Author's response to reviews

Title: A cross-sectional analysis of the relationship between tobacco and alcohol outlet density and neighbourhood deprivation

Authors:

Niamh K Shortt (niamh.shortt@ed.ac.uk)
Catherine Tisch (catherine.tisch@ed.ac.uk)
Jamie Pearce (Jamie.pearce@ed.ac.uk)
Richard Mitchell (Richard.Mitchell@glasgow.ac.uk)
Elizabeth A Richardson (E.Richardson@ed.ac.uk)
Sarah Hill (S.E.Hill@ed.ac.uk)
Jeff Collin (jeff.collin@ed.ac.uk)

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Author's response to reviews:

We would like to thank the reviewers for their support of this paper and their very constructive feedback. Below we respond to each of their comments in turn.

Referee 1:
1. The authors define alcohol off-sales and on-sales outlets on page 5. However, these definitions should be moved to page 4 when they begin to discuss these two concepts.

We have adjusted our text and moved the definitions to page 4 to address this.

2. On page 5, the authors discuss discrepancies in the number of outlets reported between their outlet dataset and the Scottish Liquor Licensing Statistics. The authors should report the proportion of this discrepancy that was attributed to the removal of duplicates.

Unfortunately we are unable to assess the proportion of the discrepancy that was attributable to the removal of duplicates. The official licensing statistics are presented as one number at the national level and are not broken down in any way to allow for meaningful comparison between the datasets with the exception of comparing totals.

3. On page 6, the authors mention mean-tested benefits. The authors should discuss what this concept is.

We have added a sentence clarifying this.

4. On page 8, the last sentence (line 8) in the first paragraph is confusing and should be checked by the authors.

Many thanks again for noting this, it was a typo and we have corrected the word least to most.

Referee 2:
1) The approach of assigning density levels to data zones appears counter-intuitive, especially using the KDE value of the population-weighted centroid for the whole data zone. Would a simpler way of calculating outlet density (numbers of outlets in a data zone per number of inhabitants) render more or less similar results? Why is a 800 m radius chosen and not the precise distance to the next outlet? Is it proven to be more important to have many retail options in a close proximity than to have one option in very close proximity?

We understand the reviewer’s reservations about KDE over other ways of calculating density. We used KDE rather than traditional measures, such as number of retailers in an area per number of inhabitants mentioned above, as the KDE measure creates a continuous surface that is not constrained by arbitrarily defined administrative area level boundaries (use of such boundaries has been heavily critiqued elsewhere (for example see Kwan (2012)). As such the measure for each data zone measures more than the number of retailers in that particular area alone, but includes a proximity decay function that is not restricted by boundaries (thus taking into account outlets in neighbouring data zones should the population weighted centroid be near the boundary). This makes it a much more sophisticated and robust measure. In the methods section where we explain this approach we have referenced research that we published in Tobacco Control (Shortt et al 2014) using this method.

We choose an 800m radius as, based on research elsewhere, 800m is seen as a plausible walking distance. Whilst this is our search radius the method includes a weighting function so that outlets nearer the centre of the search window are given greater weight, with less weight attributed to outlets further away (this is stated in the methods section). We did not use precise distance to nearest outlet as we were measuring density at an area level, not from any particular address point. This is a population-based approach exploring the association between area level deprivation and density and as such area level density is an appropriate measure.

With reference to the final point here, this paper is concerned with density and not proximity, which as the reviewer correctly points out would be a separate question. It is not proven whether having one or many outlets is more important and indeed we would argue that it depends on the mechanism that you are exploring. We outlined these mechanisms, as related to ‘density’ on page 3 as follows, “A higher density of tobacco and alcohol outlets is not only likely to increase supply but also to raise awareness of tobacco/alcohol brands, create a competitive local market that reduces product costs, and influence local social norms relating to tobacco and alcohol consumption”.

