

The measurable effect of local alcohol licensing policies on population health in England

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Online Supplementary Material

Equation S1

Unconditional growth model:

$$Y_{ij} = \log rate = (\beta_0 + u_{0j}) + (\beta_1 + u_{1j})t_i + \gamma_1 q_1 + \gamma_2 q_2 + \gamma_3 q_3 + e_{ij}$$

$$\begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} \sim N \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{u0}^2 & \\ \sigma_{u01} & \sigma_{u1}^2 \end{pmatrix} \right]$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

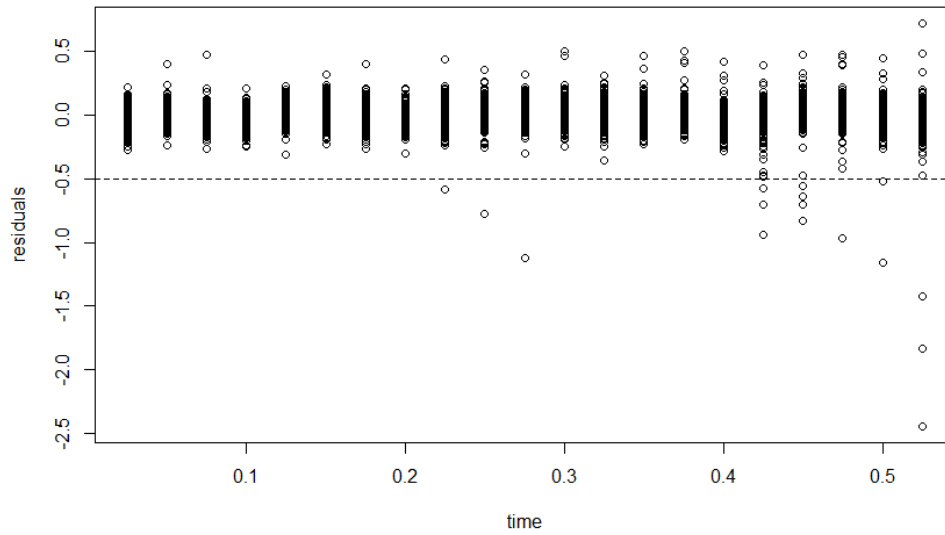
Y_{ij} = Logged rate at occasion i for location j

u_{0j} & u_{1j} = Location specific (Level 2) residuals

e_{ij} = Occasion-specific (Level 1) residuals

q_1, q_2, q_3 = dummy indicators for 1st, 2nd and 3rd quarters of year

Figure S1.



Scatterplot model residuals by time point. Dotted line indicates (arbitrary) cut-off for outliers, which are (in order of decreasing model residual): Cambridge, South Cambridgeshire, East Cambridgeshire, Isles of Scilly (3x), Warwick (3x), Greenwich (2x), City of London (2x), Bromley (2x), and Bexley (2x).

