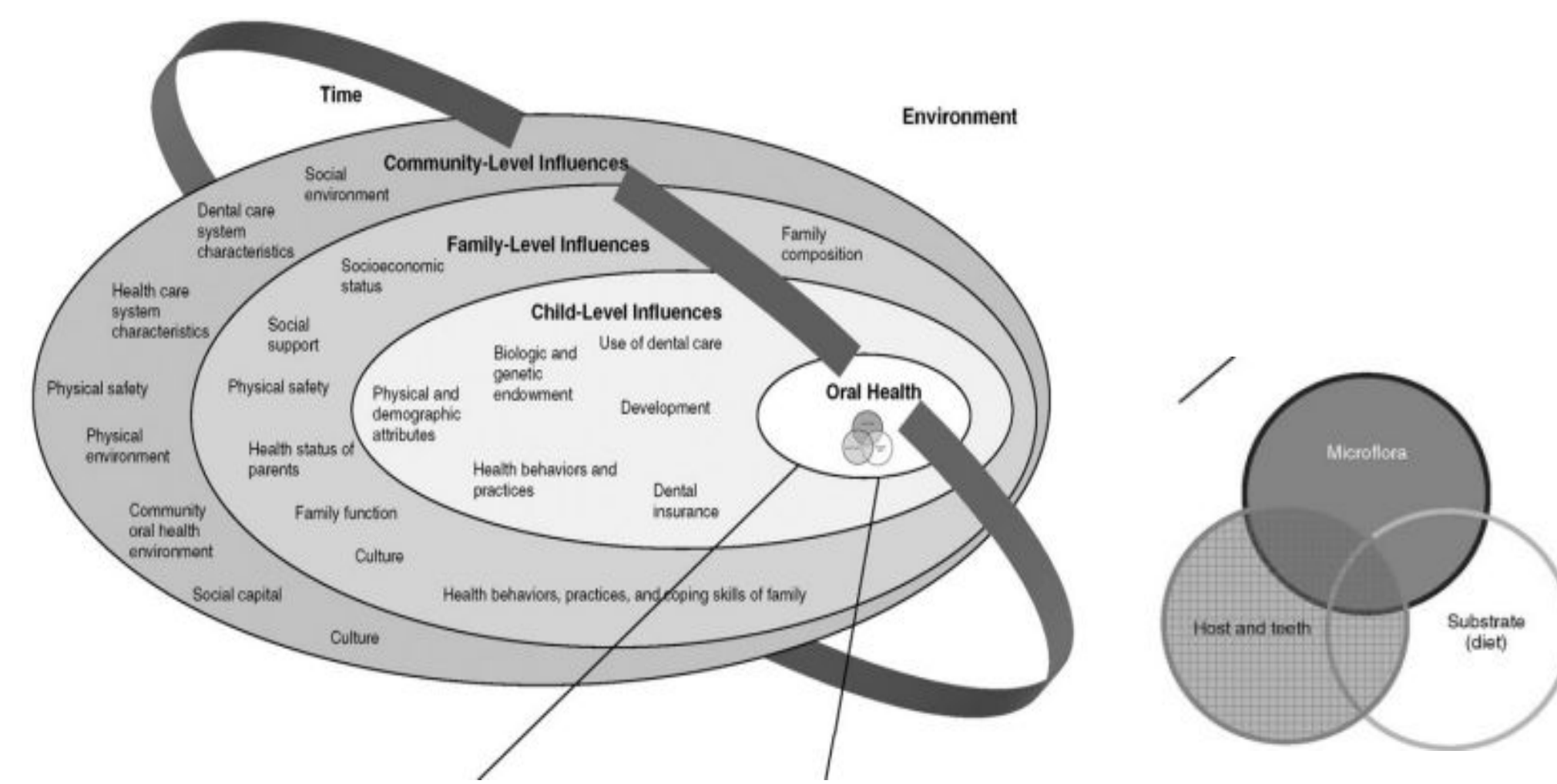


Introduction

Food environments play a critical role in shaping dietary behaviors and, in turn, broader health outcomes, including dental caries. Much of the existing literature in this area has focused on food access and food deserts, emphasizing limited availability of healthy foods. However, comparatively less attention has been given to food swamps, areas characterized by a high density of unhealthy food outlets relative to healthier options such as grocery stores, and their potential impact on oral health.

