Public Health England

Protecting and improving the nation's health

Alcohol sales in England in 2014: Analysis to assess suitability for inclusion as an indicator in the Local Alcohol Profiles for England

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and are a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

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Executive summary

Public Health England have purchased one year of alcohol sales data in order to assess its suitability for inclusion as an indicator in the Local Alcohol Profiles for England (LAPE) [1]. Data have been provided for both on-trade (businesses with a license to sell alcohol which can be drunk on the premises such as bars and hotels) and off-trade (businesses which sell alcohol for consumption off the premises such as supermarkets and off-licenses). The data have been supplied by four-weekly time period and estimated at Local Authority level.

Analysis of the data at a national level has revealed a number of important findings which add to the evidence base about alcohol use in England. In particular, there are new findings related to the level of under-reporting of alcohol consumption in household surveys by product type as well as a quantification of the seasonality of sales.

- 361 million litres of pure alcohol were sold in England in 2014 which equates to 16.3 units of alcohol per week for each adult in the population and 19.3 units per week for each drinker
- two-thirds of the volume of alcohol sold is through the off-trade
- when compared with self-reported consumption data from the Health Survey for England (HSE) the alcohol sales figures suggest significant under-reporting. The overall difference between the amount of alcohol sold and the amount reported through the HSE is 34%, and for spirits is over 50%
- alcohol sales increase by 36% in December compared with an average month and fall by 21% in January

Analysis of on-trade sales per head by local authority has revealed a strong positive correlation with visitor numbers suggesting that the variation observed in rates of sale through the on-trade and numbers of licensed premises is heavily influenced by non-resident drinking. For these areas, the inclusion of on-trade sales data may be a less helpful local public health measure compared to off-trade sales of alcohol, which may be considered a better proxy measure for consumption in the local population.

A regression model has been developed at local authority level to measure the relationship between alcohol sales and alcohol-related harms using the alcohol-specific hospital admissions measure. The model results suggest that the factors which best explain the variation in alcohol-specific hospital admissions are:

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[1] fingertips.phe.org.uk/profile/local-alcohol-profiles

- deprivation
- off-trade sales
- the concentration of licensed premises in the local authority
- ONS area classification [2] - a categorisation based on demographic variables from the census

In light of the results from the modelling we have concluded that off-trade sales are a useful and valid local public health measure and should be incorporated into the Local Alcohol Profiles for England (LAPE) tool.

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[2]

www.ons.gov.uk/methodology/geography/geographicalproducts/areaclassifications/2011areaclassifications/abouttheareaclassifications

1. Background and aim

Alcohol consumption in England is typically measured through large scale surveys. The Office for National Statistics (ONS) has asked questions about drinking in various surveys since the 1970s and the Health Survey for England has asked questions since its inception in 1991.

It is widely acknowledged that household surveys under-estimate population-level alcohol consumption with estimates suggesting UK surveys record between 55% and 60% of consumption compared with actual sales[i]. This discrepancy occurs because some populations are not covered by surveys, including children, non-UK visitors and adults not living in private households. The latter group may include people with non-typical levels of alcohol consumption, including students, adults in social care, those in hostel accommodation and the homeless.

Secondly, some groups who are likely to drink more, although eligible to take part in surveys, are harder to reach. For example, young men. Also, heavy drinkers can have lifestyles that make them harder to contact and persuade to take part in health-related surveys. Finally, survey respondents can underestimate their consumption. For example, by excluding drinking on special occasions such as celebrations or holidays or underestimating drink size with home poured drinks such as spirits.

In view of this known underestimation, Public Health England purchased one year of alcohol sales data from CGA strategy. CGA are the only organisation who routinely collect and collate both on and off-trade sales data in partnership with Nielsen. The purchased data covers all sales, on and off-trade, in 2014 and is broken down by the type of product sold and by local authority. This report provides an analytical overview of that data and assesses the value of alcohol sales data as a public health indicator at a local authority level.

2. Data source and data collection methodology

2.1 Overview of the source data

There are three elements to the alcohol sales source data:

  i.   on-trade volume and value sales which are collated by CGA Strategy
  ii. off-trade volume and value sales which are collated by Nielsen
  iii. outlet/licensed premises information for on and off-trade, collated by CGA Strategy

2.2 On-trade sales: data collection methodology

CGA Strategy holds a database of all licensed on-trade premises in Great Britain. This is maintained by a full-time production team using desk, field and phone research to keep abreast of openings, closures, refurbishments, changes of ownership, trading patterns, and changes of stocking profiles with respect to drink brands. Every year, details for approximately 85% of the premises in the database (and 95% of all pubs) are obtained and, if necessary, refreshed.

