Evaluating the causal impact of individual alcohol licensing decisions on local health and crime using natural experiments with synthetic controls.

Frank de Vocht[1,2,3], Cheryl McQuire[1], Alan Brennan[2,4], Matt Egan[2,5], Colin Angus[2,4], Eileen Kaner[2,6], Emma Beard[2,7], Jamie Brown[2,7], Daniela De Angelis[2,8,9], Nick Carter[10], Barbara Murray[11], Rachel Dukes[12], Elizabeth Greenwood[12], Susan Holden[12], Russell Jago[2,13], Matthew Hickman[1,2]

[1] Population Health Sciences, Bristol Medical School, University of Bristol

[2] The National Institute for Health Research School for Public Health Research (NIHR SPHR)

[3] The National Institute for Health Research Applied Research Collaboration West (NIHR ARC West)

[4] SCHaRR, University of Sheffield

[5] London School of Hygiene & Tropical Medicine

[6] Newcastle University

[7] University College London

[8] MRC Biostatistics Unit, University of Cambridge

[9] Statistics, Modelling and Economics Department, National Infection Service, Public Health England

[10] Bristol City Council

[11] Medway Council

[12] Leeds City Council

[13] Centre for Exercise, Nutrition & Health Sciences, School for Policy Studies, University of Bristol

Online Supplementary Materials

Case study 1

The Nightclub was a town centre pub and club, which had the nightclub in the basement. It was first granted a licence in Sept 2011 and had been in operation continually since this time. Following concerns about the amount of crime, anti-social behaviour and overt drunkenness at the premises over a period of months, during which the police tried to work with the licensing holder, the police decided to review the premises licence. The Director of Public Health provided evidence of ambulance call outs to the LSOA in which the premises is situated and the relationship between alcohol consumption and accidents, which was considered relevant as the premises is right on the river front. The designated premises supervisor (DPS) was removed and conditions placed on the licence. In effect the nightclub was closed from September 2013 (as close as can be ascertained).

The outcomes of interest for this case study, listed below, were recorded for the years 2010 to 2017 within each lower super-output area (LSOA), and were obtained from the Ambulance Service, Police database and NHS Secondary Uses Service:

i. Total monthly number of incidents of *anti-social behaviour* and *crime* with or without being flagged as 'alcohol-related' base on the location of the offence.
ii. Quarterly number of *ambulance call-outs* (see and treat)
iii. Quarterly incidents of ADMS (*emergency admissions to hospital*) based on home address of the individual. Incidents included here were mental and behavioural disorders due to use of alcohol, accidental poisoning, assault, evidence of alcohol involvement determined by blood alcohol level, evidence of alcohol involvement determined by level of intoxication, excess alcohol blood levels, ethanol poisoning, methanol poisoning, toxic effect of alcohol, intentional self-harm, and events of undetermined intent; based on the ICD-10 codes in the primary diagnosis position and first three secondary diagnosis positions, and chosen as immediate or acute consequences of alcohol misuse rather than chronic, long-term effects. Most, but not all, of included incidents will have been admitted via A&E. A&E attendances - patients who were seen in A&E and then discharged (without being admitted) - were not included.

The main post-closure time period for which we want to evaluate the impact of closure of the venue is 12 months. We also evaluated a shorter 4-month time period, which was decided *post hoc*.

The counterfactual was generated by creating a synthetic control timeseries of each outcome individually for the LSOA in which the venue was located, based on the weighted timeseries of 4 control areas that were *a priori* classified as comparable to the case-LSOA by the practice partners from the Licensing Service of the responsible Council based on the initial brief for LSOAs located in the same Local Authority as the LSOA where the nightclub was closed with comparable characteristics in terms of population demographics, socio-economic indicators, nightlife and levels of reported crime. For reasons of possible identifiability the LSOAs have been anonymised by the practice partner. Given that the synthetic control methodology used to create the counterfactual from comparable areas it is assumed that both case and control areas are susceptible to the same common shocks (30). Qualitatively as-if randomization seems plausible, despite the initial licensing review initiated because of concerns related to drunkenness and crime at the venue.

Case Study 2

Two premises co-located in the same street were closed down following a licence review brought by the police on the grounds of crime and disorder ceased trading in November 2016. There were no 'special measures' in place prior to the closure of the venues.

Concerns were around antisocial Behaviour (ASB) and crime. Total weekly number of incidents were available for the years 2010 to 2018 were obtained from the police database based on the location of the offence. These were also aggregated to monthly counts to assess model performance for longer time period, but less temporally variable, data.

The synthetic control (i.e. the counterfactual) was generated from the same timeseries from three comparable locations in the same urban area in the UK. Specifically, these were selected as examples of other main streets in the city that have a night time economy offer. Following discussion between the practice partner and study PI qualitatively as-if randomization seems plausible.

Case Study 3

The specific area in a large urban area in the north of the UK is an area of deprivation, characterised by increasing numbers of outlets to buy alcohol but a decline in the number of pubs. The publication of the joint strategic needs assessment (JSNA) highlighted a disparity in the life expectancy of residents in the area compared with other areas in the same city and with the national average. However, until 2012 licensing authorities had no ability to ensure that operators had regard for the local area when making their application.

This changed in 2012 with the adoption of a new statutory guidance issued by the government which enabled local guidance to assist applicants when making their application and elected members when they make licensing decisions. A new multi-agency action group was formed to reduce the health harm in the area linked to alcohol, and this group developed Local Licensing Guidance (LLG) specifically for the area. The purpose of the Local Licensing Guidance was to develop real and meaningful engagement with both the local community and local businesses in the area and to investigate of the impact of developing these relationships; with the aim of seeing improvements in both the quality of licensing applications being received but also in terms of impacting on local rates of DV, anti-social behaviour, and other outcomes. The aim was to provide a way in which the local communities team could develop a relationship with a local business which would lead to long term cooperation with other schemes, such as health promotion and signposting. It was felt that the licensing process was a good place to start as it was at this time the business owner would be most motivated to engage.

The developed guidance was in place for a period of about 12 months in 2013/14, during which there was active engagement by Public Health locality teams. Of the ten applications for premises selling alcohol off the premises received for this area in 2013/14, nine agreed to control measures while one application was withdrawn prior to hearing. However, in 2013, at the start of the project, local government was subjected to the start of the austerity measures put in place by the government. These led to restructuring and the loss of certain projects and teams. By November 2013 the two people leading on the project had left or were moved onto other pieces of work.

The data provided by the practice partner was a monthly time series from January 1st, 2008 through to December 1, 2017 at Middle-Super Output Area (MSOA) geographical level. The outcomes of interest were ‘drunk & disorderly behaviour’, ‘anti-social behaviour’, ‘sexual offenses’, and alcohol and non-alcohol related ‘domestic violence’ (alcohol flag yes/no) separately.

As the case areas we defined one MSOA because in this area two applications were made in the period covered by the guidance foods. The counterfactuals were based on 6 other MSOAs in the same area selected from areas in the vicinity of the case area by the officers working in the area as part of the multi agency group. The MSOAs were identified as being of concern by local practitioners, including community workers, ward members, police, environmental health officers, specialist treatment workers, housing workers, ASB workers and licensing officers first, which was then confirmed by as then confirmed by gathering baseline nuisance complaint, crime and health data. The final set of selected MSOAs had either no new licences that were granted during the period the guidance was enforced and/or they were not subject to the guidance. Qualitative information from the practice partner indicated public health involvement was not equally or randomly distributed across these areas, so the case for as-if randomisation seems somewhat weaker than for case studies 1 and 2.