2) Figure 1 (map of Edinburgh) doesn’t include information on neighborhood deprivation. In the results section, a connection between outlet density and population density is described. However, population density is not the dimension with which outlet density is associated throughout the paper. Possible solutions: Including information on neighborhood deprivation into the map; including population density into the analysis (e.g. checking its association with deprivation); deleting the map.
Many thanks again for these helpful comments. We have not described a connection between outlet density and population density, rather we have taken population density into account in our measurements. We would argue that this was entirely appropriate as it allows us to carry out the analysis nationwide, in both urban and rural areas. The map simply shows the tobacco outlet density (not population density as I think the reviewer may be interpreting) for one area to allow the reader to see what the data looks like when mapped. It does not include either population density or deprivation. Adding such features would, in our opinion, overcomplicate the map, which is presented for illustrative purposes. We would prefer to keep the original map in the paper but we refer this to the editors for their decision. If the editors feel that the map should be deleted from the paper then we will do this.

Minor compulsory revisions

3) The existing policy framework of supply-side interventions worldwide or in Scotland should be presented as part of the background (not the conclusion) chapter.

Paragraph 2 on page 3 does refer to such policy developments in the background. We have now added explicit reference to the notion of supply side interventions to this section. As our reference to this policy development builds upon the results of our research we feel that it is important to keep detail on this within the discussion.

4) Why do the authors use deprivation quintiles? Why are quintiles 1/2 and 4/5 aggregated for one part of the analysis? (page 8, lines 8-9)

In this paper we have explored the association for both deprivation quintiles and for deprivation as a continuous measure. We use quintiles as they are the measure of deprivation most often used by policy makers, see for example the Scottish Government Health survey report. We have also added a sentence explaining this when we introduce quintiles


However, we do understand that the use of quintiles can hide the underlying pattern within the quintile groups themselves. As such we use both quintiles of deprivation and a continuous measures. We noted this on page 7 where we said the following:

“Second, we treated both neighbourhood income deprivation (proportion of households receiving means-tested benefits) and the density values (outlets per km2) as continuous measures. This enabled us to examine variations in outlet density within neighbourhood income deprivation quintiles”.

Quintiles 1 and 2 and quintiles 4 and 5 were not aggregated for the analysis (see tables 2 and 3). We were simply reporting the results and the general trends in the following sentence to which we think the reviewer is referring:

“The density of outlets in the most deprived areas (quintiles 4 and 5) was significantly higher than in the less deprived areas (quintiles 1 and 2)”. We have changed the text in this sentence to the following to better reflect this.
“The density of outlets in the most deprived areas (quintile 4 and quintile 5) was significantly higher than in the less deprived areas (quintile 1 and quintile 2).”

4) Is mapping by “postcode” (and not address) precise enough in order to assign a specific point of sale to a specific data zone?

In the UK each postcode represents approximately 15 address points, data zones are a much larger spatial unit that individual postcodes so there is no problem assigning postcodes to these zones. We have added a sentence explaining this on page 5.

5) Source [40] has also simultaneously examined the relationship between neighborhood deprivation and alcohol, tobacco, (and also fast food) outlets, so the authors might not provide the first study to this (as mentioned in page 10, lines 12-14). However, source [40] analyses only parts of a city, while this study uses data from whole Scotland.

This is correct, we have adjusted this to state that this is the first national level study to do so.

7) Further questions that should be addressed in the “limitations”: Why is this ecological study relevant, even though it might not provide conclusions concerning causality between outlet density and deprivation? What flaws might arise from using this specific type of density estimation? Furthermore, as all points of sale are treated unweighted, no effects of opening hours, product diversity, age restrictions etc. can be assessed.

Many thanks for this comment. We have added further limitations to this paragraph, including opening hours and the cross sectional nature of the work. We did not weight by type of outlet in this case as we had little detail on distinction between types of premises. We had noted in our limitations that any alcohol register will include detail on shop floor and size of premise which would allow us to include a weighting function in further analysis.

6) “It is worth noting that outlet densities are comparatively high in all areas.” (page 12, line 20) – Comparatively to what? What is a high outlet density?

Using our scoring, outlined on page 9, we define what we mean by low and high outlet density. What we are saying here is that there are relatively few areas with zero outlet density.

7) Missing word on page 10, line 10: “in both tobacco and alcohol off-sales”

Many thanks for pointing this out, we have now corrected this.