On-trade sales estimates are based on a stratified random sample of approximately 4,800 outlets, derived from the premises database who are sampled on a rolling basis. Sample outlets are visited in person and/or through telephone research every three months by a dedicated full-time production team. A detailed interview with the outlet publican is conducted to collect data on what brands of products are stocked. In addition to the data collected on brands stocked by sampled outlets, CGA also has access to data on the volume of different brands sold by, and/or delivered to, a further 85,000 outlets via major breweries and suppliers who report to CGA on a monthly basis. This data is combined with the sample information to provide overall estimates of on-trade sales.

2.3 Off-trade sales: data collection methodology

Off-trade alcohol sales estimates are obtained by Nielsen using weekly store-census data from most large multiple retailers and several smaller retailer groups. 17 major multiple retailers provide data and they represent an estimated three-quarters of all alcohol sold through the off-trade. For 'impulse' outlets (independent outlets and most of the smaller multiple retailers), weekly data are provided by a stratified random sample of outlets in a similar way to that described above for CGA's on-trade. Sales from discount retailers are excluded.

The off-trade database is updated continually for larger multiple retailers using automatically provided data and at least annually for impulse outlets using various trade sources.

2.4 Estimation of data by Local Authority

Sales data (on and off-trade) are collected for estimation at TV region level. PHE asked CGA to provide estimates at Local Authority (LA) level. In order to provide data at this level, average sales volume per outlet per region by drink type were calculated. These averages were then multiplied by the number of outlets in each Local Authority to obtain estimated sales by LA.

2.5 Further information

NHS Scotland have been purchasing alcohol sales data from CGA for a number of years to help inform and monitor their alcohol strategy and have published a number of reports on the methodology and reliability of the data[iiiii].

3. Analysis of alcohol sales in England

3.1 Overview of alcohol sales in England

361 million litres of pure alcohol were sold in England in 2014. This equates to 16.3 units of alcohol per week for each adult in the population and 19.3 units per week for each drinker (once abstainers are excluded). 65% of the volume sold was through the off-trade. Figure 1 shows the breakdown of volume sales for both on and off-trade by product type. A similar amount of lager is sold through on and off-trade but three to four times as much wine and spirits are bought for home consumption.

Figure 1 - Volume of alcohol sold: CGA/Nielsen, England, 2014
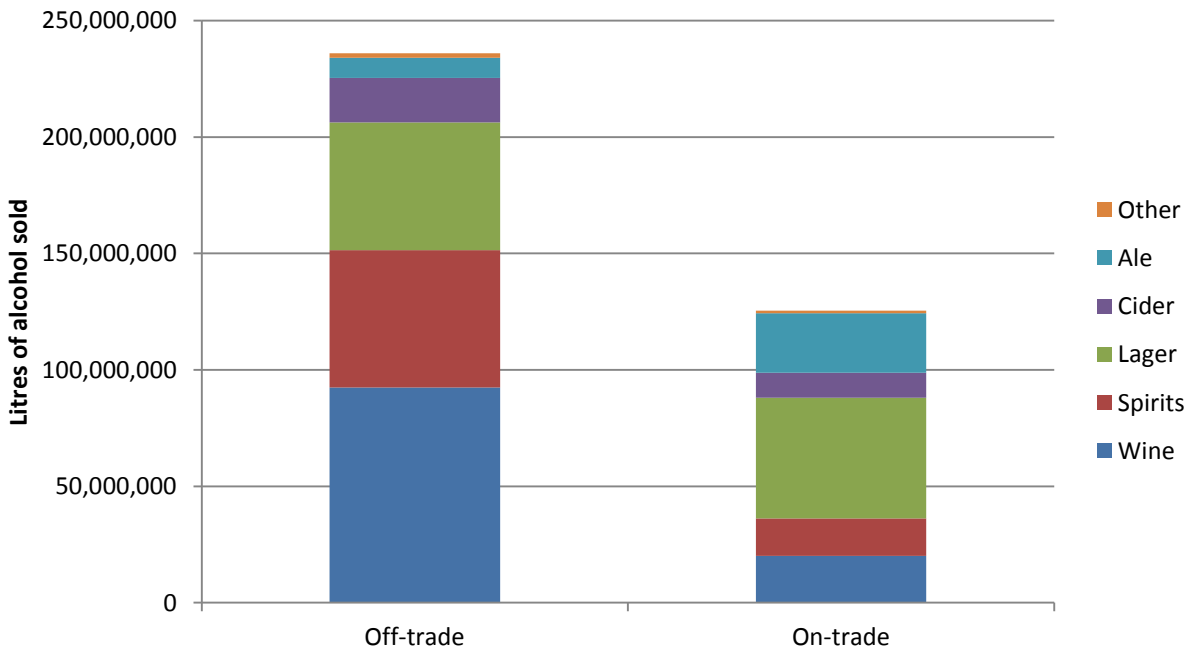
3.2. Comparison with survey data

