



Local Alcohol Profiles for England

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Alcohol Indicator Development: Methodology and Definitions

Hooper J, Dedman D, Hennell T, Kelly G, Tocque K

1. Background

This paper outlines the methods used by the North West Public Health Observatory (NWPHO) to produce this national alcohol indicator set. NWPHO is a member of the Association of Public Health Observatories, which facilitates national working between the member observatories in England, Ireland, Scotland and Wales. As part of the association, each PHO takes a lead role in key policy areas affecting public health; one of the NWPHO lead areas is Alcohol.

The increase in alcohol misuse has led to a need to understand the consequences. As well as the direct individual health impact of alcohol misuse, and the associated costs of providing health and social care for those affected, alcohol related crime and disorder impose massive additional costs, direct and indirect, on society. NWPHO and the Alcohol Research Unit (Centre for Public Health, Liverpool John Moores University) has brought together routine data and intelligence from a range of sources (including the Department of Health and the Home Office), to provide the first national indicator set intended to inform and support local, regional and national alcohol policy. The indicators will help prioritise and target local areas of concern and encourage cooperative working and partnerships to reduce the costs and harms associated with alcohol misuse. In addition, the indicators provide a baseline for the negotiation of Local Area Agreements between Regional Government Offices and Local Authorities.

In compiling the indicators, NWPHO has reviewed methods for deriving population measures of alcohol-related harms and has developed a selection of indicators and methods which are consistent with current knowledge and understanding, and that reflect the wide range of domains in which alcohol misuse may impinge. In this paper, we outline in detail the methods used for the calculation of the different indicators, so that the analyses can be replicated at smaller geographic areas or for specific population sub-groups.

2. Definitions

ATTRIBUTABLE FRACTION (AF): also known as the Population Attributable Fraction (PAF). This is the proportion of all cases of a condition in the population which are attributable to exposure to a specific risk factor – in this case alcohol consumption. AF's may be estimated directly, for example by attempting to retrospectively assign exposure status in series of fatal cases. Indirect estimates of AF's can be derived from epidemiological studies providing estimates of relative risk (RR) associated with the exposure of interest, in combination with information about the prevalence of the exposure in the target population. Note that the population attributable fraction calculation is based on the assumption of a causal association between risk factor and disease, meaning that the attributable fraction can also be viewed as the expected proportional reduction in cases of disease arising in the population as a result of removing the exposure.

ALCOHOL SPECIFIC CONDITIONS: those conditions where alcohol is causally implicated in *all* cases of the condition; for example, alcohol-induced behavioural disorders and alcoholic liver cirrhosis. By definition, the attributable fraction (AF) = 1, because no cases would be expected to arise in the absence of alcohol.

ALCOHOL RELATED CONDITIONS: includes all alcohol specific conditions as defined above, but also those conditions where alcohol is causally implicated in some but not all cases of the condition, and so the AF will range between greater than zero and less than one.

North West Public Health Observatory, Centre for Public Health, Liverpool John Moores University, North Street, Liverpool L3 2AY.
Tel: 0151 231 4454 Website: www.nwpho.org.uk; email: contactus@nwpho.org.uk



3. Alcohol specific and alcohol related conditions, and alcohol attributable fractions (AF)

In recent years, there have been several attempts to quantify, or monitor, alcohol related disease burden. This has led to publication of a number of definitions which differ slightly from each other in terms of the conditions included. The definitions reviewed in the current report include: .

