Preventive Medicine Reports 35 (2023) 102349

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Within-store fast food marketing: The association between food swamps and unhealthy advertisement

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ARTICLE INFO

Keywords:
Food marketing
Food environment
Fast food
Health disparities
Social determinants of health
Food access
Advertising

ABSTRACT

Previous studies have linked food consumption outside the home and fast food to poor diet quality and living within a food swamp to an increased likelihood of obesity. A growing amount of research has linked food marketing to food choice. Still, limited information is available on how this dynamic may work within fast food establishments and if the marketing strategies used may vary by neighborhood food swamp status. Utilizing the Environment Assessment (EAT) Tool, we examined the within-store marketing environment of fast food restaurants to understand the factors potentially influencing food choice. A cross-sectional study design surveyed fast food outlets (n = 170) for unhealthy advertisements. Each fast-food outlet was assigned an FSI score based on its geographic location and proximity to unhealthy outlets. Outlets were assessed for associations between food swamp status and unhealthy advertisements. Poisson Regression was performed to assess the relationship between unhealthy advertisements and FSI score. Low FSI had a mean unhealthy advertisement score of 36.79 (11.06). Moderate and High FSI had mean unhealthy advertisement scores of 33.03 (14.67) and 31.71 (12.63), respectively. The number of unhealthy advertisements did not differ by food swamp categories (Moderate FSI IRR: 0.90, 95% CI: 0.74–1.09; High FSI IRR: 0.86, 95% CI: 0.73–1.01 vs. low FSI). Differences in marketing environments by food swamp status were not observed. Future research should examine other factors of the food swamp environment and additional factors such as television or social media to understand its association with food choice.

1. Introduction

On a given day, over one-third of all US adults and children consume at least one meal from a fast food restaurant (Fryar et al., 2013, 2020). Many menu items in fast food restaurants, especially the most popular and marketed items, have high caloric content (Fryer and Ervin, 2013). These food offerings can significantly impact the quality of children's diets. Overall, compared with meals and snacks prepared at home, food prepared away from home increases children's caloric intake, especially older children. One study estimated that each food-away-from-home meal adds 108 more calories to total daily intake among children ages 13–18 than a snack or meal from home (Mancino et al., 2010). The positive relationship between the consumption of food at fast-food/limited-service restaurants and increased energy intake is even more robust, where total energy intake increases by 160 calories per day for children aged 2–11 and up to 310 calories per day for adolescents (Powell and Nguyen, 2013). A deeper understanding of factors influencing individuals to consume food from fast-food/limited-service restaurants can provide insights on intervention targets to improve diet quality and prevent obesity among US children and adolescents.

Marketing is one element that may influence one's food choices (Clement et al., 2015). When used effectively, strategies may influence customers' decision-making before shopping. The American Marketing Association identifies marketing strategies by the "4P's": Product, Place, Price, and Promotion (Definitions of Marketing, 2017). Several product factors can be employed to encourage the purchase of an item. Items displayed promptly affect the product's visual attention and influence choice (Clement et al., 2015). This may relate to the product location on

Abbreviations: FSI, Food Swamp Index; mRFEI, Modified Retail Food Environment Index.

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https://doi.org/10.1016/j.pmedr.2023.102349
Received 7 March 2023; Received in revised form 24 July 2023; Accepted 25 July 2023
Available online 26 July 2023

the menu in the fast-food setting. The items promoted in large font, typically the numbered meal items, receive the most attention, while smaller items are to the side. Relatedly, price and promotion information can significantly influence decision-making. Offerings with unit price information will cause price-sensitive customers to choose lower price items. But multiple unit price promotions, such as "2 for $2″ promotions, may influence customers to purchase higher quantities of food (Manning and Sprott, 2007). In the fast-food context, using promotions such as the Wendy's 4 for $4 or McDonald's 2 for $5 may promote higher consumption of foods high in calories, fat, salt, or sugar, especially for price-conscious customers or those with fewer restaurant choices. Children in particular may be most susceptible to marketing tactics (McGinnis et al., 2006; Smith et al., 2019). Specifically, food marketing may influence the preferences and consumption habits of children when exposed to particular branding or endorsements (Dixon et al., 2014; Robinson et al., 2007).