The primary source of alcohol consumption data in England is from the Health Survey for England (HSE). Table 1 compares data as reported through this survey with the sales data from CGA. Overall, the analysis suggests that HSE captures approximately two-thirds of the alcohol sold through its survey. For spirits less than half of the volume sold is reported through the consumption survey.

Table 1 – comparison of sales and estimated consumption of alcohol in England

	Estimated volume consumed, thousand litres [3](HSE 2014)	Volume sold, thousand litres (CGA 2014)	% of sales reported in HSE
Beer	101,668	140,928	72%
Spirits	33,406	74,939	45%
Wine	98,640	112,606	88%
All alcohol	238,522	361,429	66%

One important consideration is that HSE is a survey of people who are resident in England whereas the sales data will include alcohol sold to the non-resident population. For example, sales to tourists from outside England will be included in the sales data but not in the survey data. In theory alcohol drunk by English residents when they are abroad will be included in the survey data but not the sales data.

A further reason for the observed difference is that the HSE asks about 'usual' drinking behaviour. As such it's unlikely to pick up seasonal spikes in drinking around Christmas or holiday periods. Drinking on special occasions may also be under-estimated. Another factor which will impact on the survey results is the accuracy of respondents estimates of the amount of alcohol drunk when self-pouring at home. This is likely to be a particular issue for spirit drinkers.

3.3 Seasonality

The sales data has been provided in four-weekly periods and so it's possible to look at seasonality throughout the year.

Figures 2 and 3 show on and off-trade sales by product and time period. Sales increased markedly at the end of the year, particularly off-trade sales of wine and spirits and on-trade sales of lager. Sales are also noticeably lower at the beginning of the year when many people cut down on their drinking after Christmas. For example, by participating in campaigns such as Dry January or as a result of New Year's resolutions. There could also be an effect from stockpiled alcohol which may have been bought through the off-trade in December but not consumed until later.

Overall, when compared with average sales in periods 2 to 12, volume sales in period 13 (the last four weeks of the year) were 36% higher and sales in period 1 (the first four weeks) were 21% lower. There was short-term increase in off-trade sales of lager in June, possibly related to the football World Cup.

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[3] Calculated by multiplying the average weekly units consumed as estimated in the survey by the adult population and converting to litres using 10ml=1 unit

