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Original Research

Spatial analysis of food insecurity and obesity by area-level deprivation in children in early years settings in England

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ABSTRACT

Background: we assessed manager perceptions of food security and obesity in young children attending nurseries across England, assessing spatial differences by area-level deprivation.
Methods: we conducted an adjusted multinomial logistic regression and an adjusted geographically weighted logistic regression examining the odds of a manager perceiving obesity, food insecurity, or both as a problem among children in care measured via a mailed survey.
Results: 851 (54.3%) managers returned the survey. A nursery being in the highest tertile of area-level deprivation was associated with a 1.89 (95% CI 1.00, 3.57) greater odds of perceiving obesity as a problem, a 3.06 (95% CI 1.94, 4.84) greater odds of perceiving food insecurity as a problem, and a 8.39 (95% CI 4.36, 16.15) greater odds of perceiving both as a problem, compared with the lowest tertile.
Conclusions: we observed differences in manager perception by area-level deprivation, but the relationship was especially pronounced for food insecurity.

1. Introduction

Obesity is associated with numerous adverse health and behavioral conditions—even in early childhood (Juonala et al., 2011; Kuhl et al., 2012; Llewellyn et al., 2016; Puder and Munsch, 2010; Simmonds et al., 2016). Thus, the prevention of childhood obesity is a public health priority in the United Kingdom (UK). Although rates of obesity in early childhood have shown some improvement in recent years, over 20% of children aged 2–4 years are currently overweight or obese (National Child Measurement Programme England, 2015–2016 School Year, Health and Social Care Information Centre). Moreover, as in adults, there are persistent social inequalities in the prevalence of obesity (Anderson and Whitaker, 2009; Ogden et al., 2015; Zilanawala et al., 2015). These inequalities have widened in recent years, with children from the lowest socioeconomic groups showing the sharpest rises in obesity (National Child Measurement Programme England, 2015–2016 School Year, Health and Social Care Information Centre).

Abbreviations: AIC, akaike information criterion; CI, confidence interval; GIS, geographic information system; GWR, geographically weighted regression; IMD, index of multiple deprivation; LSOAs, lower super output areas; OR, odds ratios; UK, United Kingdom; US, United States.

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At the same time, food insecurity, also known as food poverty, has emerged as an important social and public health concern in England (Too Poor to Eat, Food Insecurity in the UK). Food insecurity, characterized as limited or uncertain availability of (or access to) nutritionally-adequate, safe and socially-acceptable foods (Core Indicators of Nutritional State for Difficult-to-Sample Populations, 1990), has been associated with increased hospitalization, anemia, anxiety and depression, and lower academic performance (Bhattacharya et al., 2004; Black et al., 2012; Cook et al., 2004; Cook et al., 2013; Hendrickson et al., 2010; Ke and Ford-Jones, 2015; Metallinos-Katsaras et al., 2016; Olson, 1999; Skalicky et al., 2006;). A recent United Nations survey of European countries estimated that in the UK over 10% of people aged 15 years and above experienced food insecurity (Too Poor to Eat, Food Insecurity in the UK). For just under 5% of people surveyed, food insecurity was severe, meaning they sometimes went without eating for an entire day because they did not have enough money to purchase food (Too Poor to Eat, Food Insecurity in the UK). Paradoxically, food insecurity may be a determinant of obesity (Dinour et al., 2007; Nackers and Appelhans, 2013).

The majority of evidence, largely from the United States (US) and Canada, has linked food insecurity with obesity and weight gain in adults. But the experience of food insecurity by children, particularly very young children, has also been associated with obesity in both cross-sectional and longitudinal studies (Dinour et al., 2007; Eisenmann et al., 2011; Metallinos-Katsaras et al., 2009; Metallinos-Katsaras et al., 2012; Speirs and Fiese, 2016). A recent study of children aged 2–5 years found that more than 25% of food insecure children were overweight or obese, which is higher than the overall average proportion of overweight and obesity in children across the US (Speirs and Fiese, 2016). Several explanations have been put forward to reconcile the apparent paradox of obesity existing within food-insecure families, including psychosocial stress and the reliance on energy-dense, nutrient poor foods, which are low-cost and affordable for those experiencing financial hardship (Drewnowski and Specter, 2004), and especially palatable and acceptable to children (Daniel, 2016).

Taken together, child obesity and food insecurity constitute complex and interrelated challenges to public health. While obesity in the population is closely tracked, the study of food insecurity in the UK population has been largely neglected. Considering the social and health consequences of food insecurity among children (Cook et al., 2004; Cook et al., 2013; Fotso et al., 2012; Hendrickson et al., 2010; Metallinos-Katsaras et al., 2016; Pilgrim et al., 2012;) more information is urgently needed on the scope and extent of the problem in the UK. Moreover, little to no information is available on the association between food insecurity and obesity in the UK.

Nurseries may provide important insight into the state of food insecurity among children. The majority of children under the age of five years spend time in out-of-home child care, and the amount of time in care increases as children age (Childcare and Early Years Providers Survey, 2013; Kamerman, 2000). The number of children in early years settings in England has more than doubled in the past decade, with 796,500 in care in 2013 (Childcare and Early Years Providers Survey, 2013; Kamerman, 2000). The purpose of this study was to assess manager perceptions of both food security and obesity in children attending early years settings, assessing differences by area socioeconomic status across England. We hypothesized that perceptions of both food insecurity and obesity in children would be highest in the most deprived areas of England.

2. Methods

2.1. Sample

We administered a survey by post to a stratified random (cross-sectional) sample of 2000 nurseries (determined by available funds) in England from November 2012 to September 2013. Details of the survey protocol are available elsewhere (Neelon et al., 2015). Briefly, we obtained the names of all 28,091 registered nurseries in England from Ofsted, the agency responsible for regulating early years programs in England. Nurseries include any group or organization that provides care for children more than six days a year, and for at least two hours a day on non-domestic premises. To be included in the study, Ofsted regulated nurseries needed to provide at least one meal or snack to children in care daily, and care for children under six years of age on a regular basis (e.g., not simply during holidays or after school hours). Programs were excluded if they were a sports club or camp for children, served children with special dietary needs only, or cared for children over six years of age exclusively. We designed the survey to be completed by the manager in about 20 min, without review of any nursery documents or input from parents. We did ask managers to seek input from other child care providers in their nurseries as needed. We provided nursery managers with a £15 voucher after they completed the survey. The survey included a letter to the manager stating that completion of the survey constituted consent to participate in the study. All study procedures were approved by the University of Cambridge Psychology Research Ethics Committee.

Using the list provided by Ofsted, we geocoded all 28,091 nursery addresses at the postcode level, using a geographic information system (GIS) (ArcGIS 10, ESRI Inc., Redlands, CA) and used the geocoded addresses to classify nurseries within lower super output areas (LSOAs), which are small administrative boundaries containing about 1500 individuals. Next, we stratified nurseries based on LSOA tertile (low, middle, high) using the index of multiple deprivation (IMD) 2010 scores (The English Indices of Deprivation, 2011), the most recent scores available at the time the nursery survey was administered. The IMD measures relative deprivation and is published by the Department for Communities and Local Government in England. The IMD is updated every three to four years, is a compound measure of material deprivation, and includes aspects of unemployment, housing prices, income, crime, and education levels, within LSOAs. As noted previously (Neelon et al., 2015), we oversampled nurseries in the most