This study aims to evaluate the association between living in a food swamp and the prevalence of dental decay among children. Specifically, it seeks to determine whether children residing in food swamps are more susceptible to cavities compared to those in areas with greater access to healthy foods. The study population includes children aged 0 to 12 years who received care at the VCU School of Dentistry Pediatric Dental Clinic in 2023.

We hypothesize that children living in food swamp areas will exhibit higher rates of dental caries than their counterparts in non food swamp areas. Additionally, the Fisher-Owens model is used to illustrate the multifactorial nature of dental caries, highlighting influences at the child, family, and community levels.



Methods

Data were obtained from de-identified electronic dental records (Axium) of pediatric patients (ages 0-12) treated at the Virginia Commonwealth University (VCU) School of Dentistry Pediatric Clinic in 2023, following Institutional Review Board approval.

Patient information included age, sex, insurance status, race/ethnicity, and residential ZIP code. ZIP codes were converted to **Federal Information Processing Standards (FIPS)** codes to align with county-level geographic data. Food outlet data were obtained from the USDA Food Environment Atlas.

Food swamp exposure was measured using the **Retail Food Environment Index (RFEI)**, defined as the ratio of fast food restaurants and convenience stores to grocery stores and supermarkets, with higher scores indicating greater density of unhealthy food outlets. Two additional measures (**RFEI 1 and RFEI 2**) were also calculated using alternative classifications of food outlets.

Dental caries experience was identified using CDT codes related to caries diagnosis and treatment. RFEI scores were compared between children with and without caries using unequal variance t-tests. Multivariable logistic regression models were used to evaluate associations between food swamp exposure and caries while adjusting for age, sex, race/ethnicity, and insurance status. Analyses were performed using SAS Enterprise Guide v.8.3.