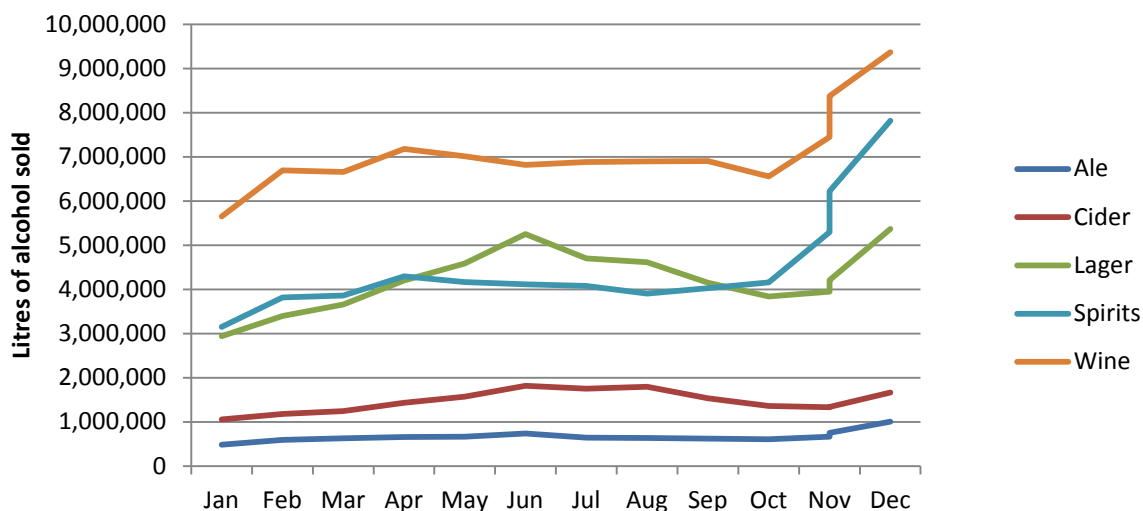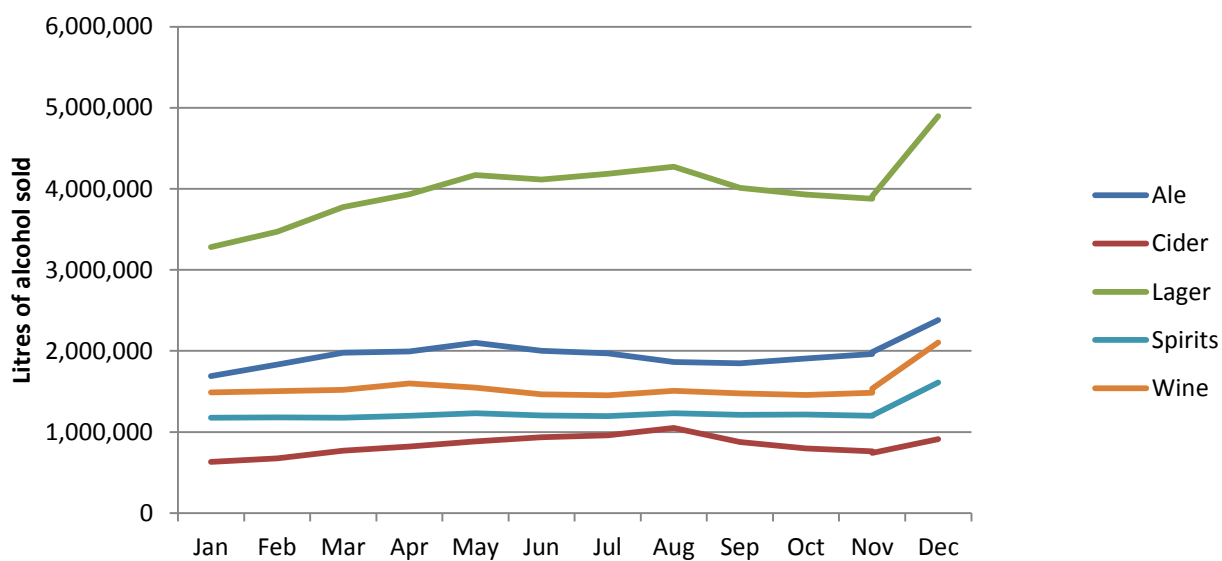## Figure 2: Off-trade sales by product, CGA/Nielsen

## Figure 3: On-trade sales by product, CGA/Nielsen

4. Analysis of alcohol sales by local authority

The primary purpose for PHE in purchasing alcohol sales data was to assess the value of this data as a local public health indicator and to consider its inclusion in the Local Alcohol Profiles for England (LAPE) tool[4]. In order to make this assessment, the sales data were converted to rates per head using the adult (18+) population in each local authority. Sales rates for all alcohol products combined are available in Excel format[5] fingertips.phe.org.uk/documents/Tables%20for%20sales%20report.xlsx.

Figure 4 provides a scatter plot of rates of sale for on-trade compared with off-trade rates for 322 lower tier local authorities[6]. A wide range of values are observed for both on and off-trade and whilst there is some correlation between the two values it isn't a strong relationship (the correlation coefficient is 0.27).