An open question in the literature is whether within-store marketing in fast food restaurants differs depending on the surrounding food retail environment. Fast-food restaurants are a crucial element in developing the concept of food swamps – locations with an overwhelming majority of energy-dense food outlets, such as convenience stores and fast-food restaurants. The inundation of many energy-dense food outlets may "swamp out" the outnumbered healthier food options in the given area (Rose et al., 2009). Those living within food swamps are more likely to report poorer diets (Stowers et al., 2020) and are more likely to have obesity (Cooksey-Stowers et al., 2017). This association is even more significant in lower-income areas and locations where residents have less access to transportation.

The repercussions for living in these food swamps are great, as evidence exists that suggests that those with greater exposure to fast food promotion will find the consumption of fast food to be more normative and favorable (Grier et al., 2007). These advertisements often target parents to suggest that these fast-food products are suitable for their children. In other cases and increasingly, promotional food items have targeted children directly. This has been done through new targeted products or messaging geared towards younger audiences (McGinnis et al., 2006). Some evidence exists to show that marketing tactics are not evenly distributed, as neighborhoods with more ethnic minorities may be exposed to more advertisement on the outside of buildings. These advertisements were not limited to quick service restaurants, as price promotions were also more prevalent in Hispanic and Black neighborhoods (Finlay et al., 2022).

Still, gaps exist in the literature examining marketing in fast-food/limited-service restaurants to understand strategies used and how they influence choice specifically. While evidence has shown an increased prevalence of advertisement in neighborhoods with higher racial minority populations, little is known about potential variability in marketing strategies based on the neighborhood's food swamp status. In this study, we examined whether the number of unhealthy advertisements within fast-food/quick-service restaurants differs by neighborhood food swamp status and if differences could be found based on their location within the establishment (ex., exterior vs. interior).

2. Methods

2.1. Research design

This study utilized a cross-sectional design to examine fast-food restaurants at one point. Research assistants were employed to observe the physical layout of the fast-food/limited-service restaurants within a defined geographic location at a singular time point for each restaurant (Cohen et al., 2021). A stratified randomized selection of fast-food restaurants was observed within the northeast region of the United States. Fast food restaurants were stratified by restaurant brand and neighborhood makeup regarding socioeconomic status and race/ethnicity. The stratification of stores was utilized to ensure that any singular restaurant brand or demographic location was overrepresented in the sample. Five national brands of fast-food restaurants were selected for observation: McDonald's, Burger King, Taco Bell, Subway, and Wendy's. These brands were chosen based on their spread and diversity based on neighborhood location. In total, 170 restaurants were observed throughout New Hampshire, Massachusetts, and Rhode Island. Though the selection of outlets exists within a specific region, outlets were chosen from an area with varying racial/ethnic makeup and economic outlooks. This study was approved by the Merrimack College IRB.

2.2. Retail food environment

Food swamp exposure can be defined by the Food Swamp Index (FSI) score (Stowers et al., 2020). FSI is a ratio of unhealthy and intermediate food outlets compared to the total number of food outlets within a 1-mile buffer of the outlet's store location (0% to 100%; higher scores indicate a higher degree of food swamp) (Appendix 1). Unhealthy store types include gas stations, convenience stores, fast food restaurants, etc. While intermediate food outlets include sit-down or limited-service restaurants. Previous use of food swamp exposure uses a range of measurements, cutoffs, and categorizations based on the distribution of healthy and unhealthy outlets. Still, food swamp scores above the median have been treated as food swamps or high food swamp exposure areas (Cooksey Stowers et al., 2020). For this study, a 3-level categorization represents Low, Moderate, and High FSI exposure. An FSI score between 0 and 85.71 was categorized as Low, 85.71 to 91.66 was categorized as Moderate, and 91.66 to 100 was categorized as High. These categories reflect the distribution of locations chosen in this study and their exposure to fast-food establishments, where the categorization skewed toward higher FSI scores. Additional categorizations of binary FSI and Modified Retail Food Environment Index (mRFEI) measurements were utilized as sensitivity analyses to help validate the use of FSI as a suitable measure for food swamp environments. mRFEI is a food environment measure presented that is similarly presented as a ratio (Appendix 2). It has been to assess food swamp exposure in data collection and previous studies (CDC, n.d.; Salinas et al., 2014).

