

IMD 2004 score

The (revised) Index of Multiple Deprivation (2004) for England is a weighted, exponentially transformed aggregate score of seven indices of deprivation¹ covering England at the lower level super-output area (an average of 1500 people per SOA, and usually 7-8 SOA per local authority ward). The seven domains are combined to form the overall score are: income deprivation; employment deprivation health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation. The overall score is constructed as continuous interval (not ratio) scale data with scores to two decimal places with a theoretical range of deprivation scores between 0 and 100. It is ranked such that a rank of 1 indicates the most deprived and 32,482 the least deprived SOA.

Statistical method

We examined the relation of the continuously distributed IMD score to the likelihood of a pub being smoke free in BTW using logistic regression. The outcome was a binary variable (pub exempt or not) and independent variable is the IMD is a score, which could theoretically range between 0 and 100.

The equation we set up is

$\text{Log}_e(p/(1-p)) = a + B \cdot \text{IMDscore}$, where p is the probability of exemption (and $p/(1-p)$ is defined as the odds of exemption), a is the constant, and B the logistic coefficient for the IMD score.

We did this twice: once for pubs only, and second for pubs and clubs. On each occasion, the computer programme uses the observed pattern of exemptions in relation to deprivation to estimate values for a and for B (and the standard error of B).

The values for this were

	Pubs only	Pubs and clubs
a	-1.260	-0.683
B	0.045	0.043
se B	0.015	0.014

A standard way to present the logistic regression output is to present odds ratios (e^B), which, in the pubs and clubs case, is 1.04, with 95% confidence intervals (derived from the se of B) of 1.02-1.07. This is the increase in the odds of being exempt with a 1-point increase in the IMD score (1 point more deprived). The problem with this is that this conveys little information to the reader. Instead, therefore, we decided to calculate the probability that a pub would be exempt, using the regression output.

If $\text{Log}_e(p/(1-p)) = a + B \cdot \text{IMDscore}$ then it can be shown that:

$$p = \frac{e^{(a + B \cdot \text{IMDscore})}}{(1 + e^{(a + B \cdot \text{IMDscore})})}$$

So, if we are interested in the probability of any pub being smoke free, we can supply an IMD score and calculate it using this equation. We chose the median IMD scores for the quintiles of IMD scores for all the census output areas in England. These scores are given in the table in the paper. In other words, these are pubs in typical areas from the most deprived fifth of areas in England, the next most deprived fifth, the middle fifth, and so on.

¹ Office of the Deputy Prime Minister (2004). The English Indices of Deprivation 2004 (revised). HMSO: London