Figure 4 - On and off-trade rates of sale by local authority

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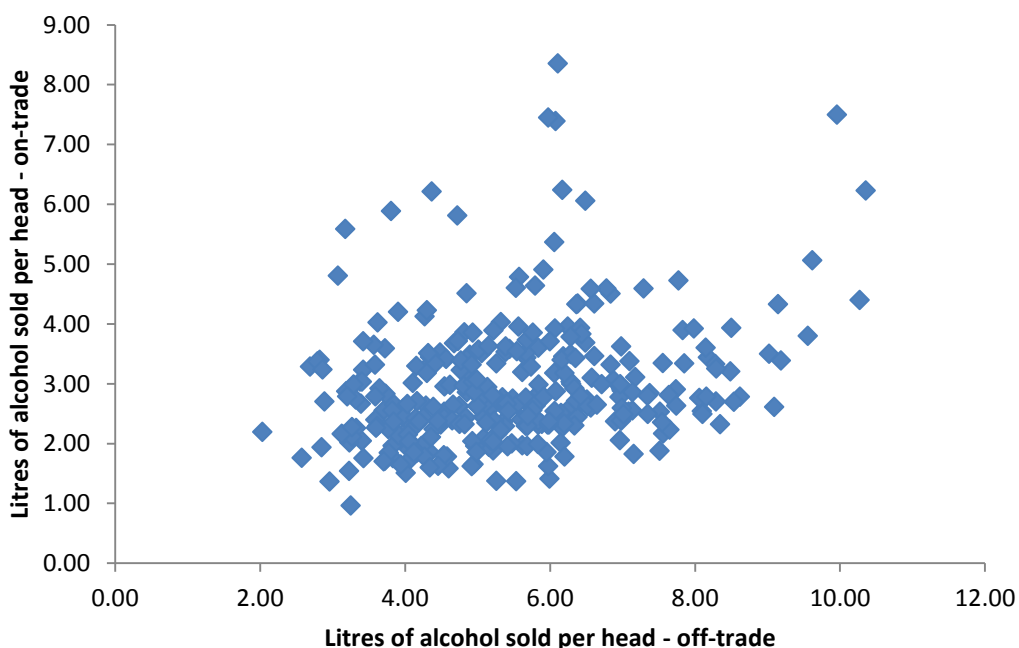
[4] fingertips.phe.org.uk/profile/local-alcohol-profiles
[5] The Isles of Scilly and City of London are very small local authorities and there are frequently difficulties in providing robust estimates for these areas. In the case of the alcohol sales data we found that the estimated sales rates for these areas were implausible high and hence these two authorities have been excluded from the analyses presented below.
[6] Blackpool and Westminster are excluded as they both had very high on-trade rates of sale, 14 and 16 respectively, which distorted the chart.

There are a group of local authorities which appear to have particularly high on-trade sales per head. Table 2 shows all of the local authorities with on-trade rates of sale above 5 litres per head. It is noticeable that all of them are either London boroughs or areas with high levels of tourism.

**Table 2 – Local Authorities with on-trade rates of sale over 5 litres per head**

Local authority name	Litres sold per head
City of Westminster	16.17
Blackpool	14.12
Scarborough District	8.35
South Lakeland District	7.50
Kensington and Chelsea	7.45
Camden	7.39
East Lindsey District	6.24
Craven District	6.23
Derbyshire Dales District	6.21
Isle of Wight	6.05
Eden District	5.88
Cotswold District	5.81
Ryedale District	5.59
Allerdale District	5.37
North Devon District	5.06

To investigate this relationship further, data on tourism numbers from the Great Britain Tourism Survey[7] was obtained. Figure 5 shows the relationship between the number of visitors (both UK and overseas visitors) per head of population and on-trade sales of alcohol. There is a clear positive relationship, even for the outlier points, with a correlation of 0.67 for the 283 local authorities where both sales and tourism data are available.

This suggests that the variation observed in rates of on-trade sales by local authority may be more influenced by non-resident consumption than by differences in drinking patterns by the resident population. Furthermore, this suggests that on-trade sales may be a less useful local public health measure since higher levels will be associated with alcohol consumption by the non-resident population.