2.3. Environmental assessment (EAT) tool

Data was collected by utilizing the validated Environmental Assessment Tool (EAT), which examines the physical external and internal environment and the social environment of a given food outlet (Cohen et al., 2021). The stated goal of the EAT tool is to investigate children's food and behavior change techniques employed by fast food outlets. The justification of this tool is based on evidence suggesting that children's decisions are not based on what is on the menu but on what foods and images are promoted most (Cohen et al., 2020). This includes marketing but also contains elements related to a given outlet's physical and social characteristics. This application serves as further validation of the tool, as has been tested in across a number of environments and was able to identify all relevant advertisements. The EAT tool has ten sections for each relevant aspect of the food outlet, allowing for each of marketing's "4P's "to be assessed. These ten sections collect quantitative and qualitative data related to the environment's interior, exterior, and social order.

On the EAT tool, marketing strategies used were either categorized as advertising healthy foods or utilizing techniques to advertise unhealthy foods. Included in this unhealthy marketing is not only explicit advertisement of unhealthy foods such as cheeseburgers or french fries. It also included strategies that employ celebrities, particularly of Black or Latino descent, advertisements in languages other than English, and marketing specifically targeting children. This included advertisements with visible images of children or food and advertisements that are less than 3 ½ feet off the ground. Researchers believe that marketing and promotion of items may influence children and parents in selecting food items (Cohen et al., 2020).

The dependent variable examined the number of unhealthy advertisements in each fast-food restaurant. The EAT tool was utilized to count the number of advertisements visible from interior and exterior of the restaurant, assessing these both individually and as a total count. In accordance with the research standards of the use of mystery shoppers, multiple research assistants completed the evaluation of each restaurant (Allison and Baskin, 2009). This included ads and posters related to promotion, Menu Displays (with details on what is displayed on the menu), and promotional items like toys or images of famous people. Research assistants also observed the prompting of certain items by cashiers as this might influence decision-making (e.g., Would like fries with that?) (Cohen et al., 2021). If there were multiple copies of a specific advertisement type, the unhealthy advertisement count accounted for how many there were. In contrast, a similar advertisement in two different locations would count as two advertisements. These counts were added to create a total count for each food outlet. Exterior and interior advertisements were assessed separately to determine whether the exposure of the different advertisements varied by location.

Racial makeup, median household income, and socioeconomic status were measured utilizing census tract level data. Outlets were categorized as Black, White, or Latino based on the percentage of each group. Socioeconomic status was categorized as low, medium, or high based on income and employment.

2.4. Statistical analysis

Statistical analyses were conducted using SAS version 9.4 software (SAS Institute Inc., Cary, NC, USA). We compared the characteristics of fast-food restaurants by food swamp status using chi-square tests for categorical variables and Kruskal Wallis tests for the number of healthy advertisements as this variable was not normally distributed. To assess small differences in the number of unhealthy and healthy advertisements with alpha = 0.05 and 80% power, a sample size of at least 136 was needed.

Poisson regression models were run to examine the association between the retail food environment and the number of unhealthy advertisements. As the number of unhealthy ads was over-dispersed, we adjusted the standard errors by scaling by the deviance. Initial adjusted models included healthy advertisements and restaurant brands were covariates. However, neither of these variables was associated with the number of unhealthy ads. They were removed from subsequent adjusted models. Thus, the adjusted models included each location's income, socioeconomic status, and neighborhood racial makeup.

3. Results

The sample of the study included 170 fast food outlets. We excluded outlets missing food swamp score (n = 24), resulting in an analytic sample of 146 food outlets. Reasons for missing food swamp score data varied, such as the closing of particular locations during the research process and isolated locations where food stores with the 1-mile buffers of these locations were not audited. Food swamp status did not differ by restaurant brand (p = 0.2938), healthy advertisements (p = 0.8370), or median household income (p = 0.1108). Significant differences were found when measuring race (p = 0.0004) and socioeconomic status (p < 0.0001), where locations of higher ethnic minority population and lower income were more likely to exist in a food swamp (Table 1).

For the 3-level FSI measure, 77 (52.7%) fast food outlets fit in the High FSI group, 36 (24.7%) were in the Moderate FSI group, and 33 (22.6%) were in the Low FSI group. The average unhealthy advertisement count was highest in the Low FSI group (mean = 36.8, SD = 11.1). The Moderate FSI group had the second highest (mean = 33.0, SD = 14.7), and the High FSI group had the lowest mean score (mean = 33.2, SD = 12.6). Overall, the number of unhealthy advertisements did not differ by food swamp categories (Moderate FSI IRR: 0.90, 95% CI: 0.74–1.09; High FSI IRR: 0.86, 95% CI: 0.73–1.01 vs. low FSI) (Table 2).