Table S2. Sensitivity analysis 1; “baseline exposure” (2007/08) growth model

parameter	Unconditional Estimate (SE)	Conditional (1) Estimate (SE)	Conditional (2) Estimate (SE)
Baseline (intercept)	5.013 (0.014) <i>P</i> <0.0001	4.707 (0.023)	4.716 (0.027)
Seasonal trend (Quarter 1)	ref	ref	ref
Jul-Sep (2)	0.042 (0.004)	0.042 (0.004)	0.042 (0.004)
Oct-Dec (3)	0.020 (0.004)	0.020 (0.004)	0.020 (0.004)
Jan-Mar (4)	-0.007 (0.004) <i>P</i> <0.0001	-0.007 (0.004) <i>P</i> <0.0001	-0.007 (0.004) <i>P</i> <0.0001
Slope	-0.048 (0.021) <i>P</i> =0.022	-0.010 (0.026) <i>P</i> =0.0002	-0.040 (0.056) <i>P</i> =0.022
<i>Effect on intercept</i>			
No policy		ref	ref
Low policy		0.045 (0.022)	0.048 (0.022)
High policy		0.083 (0.041) <i>P</i> =0.037	0.094 (0.041) <i>P</i> =0.022
Deprivation at baseline		2.163 (0.118) <i>P</i> <0.0001	2.258 (0.152) <i>P</i> <0.0001
Population at baseline		-0.021 (0.009) <i>P</i> =0.018	-0.028 (0.011) <i>P</i> =0.014
Alcohol-related crime at baseline		-0.014 (0.003) <i>P</i> <0.0001	-0.017 (0.004) <i>P</i> <0.0001
<i>Effect on slope</i>			
No policy		ref	Ref
Low policy		-0.070 (0.046)	-0.080 (0.047)
High policy		-0.226 (0.079) <i>P</i> =0.011	-0.263 (0.086) <i>P</i> =0.006
Deprivation at baseline			-0.304 (0.311) <i>P</i> =0.329
Population at baseline			0.023 (0.023) <i>P</i> =0.318
Alcohol-related crime at baseline			0.009 (0.008) <i>P</i> =0.274
Variance (Intercept)	0.057	0.030	0.030
Variance (slope)	0.115	0.112	0.112
Covariance (Int, Slope)	-0.49	-0.61	-0.61
Variance (residual)	0.011	0.011	0.011
BIC	-9137.81	-9310.34	-9271.77

Conditional (1): baseline effects and interaction policy & time (2): baseline effects plus all interactions with time

Table S3. Sensitivity analysis 2; 2009-2013 outcome data only

parameter	Unconditional Estimate (SE)	Conditional (1) Estimate (SE)	Conditional (2) Estimate (SE)
Baseline (intercept)	5.013 (0.013) <i>P</i> <0.0001	4.699 (0.024) <i>P</i> <0.0001	4.724 (0.027) <i>P</i> <0.0001
Quarter 1	ref	ref	ref
2	0.028 (0.003)	0.028 (0.003)	0.028 (0.003)
3	0.008 (0.003)	0.008 (0.003)	0.008 (0.003)
4	-0.022 (0.003) <i>P</i> <0.0001	-0.022 (0.003) <i>P</i> <0.0001	-0.022 (0.003) <i>P</i> <0.0001
Slope	0.005 (0.020) <i>P</i> =0.817	0.034 (0.030) <i>P</i> =0.762	-0.046 (0.055) <i>P</i> =0.067
Effect on intercept			
No policy		ref	ref
Low policy		0.007 (0.026)	0.010 (0.026)
medium		0.065 (0.028)	0.073 (0.028)
High policy		0.031 (0.031) <i>P</i> =0.124	0.050 (0.032) <i>P</i> =0.054
Deprivation at baseline		2.179 (0.118) <i>P</i> <0.0001	2.238 (0.150) <i>P</i> <0.0001
Population at baseline		-0.020 (0.009) <i>P</i> =0.023	-0.027 (0.011) <i>P</i> =0.019
Alcohol-related crime at baseline		-0.014 (0.002) <i>P</i> <0.0001	-0.018 (0.004) <i>P</i> <0.0001
Effect on slope			
No policy		ref	Ref
Low policy		-0.022 (0.052)	-0.031 (0.053)
Medium policy		-0.061 (0.054)	-0.089 (0.056)
High policy		-0.077 (0.058) <i>P</i> =0.490	-0.138 (0.064) <i>P</i> =0.142
Deprivation at baseline			-0.191 (0.299) <i>P</i> =0.523
Population at baseline			0.021 (0.022) <i>P</i> =0.360
Alcohol-related crime at baseline			0.015 (0.008) <i>P</i> =0.047
Variance (Intercept)	0.055	0.030	0.030
Variance (slope)	0.094	0.094	0.093
Covariance (Int, Slope)	-0.45	-0.61	-0.60
Variance (residual)	0.007	0.007	0.007
BIC	-9112.25	-9258.98	-9224.32

Conditional (1): baseline effects and interaction policy & time (2): baseline effects plus all interactions with time

