# Exploring the association between neighbourhood socioeconomic status, food environment and child excess weight in Waltham Forest, East London

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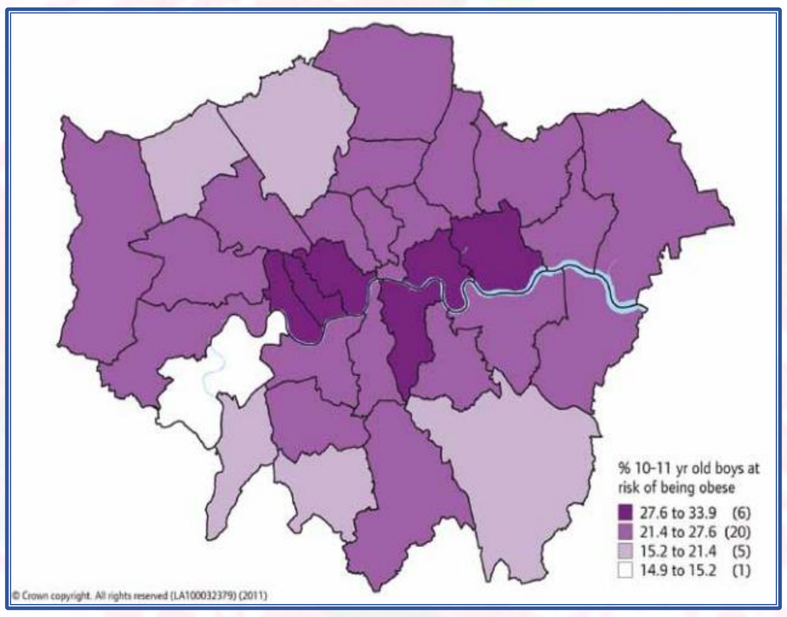
Percentage of 10-11 year-old boys at risk of being obese. London. 2009/2010.




GLA Intelligence Unit, 2011

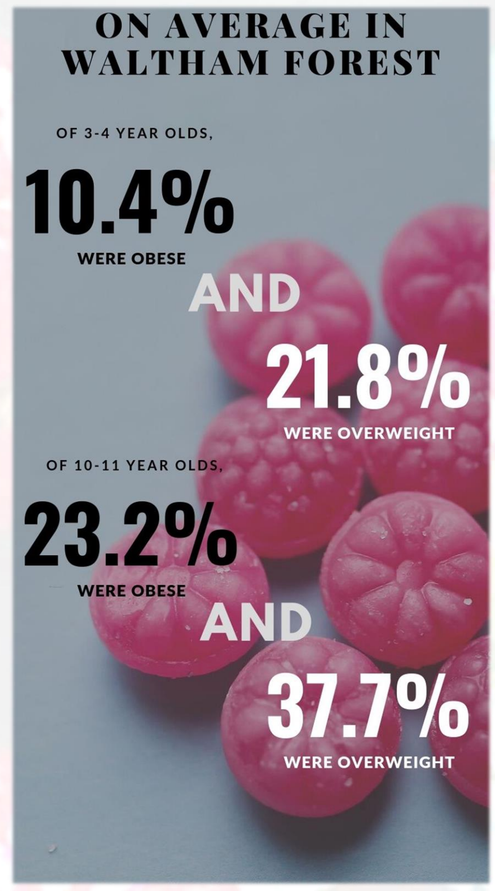
## BACKGROUND

There are several reasons why childhood obesity is one of the most pressing health issues in the UK today, but two stand out amongst the others:

- The ever-growing share of children who are overweight or obese; legislators are concerned about the strain on the NHS, which must deal not only with obesity, but also obesity-related complications (e.g. asthma and orthopaedic problems)
- Health inequalities by socioeconomic status (SES); children from low-income households are more likely to be overweight and maintain excess weight into adulthood

Mitigating childhood obesity has been unsuccessful, as there are a number of factors that influence body weight. Research and mass media have placed a lot of blame on the increase in fast-food outlets. Literature on this relationship, however, is controversial and largely focuses on adults, resulting in a gap on the relationship between childhood obesity, the neighbourhood food environment and SES.

