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Linking Food Consumption to Deprivation: A Study Leveraging Shopping Data

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Introduction & Background

Food insecurity is a prevalent issue in the UK and goes beyond a simple lack of food in quantity, but instead is deeply associated with the affordability of healthy food choices. Healthier food items cost more than twice as much as less healthy options given the same amount of energy (i.e., £-per-kcal) and, unsurprisingly, close to 14% of households in the UK experienced food insecurity, a sizeable proportion of which struggled to purchase fruits (57.2%), vegetables (41.6%), and dairy products (48.1%).

Objectives & Approach

Following up on recent studies, we define two sets of key variables to capture the extent to which food items can be classified as "unhealthy". Firstly, we define calorie-oriented purchasing (COP; i.e., kcal-per-£), which measures the energy cost of a food item and measures how calorie-dense it is. Secondly, we define hyper-palatability variables, which measure whether a food item is high-fat-and-sodium (FSOD), high-fat-and-sugar (FS), and high-carbohydrates-and-sodium (CSOD).

Harnessing membership data from a major supermarket chain, we investigate:

- the relationship between calorie costs (as defined by COP) and hyper-palatability;
- the proportions of food items that can be classified as calorie-dense and hyper-palatable, by food category;
- the sales of calorie-dense and hyper-palatable food items by regional deprivation.

Relevance to Digital Footprints

This work uses shopping data to study phenomena in public health and food security.

Results

At product levels, while calorie costs and hyper-palatability overlap, they are distinct characteristics. As an example, only 26% of food items in the data sets are classified as both calorie-dense (i.e., above median kcal-per-£) and hyper-palatable, while 24% are exclusively calorie-dense and 14% exclusively hyper-palatable. More specifically, only 27% are classified as both calorie-dense and FS (high-fat-and-sugar), only 14% are both calorie-dense and FSOD (high-fat-and-sodium), and only 13% are both calorie-dense and CSOD (high-carbohydrates-and-sodium).

As a next step, we will define regional COP and hyper-palatability and predict health outcomes such as obesity and disease-related deaths.

We also obtained evidence that calorie-dense and hyper-palatable items are more popular in deprived regions. E.g., sugary snacks have close to 600 kcal-per-£, are FS, and are close to being the most popular food items in deprived regions.

Conclusions & Implications

This study shows that shopping data are useful in mapping the relationships between food consumption and deprivation, while we explore the potential of using product characteristics and shopping behaviours to predict health outcomes.

Keywords

food insecurity, shopping data, calorie-oriented purchasing, hyper-palatability