1. UK Office for National Statistics (ONS) has reported on alcohol-related deaths using a definition based on a relatively small number of conditions regarded to be most directly associated with alcohol consumption. Prior to 2001 these conditions were identified using ICD-9 codes, with ICD-10 codes used subsequently. More recently, ONS conducted a consultation exercise⁵, which resulted in a revised list⁶ of ICD10 codes which will be used to monitor 'deaths related to alcohol consumption'. This has increased the number of deaths included in the analysis by around 1%.
2. The UK Prime Minister's Strategy Unit produced an Interim Analytical Report⁷ on the harms associated with alcohol misuse, and reviewed available data and evidence. A list of AFs were assigned to alcohol related conditions defined by ICD-9 codes (see Annexes to Interim Report).
3. Taking Measures²: this NPHO & Centre for Public Health publication examined alcohol related mortality and morbidity based on the list of conditions produced by the Prime Minister's Strategy Unit, but employed a mapping of these conditions onto ICD10 codes, instead of the original ICD-9 codes.
4. The Scottish Executive commissioned report, Alcohol Misuse in Scotland⁸, used a number of different definitions to estimate costs directly or indirectly associated with alcohol misuse. These definitions included: alcohol specific consultations in primary care (based on Read codes); alcohol specific admission to psychiatric hospital (ICD10); alcohol specific and related non-psychiatric hospital episodes (ICD-10); and mortality (ICD-9)
5. US Centers for Disease Control and Prevention (CDC) Alcohol-Related Disease Impact (ARDI) program¹: CDC produces a list of alcohol related and alcohol specific conditions, along with attributable fractions that can be applied to different levels of alcohol consumption. See www.cdc.gov/alcohol/ardi.htm.
6. An online search of ICD10 code descriptions¹⁰ for the word 'alcohol' identified a small number of additional alcohol specific codes for consideration (e.g. E24.4: alcohol induced pseudo-Cushings disease)

From these sources we defined a list of alcohol related, and alcohol specific conditions (see Table 1), based on ICD-10 codes. Alcohol attributable fractions for these conditions were taken from the UK Prime Minister Strategy Unit report⁷ wherever possible. Where there were more than one estimate of the AF, we applied the average value. Newly included alcohol specific conditions were set to AF=1.

The list of alcohol specific and alcohol related conditions in Table 1 has been updated since the publication of "Taking Measures"², and the report "Where Wealth means Health"⁹. These changes mean that there may be small discrepancies between the estimates in the different reports, of the order of 1-2%.

4. Reduced life expectancy attributable to alcohol

Deaths for persons under 75 were extracted to reduce the interaction in that death by one cause precludes death by another and to take into account the uncertainty in 'cause of death' certification for the over 75s. This also reduces the distorting local effects of persons moving to continuing care facilities. Data were extracted for all alcohol related deaths for the years 2002 to 2004.

Deaths were aggregated by disease type, sex, and age at death in 5 year age groups (to age 74), for each local authority in England. Aggregated deaths were multiplied by the corresponding alcohol attributable fraction, see Table 1, and summed over all disease types to obtain an estimate of alcohol attributable deaths in each age and sex group for each local authority. For simplicity, each death in a given age/sex band was considered to have occurred at the mid point of that age band, and the number of potential years life lost was estimated by the conditional life expectancy (e_x - the average expectation of life at exact age x) at that midpoint age, obtained from Government Actuary Department's (GAD) interim life tables for 2002-2004, (see www.gad.gov.uk).

Years of life lost were reaggregated to the following age groups: 0-1, 1-44, 45-54, 55-64, 65-74, and age standardised rates were calculated for males and females separately, using ONS mid-year population estimates for 2002-04 as denominators, and the European Standard Population (ESP) as the reference. Finally, the age standardised rates were multiplied by the sex specific life expectancy at birth for 2003 (males

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– 76.53y, females 80.91y) in order to project the estimates to a lifetime effect. Results were then expressed in *months* life lost (i.e. multiplied by 12).

5. Mortality from Chronic Liver Disease

Indirectly Standardised Mortality Ratios (SMR) for chronic liver disease, were taken from the NCHOD Compendium³ produced by the National Centre for Health Outcomes Development. In this dataset, deaths from chronic liver disease mortality are defined as those deaths registered during 2004, where the underlying cause of death is coded to ICD-10 K70, and K73-K74. Denominator data was mid-2004 population estimates from ONS.