Table 1
Characteristics of Fast Food Outlets by Food Swamp Exposure (Massachusetts, New Hampshire, and Rhode Island, 2019).

	Low FSI* (n = 33) N (%)	Moderate FSI (n = 36) N (%)	High FSI (n = 77) N (%)	p-value
Restaurant Name	7	8	13	0.29
Burger King	(4.79)	(5.48)6	(8.90)	
McDonalds	11	(4.11)4	13	
Subway	(7.53)3	(2.74)12	(8.90)	
Taco Bell	(2.05)4	(8.22)6	14	
Wendys	(2.74)8	(4.11)	(9.59)	
	(5.48)		18	
			(12.33)	
			19	
			(13.01)	
Neighborhood Racial				<0.01
CompositionBlack	4	2	5	
(10–40%)Hispanic	(2.74)	(1.37)7	(3.42)	
(10–40%)White	11	(4.79)27	24	
(<70%)	(7.53)	(18.39)	(16.44)	
	18		48	
	12.33)		(32.88)	
Neighborhood Socioeconomic				<0.01
Status *(Median Household*				
Income)	13	19	22	
High	(8.90)3	(13.01)1	(15.07)	
Medium	(2.05)	(0.68)16	13	
Low	17	(10.96)	(8.90)	
	(11.64)		42	
			(28.77)	
Number of Healthy Ads (M/SD)	0.27	0.19 (0.47)	0.30	0.84
	(0.67)		(0.67)	

*FSI = Food Swamp Index (Appendix 1).

Table 2
3-Level Food Swamp Index Categorical Association of Unhealthy Advertisements and Food Swamp Exposure (Massachusetts, New Hampshire, and Rhode Island, 2019).

	M (SD)	Crude IRR (95% CI)	Adjusted IRR (95% CI)*
All Unhealthy Advertisements			
Low FSI**	36.0.79 (11.06)	REF	REF
Moderate FSI	33.03 (14.67)	0.90 (0.74–1.08)	0.90 (0.75–1.09)
High FSI	31.71 (12.63)	0.86 (0.74–1.01)	0.86 (0.73–1.01)
All Exterior			
Low FSI	10.39 (5.07)	REF	REF
Moderate FSI	7.72 (5.74)	0.74 (0.55–1.00)	0.77 (0.56–1.04)
High FSI	7.90 (4.97)	0.76 (0.59–0.98)	0.76 (0.59–0.99)
Exterior Visible from Outside			
Low FSI	5.55 (2.41)	REF	REF
Moderate FSI	4.43 (2.94)	0.78 (0.60–1.02)	0.80 (0.61–1.05)
High FSI	4.35 (2.43)	0.78 (0.63–0.98)	0.79 (0.63–0.98)
All Interior			
Low FSI	15.30 (6.55)	REF	REF
Moderate FSI	13.00 (7.35)	0.82 (0.59–1.14)	0.82 (0.59–1.15)
High FSI	13.29 (5.92)	0.94 (0.71–1.23)	0.96 (0.72–1.26)
Interior Visible at Counter			
Low FSI	4.00 (2.65)	REF	REF
Moderate FSI	3.27 (2.22)	0.85 (0.68–1.06)	0.85 (0.68–1.08)
High FSI	3.75 (2.73)	0.87 (0.72–1.05)	0.87 (0.71–1.06)

*Adjusted for Race, SES, or Median Household income.
**FSI = Food Swamp Index (Appendix 1).

Still, results found lower unhealthy exterior advertisement counts in the high food swamp exposure groups compared to the low categories (Moderate FSI IRR: 0.77, 95% CI: 0.56–1.04; High FSI IRR: 0.76, 95% CI: 0.59–0.99). Similar results were found for exterior advertisements visible from the outside (Moderate FSI IRR: 0.80, 95% CI: 0.61–1.05; High FSI IRR: 0.79, 95% CI: 0.63–0.98). No differences were found for all interior advertisements (Moderate 3-Level FSI IRR: 0. 85, 95% CI: 0.68–1.08; High 3-Level FSI IRR: 0. 87, 95% CI: 0.71–1.06) or interior advertisements visible from the counter (Moderate 3-Level FSI IRR: 0. 82, 95% CI: 0.59–1.15; High 3-Level FSI IRR: 0. 96, 95% CI: 0.72–1.26). (Table 2).