This research project attempted to cover this gap, using Waltham Forest, East London as the setting.



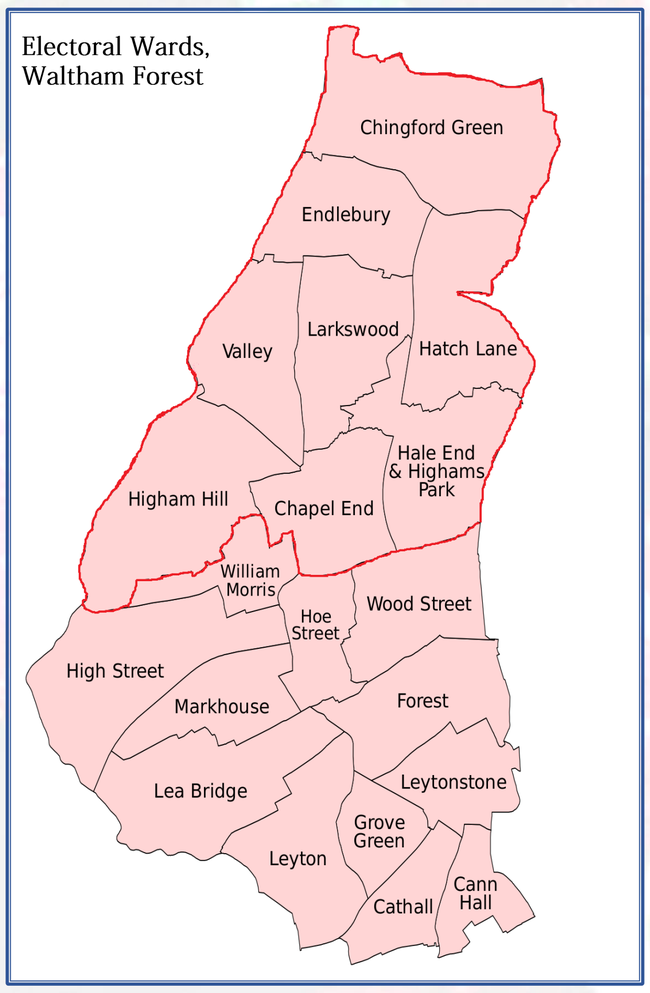

## ANALYSIS AND IMPLICATIONS

The majority of results obtained fell in line with findings seen in literature.

- Negative association between weight status and SES for 3-4 year olds supported by Reilly (2007); Drewnwoski et al (2014)
- Lack of such an association for 10-11 year olds explained by greater independence from heads of household (Timperio et al, 2012)
- Strong negative associations between fast food outlet concentration and SES supported by Thornton et al (2013); Edwards and Fraser (2010); This was not supported for healthy outlets
- Lack of an association between excess weight prevalence and food environment has mixed support
- Lack of any strong association with the food environment, when looking at the interaction of three factors is also supported by literature (Cetateanu and Jones, 2014)

Limitations and future research:

- Data is cross-sectional, rather than longitudinal. This prevents any inferences regarding causality from being made.
- Sample size is far too small, albeit covering a diverse set of electoral wards. A better methodology would be to analyse several London boroughs, taking into account socioeconomic and ethnic diversity when making the selections
- The existence of a pedestrianised high street, which is home to a significant share of the food outlets in the borough, skews the results (as seen for healthy food outlets). Using a buffer may not be effective, as also witnessed
- Lack of available data resulted in a mismatch in the ages of datasets
- GIS software could be used in the future to examine different stories, given a more lenient time constraint. The main question of interest is whether the food environment around primary schools and nurseries is a better predictor of excess weight prevalence than neighbourhood characteristics.