Figures S2 a and b. Measured and modelled age-adjusted alcohol-related hospital episode statistics for six case study areas

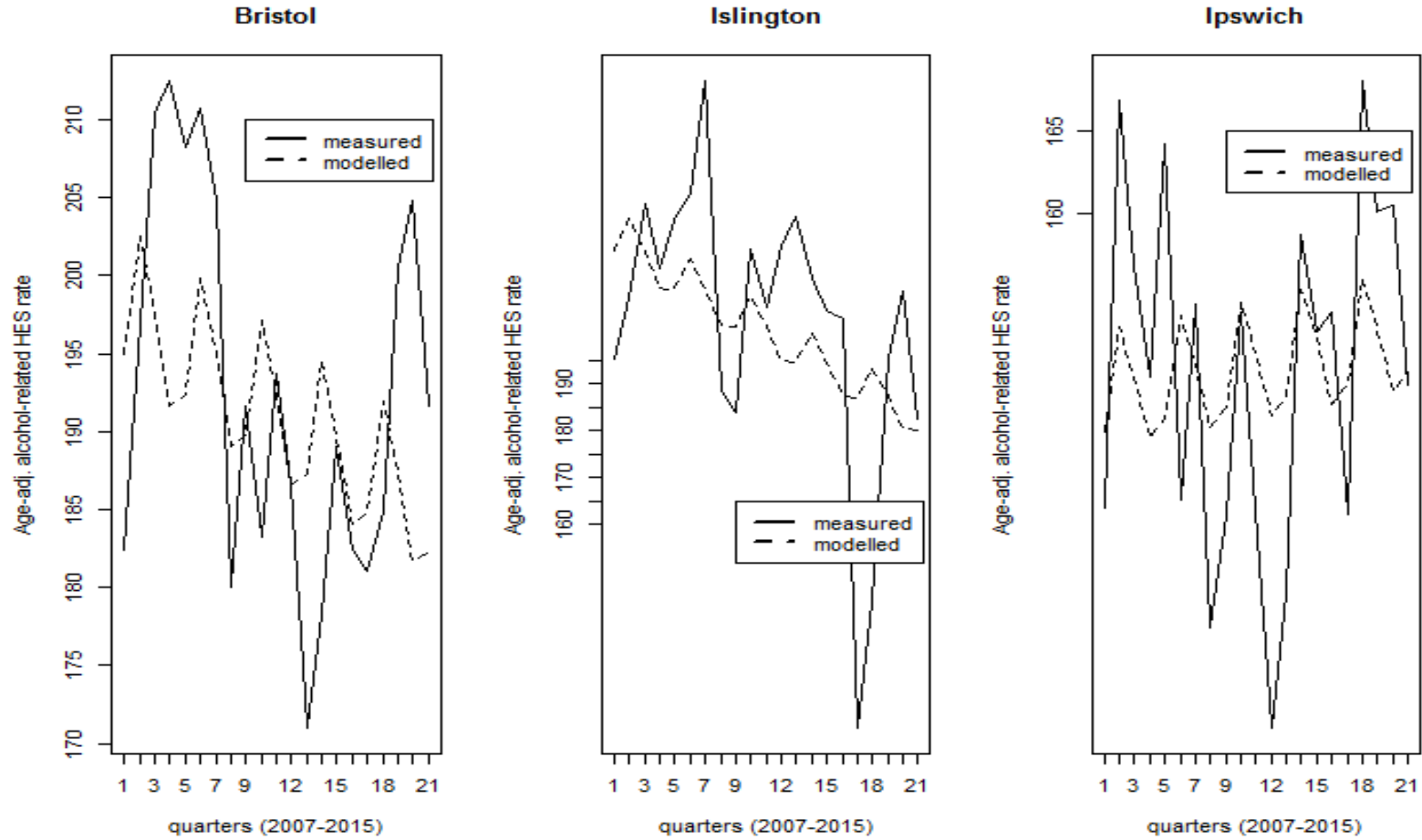