In indirect standardisation, a set of age-specific reference rates (in this case, national rates for England) are applied to the population structure of each local authority. From this an expected number of deaths is obtained, and the ratio of observed/expected deaths is multiplied by 100 to give the SMR. The use of SMRs is justified in situations where the number of events in the target population is expected to be small (e.g. for small areas, and/or rare diseases), and therefore the rate estimated are likely to be numerically unstable.

Please refer to the NCHOD website for further details (www.nchod.nhs.uk).

6. Alcohol specific and alcohol related hospital admission

The list of ICD10 codes (see Table 1) was used to extract all episodes containing alcohol related (and specific) diagnoses from the HES datasets. For many conditions there was a high and low estimate of the alcohol AF, in which case an average of the two values was used. Sex specific AF's were used, reflecting the difference in exposure prevalence and intensity, and physiological differences between males and females (Table 1).

Person based analysis:

A person-based analysis was performed, yielding a period prevalence estimate of the number of persons who were admitted to hospital at least once during the course of a (financial) year. Episodes relating to the same individual were linked using HESID (which uniquely identifies a patient across all data years). As there are multiple diagnosis codes (14) per episode, and potentially more than one episode per person, it is possible that there may be more than one alcohol related ICD10 code associated with an individual over the course of the year. A decision rule was therefore needed to allocate individuals to a single ICD10 so that an attributable fraction could be applied. We adopted the following approach:

1. for each individual, identify all alcohol related diagnosis codes from their HES records.
2. assign the code with the largest attributable fraction.
3. in the event of an individual having two or more codes with the same attributable fraction, assign the one which occurs with the highest frequency in the total dataset.

These rules have the effect of producing maximum estimates for period prevalence.

Age was calculated from date of birth and the start date of the relevant hospital episode. Directly age standardised rates were calculated separately for males and females, using the European Standard Population (ESP) as a reference group. Five year age groups were used up to age 84, with persons aged 85 and over in a single group.

Mid-year population estimates for Local Authority (LA) districts and unitary authorities were obtained from the Office for National Statistics (ONS).

7. Alcohol related crime

Recorded crime related to alcohol is calculated using the Strategy Unit's 'attributable fractions' and applying them to the total number of recorded crimes. The AFs were taken from the NEW-ADAM arrestee survey and are based on urine tests of arrestees⁴. As such these AFs estimate the *statistical* association between alcohol and crime, and not necessarily the *causal* association, and should therefore be distinguished from the disease specific attributable fractions described above. The proportion of arrestees testing positive for alcohol (and thus the attributable fractions) are shown in Table 2 (source: Strategy Unit).

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Numerators and population denominators (based on ONS mid-year estimates) for the the following categories of offences were obtained nationally from the Home Office for all of the Crime and Disorder Reduction Partnerships (CDRP) in England:

- Violence against the person
- Sexual Offences
- Robbery
- Burglary
- Theft of a Motor Vehicle
- Theft from a Motor Vehicle

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This represents all crime published at a LA level but does not necessarily cover all crimes that have taken place as the data is not reported nationally at Local Authority Level. Numerators were multiplied by the relevant AF to obtain the number of alcohol related crimes, and results presented as crude rates.

Data are presented as crude rates.

Further details on the reporting of Crimes can be found on the Crime Statistics Web-site (www.crimestatistics.org.uk).

Changes in how crime is reported in England and Wales mean trends are difficult to measure. Specifically, the National Crime Recording Standard (NCRS; introduced in 2002) required police to record all known incidents of crimes, regardless of whether those involved intended to press charges. The impact of these changes led to an estimated 10 per cent increase in total recorded crime in 2002/03 compared to 2001/02, with violent crime most affected. Given these changes, for the purposes of this report changes in crime have been measured from 2003/04.

8. Synthetic Estimate of Binge Drinking

The data shows the percentage of adults aged 16 and over who binge drink 2000-2002. Binge drinking was defined separately for men and women: men were defined as having indulged in binge drinking if they had consumed 8 or more units of alcohol on the heaviest drinking day in the previous seven days; for women the cut-off was 6 or more units of alcohol.