### Sample IV Model Run

```
. reg yrsixexcess denhealthyeth bten asianten owned

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(4, 15)      =    3.56
       Model |  .012445468     4  .003111367            Prob > F      =  0.0311
    Residual |  .013106333    15  .000873756            R-squared     =  0.4871
-------------+------------------------------           Adj R-squared =  0.3503
       Total |  .025551801    19  .001344832            Root MSE      =  .02956

------------------------------------------------------------------------------
  yrsixexcess |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
denhealthyeth |   .0123987   .0104398     1.19   0.253    -.0098532    .0346506
         bten |   .2846508   .1294174     2.20   0.044     .008804    .5604975
     asianten |   .0503144   .0895075     0.56   0.582    -.1404663    .2410951
        owned |  -.0106773   .0842792    -0.13   0.901    -.1903142    .1689595
        _cons |    .291743   .0783974     3.72   0.002     .1246429    .4588431
------------------------------------------------------------------------------

. ivregress 2sls yrsixexcess ( denhealthyeth = bandsfgh ) bten asianten owned

Instrumental variables (2SLS) regression          Number of obs   =         20
                                                  Wald chi2(4)    =      16.49
                                                  Prob > chi2     =     0.0024
                                                  R-squared       =     0.4153
                                                  Root MSE        =     .02733

------------------------------------------------------------------------------
  yrsixexcess |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
denhealthyeth |   .0275253   .022657     1.21   0.224    -.0168815    .0719322
         bten |   .3078293   .1237187    2.49   0.013     .0653452    .5503134
     asianten |   .0150148   .0955915    0.16   0.875    -.1723411    .2023706
        owned |   .0091618   .0824352    0.11   0.912    -.1524082    .1707319
        _cons |   .2681557   .0792237    3.38   0.001     .1128802    .4234312
------------------------------------------------------------------------------
Instrumented:  denhealthyeth
Instruments:   bten asianten owned
               bandsfgh
```

### Sample MLR Model Run

```
. reg recexcess denhealthyeth bthree asian3 owned

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(4, 15)      =    0.71
       Model |  .001320973     4  .000330243            Prob > F      =  0.5997
    Residual |  .007008827    15  .000467255            R-squared     =  0.1586
-------------+------------------------------           Adj R-squared = -0.0658
       Total |  .008329801    19  .000438411            Root MSE      =  .02162

------------------------------------------------------------------------------
   recexcess |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
denhealthyeth |   .0018904   .0072979     0.26   0.799    -.0136647    .0174455
      bthree |   .0980591   .1123432     0.87   0.397    -.1413948    .3375131
      asian3 |  -.0055638   .0786769    -0.07   0.945    -.1732597    .1621321
       owned |  -.0168654   .0692213    -0.24   0.811    -.1644071    .1306763
       _cons |   .2032115   .0663827     3.06   0.008     .0617201    .3447029
------------------------------------------------------------------------------

. ivregress 2sls recexcess ( denhealthyeth = bandsfgh ) bthree asian3 owned

Instrumental variables (2SLS) regression          Number of obs   =         20
                                                  Wald chi2(4)    =       3.02
                                                  Prob > chi2     =     0.5551
                                                  R-squared       =          .
                                                  Root MSE        =     .03497

------------------------------------------------------------------------------
   recexcess |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
denhealthyeth |   .0464927   .0331942     1.40   0.161    -.0185668    .1115521
      bthree |   .1917308   .1930857     0.99   0.321    -.1867102    .5701718
      asian3 |  -.0313679   .1285512    -0.24   0.807    -.2833235    .2205878
       owned |   .0962252   .1368579     0.70   0.482    -.1720113    .3644617
       _cons |   .0843153   .135551      0.62   0.534    -.1813598    .3499904
------------------------------------------------------------------------------
Instrumented:  denhealthyeth
Instruments:   bthree asian3 owned
               bandsfgh
```

## RESULTS

SLR models:

- Negative associations for 3-4 year olds and no association for 10-11 year olds between excess weight prevalence and SES
- Significant, negative relationship between food environment and SES
- No association between excess weight prevalence and food environment

MLR models:

- OLS model yielded only one significant relationship, which was between SES and excess weight prevalence (for 3-4 year olds). No significant relationships were observed for 10-11 year olds.
- Using instrumental variables for food environment measures yielded no significant associations of interest whatsoever. Only significant association was discovered between excess weight prevalence and the proportion of children who are Black. This association was positive.