Results

Figure 1: State of Virginia Map of Caries Experience Among Included Patients

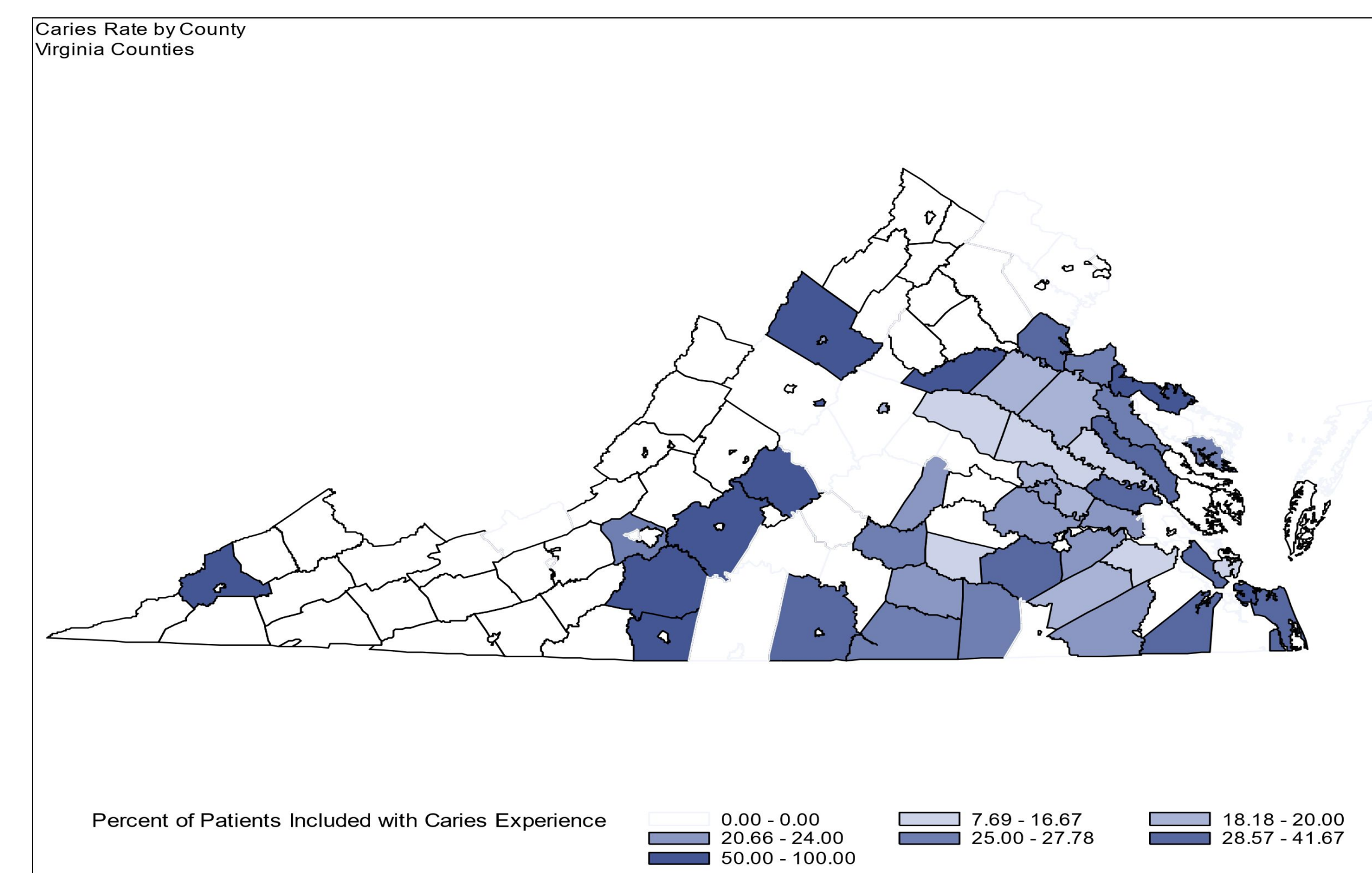


Figure 2: Summary of Included Patients

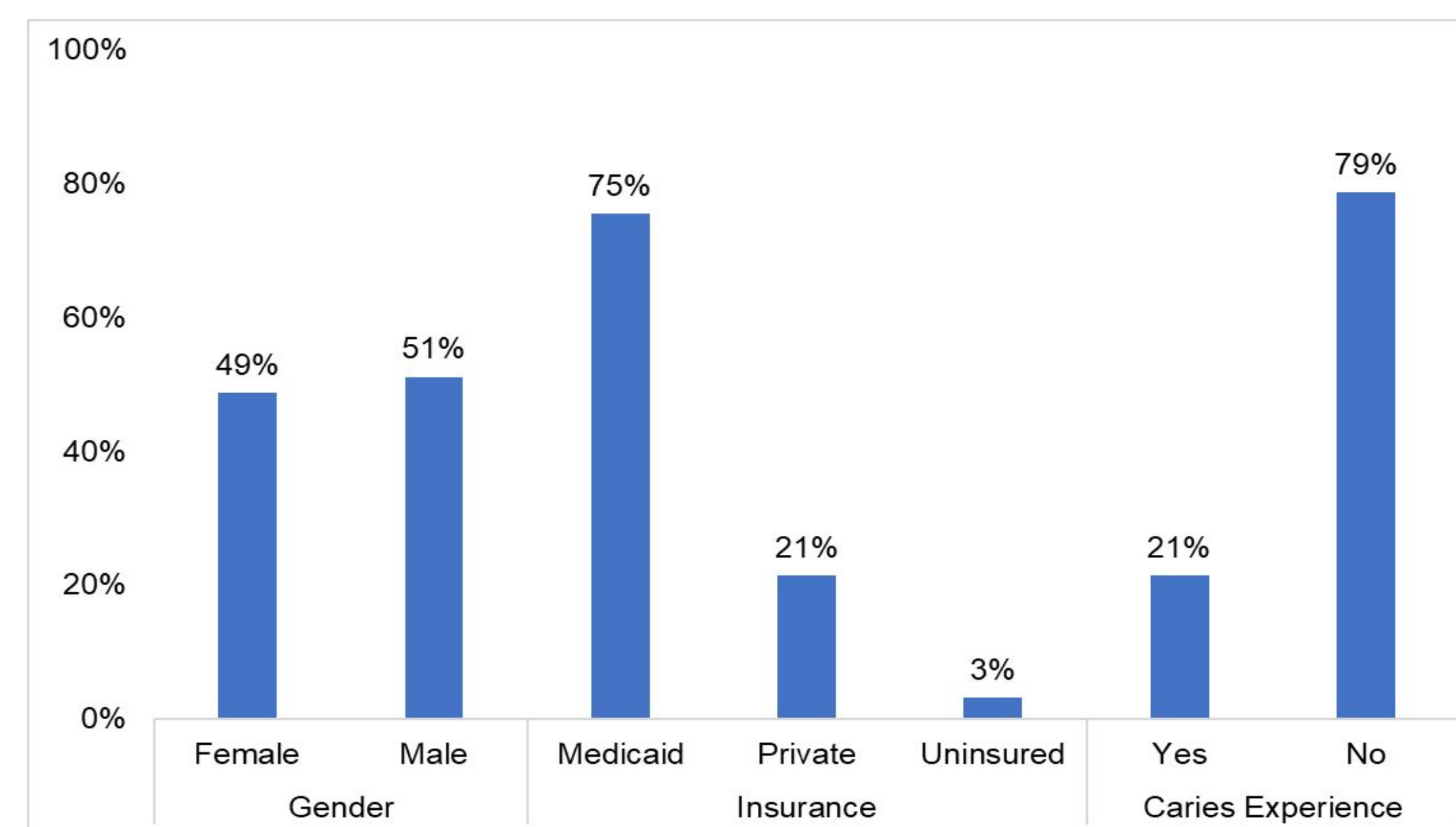


Table 1. Food Swamp Measures.

Food Swamp Measure	Definition
Traditional Retail Food Environment Index (RFEI) [39]	Fast Food/Limited Service Establishments + Convenience Stores Grocery Stores/Supermarkets
Expanded RFEI #1	Fast Food/Limited Service Establishments + Convenience Stores + Supercenters Grocery Stores/Supermarkets + Farmer's Markets + Specialized stores
Expanded RFEI #2	Fast Food/Limited Service Establishments + Convenience Stores Grocery Stores/Supermarkets + Farmer's Markets + Specialized stores + Supercenters

Table 1. The Retail Food Environment Index (RFEI), is defined as the ratio of fast-food outlets and convenience stores to grocery stores and supermarkets. This measure classifies fast-food restaurants, full-service restaurants, and convenience stores as unhealthy food outlets, while supermarkets, grocery stores, and farmers' markets are considered healthy food outlets.¹