The sensitivity analysis, utilizing the binary FSI categorization, produced similar results, with lower counts of unhealthy advertisements being found with the exterior (High FSI Binary IRR: 0.76, 95% CI: 0.60–0.97) and exterior visible from the outside measurements (High FSI Binary IRR: 0.79, 95% CI: 0.63–0.98), while no difference was found with the interior (High FSI Binary IRR: 0. 86, 95% CI: 0.72–1.04) or interior advertisements visible at the counter (High FSI Binary IRR: 0. 91, 95% CI: 0.70–1.19) counts (Table 3).

The binary mRFEI categorization also found differences in advertisement counts for the exterior (High mRFEI Binary IRR: 1.31, 95% CI: 1.03–1.66) and exterior advertisements visible from the counter (High mRFEI Binary IRR: 1.27, 95% CI: 1.03–1.57) while finding no differences in advertisement counts for the interior advertisements (High mRFEI Binary IRR: 1.09, 95% CI: 0.84–1.43) or interior advertisements visible from the counter (High mRFEI Binary IRR: 1.09, 95% CI: 0.84–1.42) (Table 4).

4. Discussion

This study sought to compare the presence of unhealthy advertisements within fast-food outlets to the local retail food environment. We found that the total number of unhealthy ads and the number of ads inside restaurants did not differ by the degree of food swamp exposure of the restaurant's location. However, the number of unhealthy exterior advertisements was found to be lower in high food swamp exposure categories. The results of this study reveal a more complicated relationship between the food environment and unhealthy advertisements.

Previous studies highlighted the importance of within-store marketing on food choice (Clement et al., 2015; Manning and Sprott, 2007). In the context of a fast-food outlet, this evidence seems relevant. Many of the promotion strategies employed for unhealthy advertising by fast food outlets mirror those mentioned in the above studies. Fryar et al. did not examine the food choice of those who may frequent fast food establishments but recognized the trends in consumption overall (Fryar et al., 2013, 2020). Still, mapping the marketing environment of the fast food outlet and its influence on food choice remains a work in progress (Cohen et al., 2020). The results of this study suggest unhealthy advertisements are used more often in lower food swamp exposure areas. As unhealthy food options are readily available in high food swamp areas, unhealthy advertisements may be less necessary for attracting patrons. It also suggests that there may be more essential factors that affect food choice at fast food outlets.

This study incorporated 170 food outlets in New England, 146 of which were eligible for analysis. The number of outlets selected and their geographical location may not be representative of all fast-food outlets. It must also be recognized that the types of chosen outlets are large corporations with national marketing divisions of their own. Standard promotion practices may have been established within each restaurant brand. This means that Wendy's or Taco Bell may not adjust their marketing much, especially if they are in a similar geographical location and serving the same menus. The results from this study reflect this reasoning. Perhaps an examination of outlets with less standardized practices would reveal a different story. Thus, researchers may find it helpful to examine the food marketing environment of locally-owned restaurants, convenience stores, and markets.

The measurement of food swamps also does not have one standard. mRFEI, a measurement that is the inverse of FSI, has been used in previous studies (Cooksey Stowers et al., 2020; Cooksey-Stowers et al., 2017). An additional study that examined the food marketing environment utilizes a different measure that does not incorporate fast food outlets at all (Huang et al., 2020). The measurements also lack the social

Table 3
Food Swamp Index Binary Association of Unhealthy Advertisements and Food Swamp Exposure (Massachusetts, New Hampshire, and Rhode Island, 2019).

