

# **Association of food outlet density and obesity: A cross-sectional study of urban areas in Mexico**

## **Introduction**

Obesity is an important and highly prevalent risk factor for non-communicable diseases in both developed and developing countries. Obesity prevalence is influenced by a complex, multifaceted system of determinants among which the food retailing and advertising environment is pivotal. Current food environments are often characterised by pervasive exposure to unprecedented availability and marketing of energy-rich and nutrient-poor foods. Mexico has one of the highest obesity rates in the world: 70% of the population is overweight or obese. The country has experienced a dietary and food retail transition involving increased high-calorie-dense food and drink availability.

The aims of this study were 1) to analyse the associations between total food outlet density and BMI; 2) to examine the association of the retail food environment index (RFEI) and obesity; and 3) to study the association of the density of individual food outlets and obesity in Mexican adults in urban areas.

## **Methods**

The National Institute of Statistics and Geography in Mexico provided geographical and food outlet data; BMI, calculated from anthropometric measurements, and socio-economic characteristics of a nationally-representative sample of adults aged 18+ came from participants in the National Health and Nutrition Survey in Mexico (ENSANUT) 2012. I calculated densities of supermarkets, restaurants, chain and non-chain convenience stores, and fruit and vegetable stores in total and by individual food outlet type per 1,000 people per census tract area, using ArcGIS. I calculated RFEI, the ratio of 'unhealthy' to 'healthy' food outlets. Using multilevel linear regression, I analysed the relationship between density of food outlet types and obesity using complex survey design in STATA14. All analyses were adjusted for sex, age, socioeconomic status and physical activity.

## **Results**

Both non-chain convenience store density [ $\beta = 3.10$ , 95% CI: 0.97 - 5.23,  $P = 0.004$ ] and total convenience store density (non-chain and chain combined) [ $\beta = 2.71$ , 95% CI: 0.63-4.80,  $P = 0.011$ ] were significantly associated with obesity. Total food outlet density showed no significant association with obesity. However, the RFEI was associated with higher levels of obesity [ $\beta = 0.040$ , 95% CI: 0.00049 - 0.02,  $P = 0.040$ ].

## **Conclusion**

Convenience stores, which offer a greater availability of energy dense foods with low nutrient content, pose a risk to higher levels of obesity. A balance of healthier food outlets versus non-healthy food outlets could decrease the risk of obesity in urban areas of Mexico.

**Key Words:** Food outlet density, Obesity, Food environment, Mexico