Pro-inflammatory diets

High in fats, protein, and simple carbohydrates

Anti-inflammatory diets

High in fruits and vegetables, whole grains, and fish

- The Dietary Inflammatory Index (DII®) quantifies the inflammatory potential of a diet on a scale from anti- to pro-inflammatory[4]
- The type of diet an individual consumes is determined by consumer behaviors related to food shopping and food expenditure[5,6]
- Higher food expenditure tends to be associated with the purchase and consumption of anti-inflammatory foods[5,6]

Hypothesis: Among adults in the U.S, those spending more money on groceries, less money on dining out, or who exhibit other healthy aspects of consumer behaviors (e.g., consuming more fruits and vegetables and fewer soft drinks and snacks) will have lower (more anti-inflammatory) DII scores when compared to others who spend less money on groceries, more on dining out, and have unhealthier consumer behaviors, respectively.

Methods

Study Population: US adults (≥18years old) from 2005 through 2016 National Health and Nutrition Examination Survey (NHANES, uses complex sampling).

Sample Size: Cross-sectional data from 27,438 participants

National Health and Nutrition Examination Survey

Outcome variable: DII scores were derived from a 24-hour dietary recall

- DII is comprised of "food parameters", each with an inflammatory effect score. Participants' intake for food parameters are standardized to world values, then are multiplied by the inflammatory effect score, and summed to obtain DII® score.
- More negative DII scores are anti-inflammatory and more positive values are pro-inflammatory.

Independent variables: Consumer behavior constructs were assessed using self-report questionnaires.

Sample Consumer Behavior Items from NHANES

Items	Response options
How often {does your family/do you} have fruits available at home?	Always/Most of the time/Sometimes/ Rarely/Never
How often {does your family/do you} have salty snacks such as chips and crackers available at home? Do not include nuts.	Always/Most of the time/Sometimes/ Rarely/Never
During the past 30 days, how much money {did your family/did you} spend at supermarkets or grocery stores?	$0—∞

Statistical analyses: Using survey design procedures in SAS® (version 9.4, Cary, NC), multiple linear regression analyses were conducted

Results

Overall sample characteristics: Most were female (52%), Non-Hispanic White (67%), and married/living with a partner (64%)

Sample Characteristics	N (%)
Sex	
Male	13,389 (48%)
Female	14,049 (52%)
Race	
Non-Hispanic White	11,500 (67%)
Non-Hispanic Black	5,866 (11%)
Mexican-American	4,323 (9%)
Other	5,749 (13%)
Educational level	
Less than High School	6,579 (16%)
High School	5,913 (22%)
Some College or AA degree	7,554 (32%)
College or above	5,974 (30%)
Marital Status	
Married/living with partner	15,402 (64%)
Widow, divorced, separated	5,797 (18%)
Single	4,835 (18%)
Income	
<20,000	6,867 (18%)
< 35,000	5,277 (16%)
< 65,000	6,166 (24%)
> 65,000	7,833 (42%)

Consumer behavior and mean DII scores :

- Higher DII® scores were associated with having no fruits or vegetables at home compared to always having fruits or vegetables at home.
- Higher DII® scores were also associated with always having snacks at home versus never having snacks at home.
- Higher DII® scores were observed among those who bought foods because of the ease to prepare the foods.
- Higher DII® scores were associated with eating at restaurants, not using myPyramid, not using nutrition facts labels and not buying organic foods.

Mean DII® Scores according to food-related consumer behaviors

Consumer Behavior	Mean	95% CI	p-value
Have fruits available at home			
Always	0.08	-0.05, 0.21	REF
Most of the time	0.40	0.25, 0.56	< .01
Sometime, rarely, or never	0.73	0.61, 0.84	< .01
Have vegetables at home			
Always	0.08	-0.04, 0.20	REF
Most of the time	0.26	0.14, 0.38	< .01
Sometimes	0.59	0.42, 0.76	< .01
Rarely or never	0.84	0.67, 1.01	< .01
Have soda available at home			
Always	0.48	0.35, 0.60	REF
Most of the time	0.47	0.29, 0.64	0.89
Sometimes	0.15	0.00, 0.31	< .01
Rarely	-0.14	-0.31, 0.04	< .01
Never	-0.16	-0.30, -0.01	< .01
Money spent on grocery			
<201	0.38	0.28, 0.48	REF
<351	0.24	0.13, 0.34	<.01
<501	0.35	0.24, 0.45	0.50
>501	0.13	0.01, 0.26	<.01
Money spent dining out			
<25.5	0.17	0.06, 0.28	REF
<85.5	0.30	0.20, 0.40	<.01
<201	0.37	0.26, 0.49	<.01
>201	0.37	0.26, 0.49	<.01

Conclusions

These findings suggest that consumers who spend less on grocery food, consume no fruits or vegetables, spend more money dining out, or do not use food nutrition information/education are more likely to consume more pro-inflammatory diets.

Future Studies: More research, especially studies using longitudinal data, are needed to better understand the causal relationships between consumer behaviors related to purchasing of food/meals and inflammatory quality of the diet.

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