The data has been calculated from the Ward level estimates provided by ONS aggregated to Local Authority level using the 2001 Census Population for those aged over 16. The synthetic estimates are derived from a number of data sources including, Health Survey for England data 2000 to 2002, Census 2001 & other administrative sources.

The figures for regions and county councils are direct estimates from the Health Survey for England. Data for lower tier authorities (district councils, unitary authorities and London boroughs) are based on synthetic (modeled) estimates of the prevalence because there is insufficient sample size at this level.

The following link provides further details on the procedures used for the calculation of the synthetic estimates (<http://www.dh.gov.uk/assetRoot/04/11/69/02/04116902.doc>).

9. Confidence Intervals (CI's) and Gaps

Ninety five percent confidence intervals were used throughout.

- Hospital admission – Confidence intervals for the rates were calculated using the method described in the NCHOD Compendium for directly standardised rates.
- Crime rates – Confidence intervals for the Crude Rates were calculated using an exact binomial method for crude rates.
- Chronic Liver Disease – Confidence intervals for the ratios were calculated using the method described in the NCHOD compendium indirectly standardised ratios.

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The gap or relative variation from the average for England is presented as a z-score (or standard normal deviate) and calculated as the absolute difference between the local indicator value and the England average, divided by the standard deviation of all values for that indicator. The z-score represents a rescaling of the absolute difference so that it has an expected mean of zero and standard deviation of 1. The main purpose of the transformation is to facilitate the graphical presentation of gap measures for several indicators simultaneously using the same scale.

9. Comment

The issues associated with excess alcohol consumption have only reached prominence in recent years, as a consequence the research and evidence is continually evolving.

The evolution of alcohol related data collection systems has proceeded under the influence of two conflicting tendencies. Firstly the need for data which accurately reflects the most recent knowledge and understanding of the problem in hand means that data collection systems tend to change or evolve over time. The changes to the CDRP system, and the numerous definitions of alcohol related mortality and morbidity can be attributed at least in part to this requirement. On the other hand, monitoring of temporal trends requires collection of comparable data over several years – an aim that mitigates against changes to existing monitoring systems.

In presenting these indicators, NWPHO has attempted to balance these conflicting requirements by making its analysis current and comprehensive.

The indicators and other associated information can be found on the web-site www.nwph.net/alcohol/lape.

10. References

1. Centers for Disease Control and Prevention (2004). Alcohol Related Disease Impact (ARDI).
2. Hughes K, Tocque K, Humprey G, and Bellis M A (2004). Taking Measures: A Situational Analysis of Alcohol in the North West. Liverpool: Centre for Public Health, Liverpool John Moores University. ISBN 1-902051-2-9.
3. National Centre for Health Outcomes Development (2006). Compendium of Clinical and Health Indicators. www.nchod.nhs.uk
4. Nicholas, Sian, Povey, David, Walker, Alison, and Kershaw, Chris (2005). Crime in England and Wales 2004/2005. 11/5, 1-178. Research, Development and Statistics Directorate. Home Office Statistical Bulletins. ISSN 1358-510X.
5. Office for National Statistics (2006). Defining alcohol related deaths. 1-9. Internet publication. www.statistics.gov.uk/downloads/theme_health/Defining_alcohol-related_deaths.pdf
6. Office for National Statistics (2006). Defining alcohol-related deaths: Summary of responses to discussion paper. 1-7. Internet publication. www.statistics.gov.uk/downloads/theme_health/Summary_responses.pdf
7. Prime Minister's Strategy Unit (2004). Alcohol Harm Reduction Strategy for England. 1-90. London: Strategy Unit.
8. Scottish Executive (2001). Alcohol Misuse in Scotland: Trends and Costs. 1-104.
9. Wood, Justin, Hennell, Tom, Jones, Alyson, Hooper, Jeremy, Tocque, Karen, and Bellis, Mark A (2006). Where Wealth Means Health: Illustrating Inequalities in the North West. 1-200. Liverpool: North West Public Health Observatory. ISBN 1-902051-77-7. www.nwpho.org.uk/inequalities
10. World Health Organisation (2006). International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Online. www3.who.int/icd/currentversion/fr-icd.htm

Table 1. Alcohol specific (*) and alcohol related conditions, with ICD-10 codes and attributable fractions.