	M (SD)	Crude IRR (95% CI)	Adjusted IRR (95% CI)*
All Unhealthy Advertisements			
Low	36.79 (11.06)	REF	REF
High	32.13 (13.26)	0.87 (0.75–1.01)	0.87 (0.75–1.02)
All Exterior			
Low	10.39 (5.07)	REF	REF
High	7.85 (5.20)	0.76 (0.60–0.95)	0.76 (0.60–0.97)
Exterior Visible from Outside			
Low	5.55 (2.41)	REF	REF
High	4.35 (2.35)	0.78 (0.63–0.96)	0.79 (0.64–0.98)
All Interior			
Low	15.30 (6.55)	0.90 (0.69–1.17)	REF
High	13.19 (6.38)	REF	0.91 (0.70–1.19)
Interior Visible at Counter			
Low	4.00 (2.65)	REF	REF
High	3.60 (2.58)	0.86 (0.72–1.03)	0.86 (0.72–1.04)

*Adjusted for Race, SES, or Median Household income.

Table 4
mRFEI* Binary Association of Unhealthy Advertisements and Food Swamp Exposure (Massachusetts, New Hampshire, and Rhode Island, 2019).

	M (SD)	Crude IRR (95% CI)	Adjusted IRR (95% CI)**
All Unhealthy Advertisements			
Low	32.13 (13.26)	REF	REF
High	36.79 (11.06)	1.14 (0.99–1.33)	1.15 (0.98–1.33)
All Exterior			
Low	7.85 (5.20)	REF	REF
High	10.39 (5.07)	1.32 (1.05–1.67)	1.31 (1.03–1.66)
Exterior Visible from Outside			
Low	4.35 (2.53)	REF	REF
High	5.55 (2.41)	1.27 (1.03–1.57)	1.27 (1.03–1.57)
All Interior			
Low	13.19 (6.38)	REF	REF
High	15.30 (6.55)	1.11 (0.86–1.44)	1.09 (0.84–1.42)
Interior Visible at Counter			
Low	3.60 (2.58)	REF	REF
High	4.00 (2.65)	1.16 (0.97–1.39)	1.09 (0.84–1.43)

*mRFEI = Modified Retail Food Environment Index (Appendix 2).
**Adjusted for Race, SES, or Median Household income.

context of what may or may not be a food swamp. Concentrated areas of fast-food outlets near large shopping centers may not be comparable to low-income neighborhoods inundated with convenience shops and liquor stores. One environment may assume that people drive from other areas to shop and possibly eat. The other may believe that convenience stores are needed as items must be within walking distance of those who lack other forms of transportation. Future research should consider developing or refining food swamp measurement tools that capture this aspect of the local retail food environment.

4.1. Strengths and limitations

Several strengths of this study were identified. First, the EAT tool, used to survey the food outlets, considers many elements of food promotion. This tool identifies opportunities for unhealthy advertisement at every location within the store that is visible to a customer. This way, researchers can more accurately describe the within-store food marketing environment. Additionally, though no standard has been established, FSI does seem to reflect what residents of a given area may perceive as food swamps (Stowers et al., 2020). The purpose of this study was to examine unhealthy advertisements within fast food outlets. The subject outlets selected were diverse in the socio-demographic makeup of their location and were made up of five common restaurant brands. The samples chosen were able to reflect differences in unhealthy advertisements by brand.

A fundamental limitation lies in the measurement and categorization of food swamp scores. The use of a different measurement may have rendered different results. This study was also completed in one geographic area, and several samples did not have food swamp scores. The reliability of the food swamp measures was not tested in this area to see if what was measured agreed with what people believe to be a food swamp in that area. Finally, the equation used to measure food swamp level also did not include key elements like population density, transportation, etc., which may influence whether these food swamps are considered food swamps to the people who live there.

5. Conclusion

Overall, we found fast food marketing environments did not vary by food swamp status, but slight differences were observed on the exterior of the food outlets. Differences in corporation policy and standard promotion procedures may likely explain differences in unhealthy advertising. In the context of fast-food chain restaurants, they may advertise less in areas where unhealthy foods are already the predominant food option. Other factors like proximity, television advertisements, or social media influence may influence choices before one enters the physical establishment. Future studies should utilize the EAT tool in other environments to study what factors may influence food choice for the people who live there.

Author contributions

KCS and JC obtained the data and funding to support this paper. CJA wrote the first draft and performed the data analysis with contributions from MW and KCS. All authors reviewed and commented on subsequent drafts of the manuscript.

Funding/Financial disclosures

This research was supported by internal funding from the University of Connecticut (Cooksey Stowers) and grant number 1K01DK107810-01A1 (Cohen) from the National Institutes of Health.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

N/A.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102349.

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