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[7] www.visitbritain.org/destination-specific-research

Figure 5: on-trade sales and levels of tourism
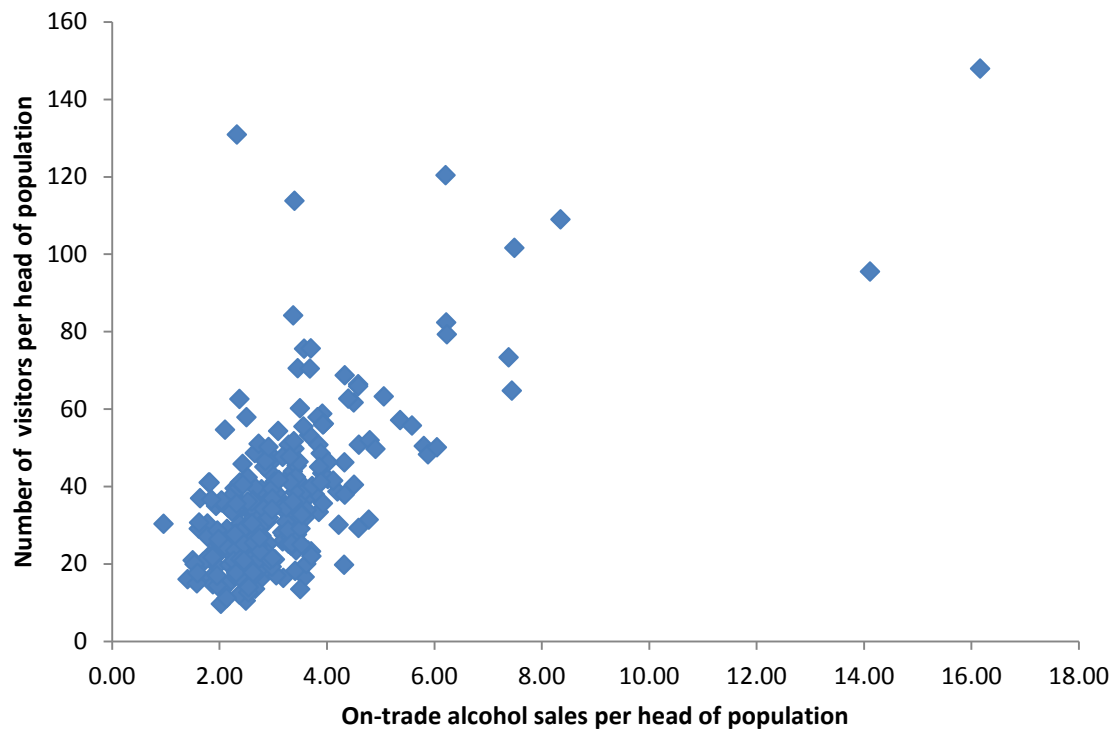
5. Modelling the relationship between alcohol sales and alcohol-related harms

For the alcohol sales to be a useful public health indicator at a local level there should ideally be a measurable relationship between sales and alcohol-related harms. PHE publish a range of data about alcohol-related harms in the LAPE tool derived from hospital admissions and mortality data.

The alcohol-specific hospital admissions measure counts all individuals who are admitted to hospital for a reason that is wholly attributable to alcohol [8] and presents this as a rate per 100,000 in the population.

In order to assess the potential value of alcohol sales data to help explain local variation in alcohol-specific hospital admission rates, a multivariate linear regression model has been developed in R. One limitation of the modelling is that, whilst the alcohol-specific admissions measure is the harm measure most directly associated with alcohol consumption, it does include some conditions which can develop over a number of years and hence alcohol sales (and consumption) prior to 2014 will also have been a factor.

The following variables were considered for inclusion in the model:

- on-trade sales per head (all products and separately for wine, spirits and beer)
- off-trade sales per head (all products and separately for wine, spirits and beer)
- licensed premises per head and per km2
- population density
- deprivation decile
- ONS area classification group [9]
- urban/rural classification
- % of non-white in the population

A backward selection process was used to find the best model based on the variables above. A number of variables were found to be highly correlated and the model was pruned to remove collinearity.

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[8] For definitions see the LAPE user guide: www.lape.org.uk/downloads/Lape_guidance_and_methods.pdf
[9] The ONS area classification process places each of the 391 UK local authority districts into different groups based on their 2011 Census characteristics. The clustering process uses a range of socio-economic variables covering demographic structure, household composition, housing, socio-economic character and employment:
www.ons.gov.uk/methodology/geography/geographicalproducts/areaclassifications/2011areaclassifications/methodologyandvariables

The results from the final model are presented in Table 3. Only area classifications with a statistically significant influence on the model are shown.