Figure S2a. Bristol, Islington and Ipswich

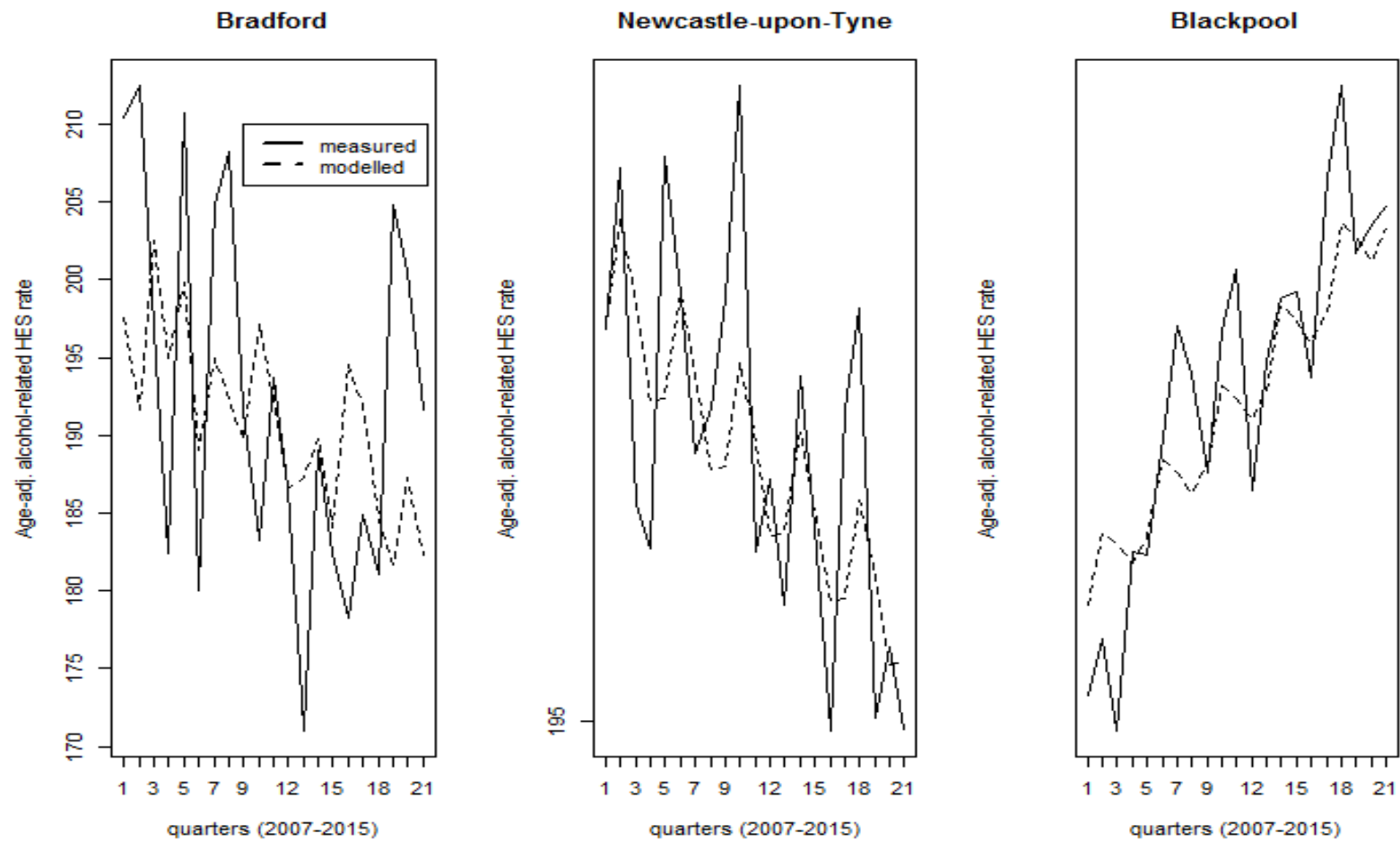


Figure S2b. Bradford, Newcastle-upon-Tyne and Blackpool