## DATA

The sample population in this study were 3-4 and 10-11 year olds in the borough. The proportions of overweight and obese children were taken from the 2011 NCMP.

Food outlets were individually located (by electoral ward; see map to the left) and classified into the categories shown below, using 2019 Food Hygiene Ratings. From there, two additional categories of food outlets were formed, based on literature:

- Healthy food outlets – supermarkets, small and ethnic groceries, and "butchers and fishmongers" - which serve a variety of fresh fruit and vegetables
- Unhealthy food outlets – corner shop and fast food/takeaway outlets

Table. Food Environment Data

| Ward | Supermarkets | Corner Shops (Ethnic) | Corner Shops | Small Groceries | Ethnic Groceries | Butchers and Fishmongers | Fast Food/Takeaways |
|---|---|---|---|---|---|---|---|
| Cann Hall | 2 | 15 | 18 | 2 | 3 | 0 | 12 |
| Cathall | 1 | 10 | 13 | 2 | 3 | 0 | 11 |
| Chapel End | 3 | 16 | 16 | 3 | 0 | 0 | 12 |
| Chingford Green | 3 | 6 | 6 | 1 | 0 | 1 | 6 |
| Endlebury | 0 | 2 | 2 | 1 | 0 | 0 | 2 |
| Forest | 2 | 19 | 20 | 4 | 1 | 7 | 22 |
| Grove Green | 4 | 21 | 23 | 3 | 2 | 4 | 12 |
| Hale End and Highams Park | 1 | 9 | 9 | 4 | 0 | 1 | 10 |
| Hatch Lane | 1 | 4 | 4 | 1 | 0 | 0 | 8 |
| High Street | 11 | 28 | 35 | 6 | 7 | 10 | 27 |
| Higham Hill | 5 | 18 | 18 | 3 | 0 | 0 | 5 |
| Hoe Street | 11 | 37 | 43 | 5 | 6 | 11 | 31 |
| Larkswood | 4 | 10 | 11 | 4 | 1 | 1 | 16 |
| Lea Bridge | 4 | 21 | 24 | 4 | 3 | 5 | 20 |
| Leyton | 6 | 32 | 36 | 3 | 4 | 2 | 16 |
| Leytonstone | 3 | 14 | 15 | 4 | 1 | 4 | 10 |
| Markhouse | 13 | 31 | 39 | 3 | 8 | 8 | 26 |
| Valley | 4 | 10 | 11 | 4 | 1 | 2 | 21 |
| William Morris | 12 | 34 | 38 | 6 | 4 | 8 | 31 |
| Wood Street | 2 | 16 | 17 | 4 | 1 | 1 | 13 |

## METHODOLOGY

The relationship between childhood excess weight prevalence, neighbourhood food environment and SES was tested by:

- Running three single linear regressions to test the relationship between each pair of factors ("first stage")
- Building two models regressing excess weight prevalence on the other factors to assess the overall relationship – an MLR model and an instrumental variable (IV) model ("second stage")

In the first stage, two different measures of SES were used. The first is the commonly used median household income. The other is the proportion of properties in council bands F, G, H (measure of property value distribution). In the second stage, only the second measure was used, since it may be more accurate, since it considers overall neighbourhood prosperity. The proportions of children who are South Asian, children who are Black and homes that are owned were used as control throughout the research.

An additional measure was used to represent the food environment – RFEI (Retail Food Environment Index). The index considers the ratio of unhealthy to healthy outlets.

STATA version 10 was used to construct all models. All t-values were evaluated at the 5% significance level.