Table 3 – Regression coefficients and significance values

Variable	Model Coefficient	T-value	Significance
Off-trade sales per head	14.4	4.3	***
Deprivation decile (1=most deprived)	-21.9	-8.4	***
Licensed premises per km^2	4.4	4.6	***
ONS area classification			
- Central London	-226.5	-4.4	***
- London – suburbia	-147.3	-4.0	***
- Multicultural suburbs	-110.5	-3.4	***
- Growth areas and cities	-75.2	-3.2	**
- Rural coastal	-71.6	-2.7	**
- Rural hinterland	-60.1	-2.4	*
(intercept)	398.0	12.3	***

Significance codes: *** =0.001, **=0.01 missing *=0.05

The adjusted R^2 value for this model was 62.9% suggesting that around two-thirds of the variation between areas can be explained by the model.

The interpretation of the model coefficients is that alcohol-specific admissions are positively associated with deprivation with the rate reducing by 21.9 on average as you move from one decile to the next, less deprived, decile.

Admissions are also positively associated with off-trade sales of alcohol with the rate increasing by an estimated 14.4 for every additional litre of pure alcohol purchased per head of population.

The concentration of licensed premises was found to have a positive association with admissions. For every additional licensed premise per square kilometre the alcohol-specific admission rate rose by 4.4 on average.

There is a considerable body of academic evidence which suggest that outlet density is related to alcohol consumption and alcohol-related harm[iv]. However, the density of licensed premises is highly correlated with population density. In the absence of the licensed premises measure, population density was significant in the model and hence it may be that the licensed premises density indicator is a proxy for something else related to densely populated areas rather than necessarily implying causation linked to the density of outlets selling alcohol. Nonetheless, the measure is an indicator of availability and exposure to alcohol at a local authority level. Albeit an average constructed from many, often heterogeneous, smaller areas.

Lastly, the model also suggests that certain types of ONS areas are more likely to have lower rates of alcohol specific admissions over and above levels of deprivation. In

particular, multicultural areas have lower rates most likely associated with low levels of alcohol consumption in certain ethnic groups.

Rates of on-trade sales were not found to be significant in the model. This is likely to be due to the non-resident effect discussed in the previous section. It could also be due to the fact that the alcohol-specific admissions measure includes both chronic and acute conditions and we might expect on-trade sales to have a stronger correlation with acute harms which occur shortly after consumption. However, even when you consider admissions for alcohol-related injuries alone, we find no correlation between the rates of hospital admission and rates of sale through the on-trade.

This may reflect a limitation in the methodology used to generate local authority estimates. As explained in section 2.4, the method assumes a constant rate of sale per outlet in each local authority. In practice, busy city centre pubs and clubs will have higher rates of sale than premises on the outskirts of the same town and hence a local authority average will mask any more localised effects.

6. Conclusions

The analysis in this report provides evidence that off-trade sales are a potentially useful local indicator for alcohol-related harms.

On-trade sales were not found to be significant in the regression modelling and have been shown to be highly correlated with tourism and visitor numbers. As such they are not an obviously useful indicator for inclusion in LAPE as it is primarily focussed on the resident population. However, this data has been made available for all local authorities through this report.

On the basis of this analysis PHE plans to include off-trade sales as a new indicator in LAPE. Consideration will be given to further future purchase of this data subject to the necessary funds being available.

Appendix: Data tables

Data tables by local authority have been provided in Excel format to enable users to reuse the data in their own analyses. The tables provide on and off-trade volume and values sales for 2014 for both Upper Tier and Lower Tier local authorities:

fingertips.phe.org.uk/documents/Tables%20for%20sales%20report.xlsx

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[i] Goddard E. Obtaining information about drinking through surveys of the general population. National Statistics Methodology Series No. 24. ONS, London, 2001.

[ii] Monitoring and Evaluating Scotland's Alcohol Strategy:
A review of the validity and reliability of alcohol retail sales data for the purpose of Monitoring and Evaluating Scotland's Alcohol Strategy, May 2012.

[iii] Monitoring and Evaluating Scotland's Alcohol Strategy:
An update of the validity and reliability of alcohol retail sales data for the purpose of Monitoring and Evaluating Scotland's Alcohol Strategy, August 2015.

[iv] Popova S, Giesbrecht N, Bekmuradov D, Patra J. Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. Alcohol and Alcoholism. 2009;44(5):500–16.