Figure 3: State of Virginia Map of Retail Food Environment Scores

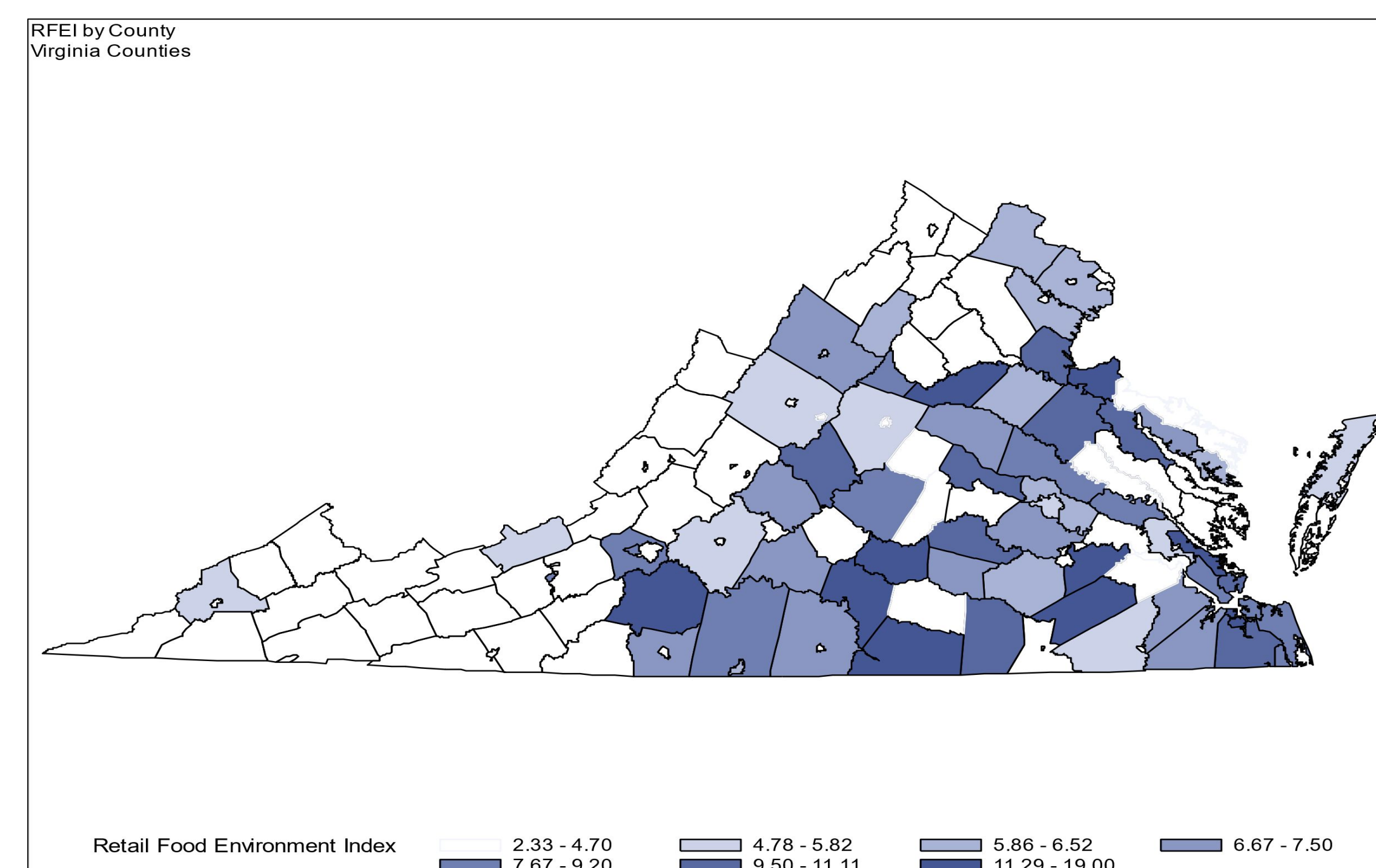
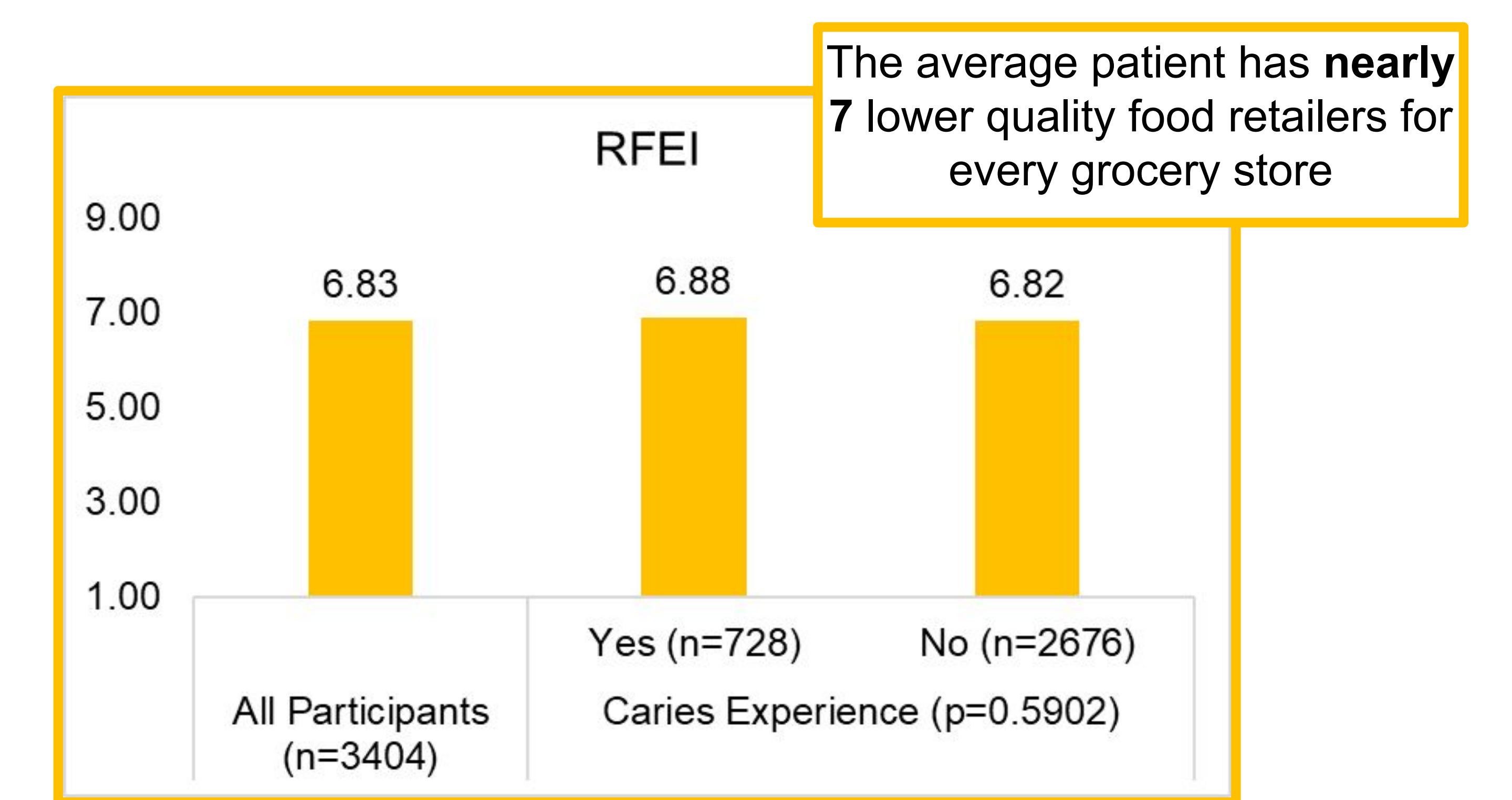


Figure 4: Comparison of RFEI by Caries Experience



Conclusion

- Living in a food swamp (RFEI) was not significantly associated with dental caries among children aged 0–12 years, after adjusting for demographic factors.
- Demographic and socioeconomic factors, particularly age and insurance status, were significantly associated with dental caries, while food environment measures were not significant predictors in the adjusted models.
- Female patients, older age at initial visit, and government-insured or uninsured status were associated with higher odds of caries experience.
- While socioeconomic and individual factors appear to be important in pediatric oral health, the influence of the neighborhood food environment may be shaped by additional considerations, including transportation, income, and dietary knowledge

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