Condition	ICD10 codes	Attributable fraction	
		Male	Female
Alcohol-induced pseudo-Cushing's syndrome*	E244	1.00	1.00
Mental and behavioural disorders due to use of alcohol*	F10	1.00	1.00
Degeneration of nervous system due to alcohol*	G312	1.00	1.00
Alcoholic polyneuropathy*	G621	1.00	1.00
Alcoholic myopathy*	G721	1.00	1.00
Alcoholic cardiomyopathy*	I426	1.00	1.00
Alcoholic gastritis*	K292	1.00	1.00
Alcoholic liver disease*	K70	1.00	1.00
Ethanol poisoning*	T510	1.00	1.00
Methanol poisoning*	T511	1.00	1.00
Accidental poisoning by and exposure to alcohol*	X45	1.00	1.00
Alcohol-induced chronic pancreatitis, Other chronic pancreatitis	K860-K861	0.72	0.72
Inhalation and ingestion of food causing obstruction of respiratory tract	W79	0.63	0.63
Malignant neoplasm of lip	C00	0.50	0.50
Chronic liver disease	K73-K74	0.49	0.52
Oesophageal varices	I85	0.46	0.37
Malignant neoplasm of larynx	C32	0.41	0.31
Fire injuries	X00-X09	0.41	0.41
Road accidents	V01-V89	0.40	0.34
Assault	X93-X99, Y01-Y09	0.37	0.37
Intentional self-harm\Event of undetermined intent	X60-X84, Y10-Y33	0.34	0.16
Drowning	W65-W74	0.32	0.28
Malignant neoplasm of oesophagus	C15	0.29	0.29
Gastro-oesophageal laceration-haemorrhage syndrome	K226	0.29	0.29
Fall injuries	W00-W19	0.29	0.26
Tuberculosis	A15-A19	0.25	0.25
Malignant neoplasm of oral cavity and pharynx	C01-C14	0.25	0.16
Firearm injuries	W32-W34	0.25	0.25
Accidental excessive cold	X31	0.25	0.25
Acute pancreatitis	K85	0.24	0.24
Malignant neoplasm of stomach	C16	0.20	0.20
Malignant neoplasm of other digestive organs	C17-C21	0.20	0.20
Water transport accidents	V90-V94	0.20	0.14
Air/space transport accidents	V95-V97	0.20	0.14
Supra ventricular cardiac arrhythmias, Atrial fibrillation and flutter	I470-I471, I479, I48	0.17	0.09
Work/machine injuries	W24-W31	0.16	0.16
Epilepsy and Status epilepticus	G40-G41	0.15	0.15
Malignant neoplasm of liver and intrahepatic bile ducts	C22	0.14	0.20
Gastric ulcer	K25-K27	0.10	0.10
Hypertensive diseases	I10-I15	0.08	0.05
Stroke	I60-I69	0.08	0.08
Diabetes mellitus	E10-E14	0.05	0.05
Pneumonia and influenza	J12-J18	0.05	0.05
Psoriasis	L40 excluding L405	0.03	0.02
Ischaemic heart disease	I20-I25	0.01	0.01
Malignant neoplasm of breast	C50	0.005	0.02
Heart failure	I50-I51	0.005	0.005
Spontaneous abortion	O03		0.08

Table 2: Alcohol Attributable Fractions (AAF) for Crime

Crime category	Attributable fraction (%)
Criminal damage	0.47 (47%)
Violence against the person	0.37 (37%)
Other	0.26 (26%)
Drug offences	0.19 (19%)
Burglary	0.17 (17%)
Fraud and forgery	0.16 (16%)
Sexual offences	0.13 (13%)
Theft and handling stolen goods	0.13 (13%)
Robbery	0.12 (12%)