European Commission

Health Equity Pilot Project (HEPP)

Feasibility of using sub-national level data to explore the alcohol harm paradox across EU countries.

Case Study

Health

HEPP CASE STUDY

Title of Project/Policy

Feasibility of using sub-national level data to explore the alcohol harm paradox across EU countries.

Project/Policy Reference [If applicable]

Not applicable

Country

This case study covers data from the following countries: Austria, Denmark, France, Germany, Italy, Netherlands, Spain and the UK.

Type of case study

Statistical analysis

Thematic/sector focus

Alcohol

Date(s)

Most recent data available

Case study overview / About the project/policy (Who, What, When, Why and How and who is this case study aimed at?):

Individuals in lower socio-economic status (SES) groups report consuming the same amount or even less alcohol than those in higher SES groups, yet rates of alcohol-related morbidity and mortality are higher in the lower SES groups (1). This phenomenon is known as the alcohol harm paradox, and suggests that lower SES groups may be more at risk of the adverse effects of alcohol use at similar levels of use. The reasons for the paradox are still being identified, often using individual-level data from country wide surveys or deaths registers. This case study explores whether it is feasible to use sub-national (defined as NUTS-2[1]) level aggregated data to explore the alcohol harm paradox further across EU countries. Research has suggested a number of possible explanations for the alcohol harm paradox, which include (2,3,4):

- A clustering of risk behaviours amongst low SES populations such as smoking and poor nutrition that combined with alcohol consumption can have multiplicative harmful effects on health;

[1] NUTS (Nomenclature of territorial units for statistics) is a system designed to divide EU territory to produce sub-national statistics. There are three classifications. NUTS 2 level refers to mid-sized (basic) regions.

- More harmful drinking patterns such as binge drinking among low SES groups;
- More harmful historic drinking patterns among low SES groups, so that although drinking patterns across SES groups may currently be similar, those with low SES may have drank more frequently, or more heavily than others in their earlier lives;
- More limited access to health services among those in low SES groups that mean that those with an alcohol problem or alcohol-related condition may not be identified / treated as quickly as those with greater access;
- Weaker social support networks among people of lower SES that could buffer against the negative effects of alcohol consumption.

Greater risk of alcohol-related harm within poorer communities can be a driver for health inequalities. Understanding the reasons why poorer communities may be more at risk can help to direct policy changes that remove or reduce relevant risk factors and that can potentially address inequalities in health across populations.

Research exploring the alcohol harm paradox often makes use of individual level data from country/multi-country level health surveys or mortality registers (5,6). This data is often rich in detail and ideal for exploring relationships between socio-demographics, levels and patterns of alcohol consumption and experiences of alcohol-related harm. However, collating this data via e.g. health surveys can often be time consuming, targeted at specific population groups and expensive, particularly when multiple countries are involved. An alternative source of information that is easily accessible and has potential to explore relationships (on the paradox or other population issues) across EU countries is aggregated data, such as publically available data managed by the OECD[2] (Organisation for Economic Co-operation and Development), EUROSTAT[3] (European Commission's Statistical Information) and WHOSIS[4] (World Health Organization Statistical Information System). These data sources include measures of inequality and economic growth, alcohol-related harm and alcohol consumption (national level only), as well as other measures that could potentially be useful in exploring the alcohol harm paradox such as levels of smoking and obesity (although typically these data are only provided

[2] http://www.oecd.org/
[3] http://ec.europa.eu/eurostat/
[4] http://www.who.int/whosis/en/

and analysed at a national level providing high level comparisons between nations).

However, there are two types of aggregated data available: national level and sub-national level. Using national data, it is possible to identify some aspects of the alcohol harm paradox across Europe. For instance, across 22 EU countries (those with available data[5]), countries that report higher levels of alcohol consumption per person also have greater levels of chronic liver disease deaths (Figure 1). At a national level, no relationship can be identified between GDP and alcohol-related deaths (e.g. chronic liver disease or mental and behavioural disorders due to alcohol). This may be due to limited data (just 22 countries) restricting the options for adequate analyses. However, countries with lower Gross Domestic Product (GDP; used as a measure of economic state of development) do experience a significantly higher rate of deaths from all causes (Figure 2). The use of similar data sources at a sub-national level would increase the amount of data points as well as potentially reducing the heterogeneity of the populations each point represents. It could also provide a means of detecting variation within countries and between countries which may be hidden when examining populations at a national level. With data on poverty and alcohol-related deaths publically available by NUTS-2 level, this level was chosen for sub-national analysis. This case study therefore has the following objectives:

a. Test if is it feasible to use (access and analyse) sub-national level (NUTS-2) data to explore the alcohol-harm paradox across EU countries.

b. Explore which aspects of / theories behind the alcohol harm paradox are able to be investigated using sub-national level data.

[5] Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the UK

Figure 1: Relationship between litres of alcohol bought per person per year and age standardised rate of death from chronic liver disease (2014) for 22 EU countries

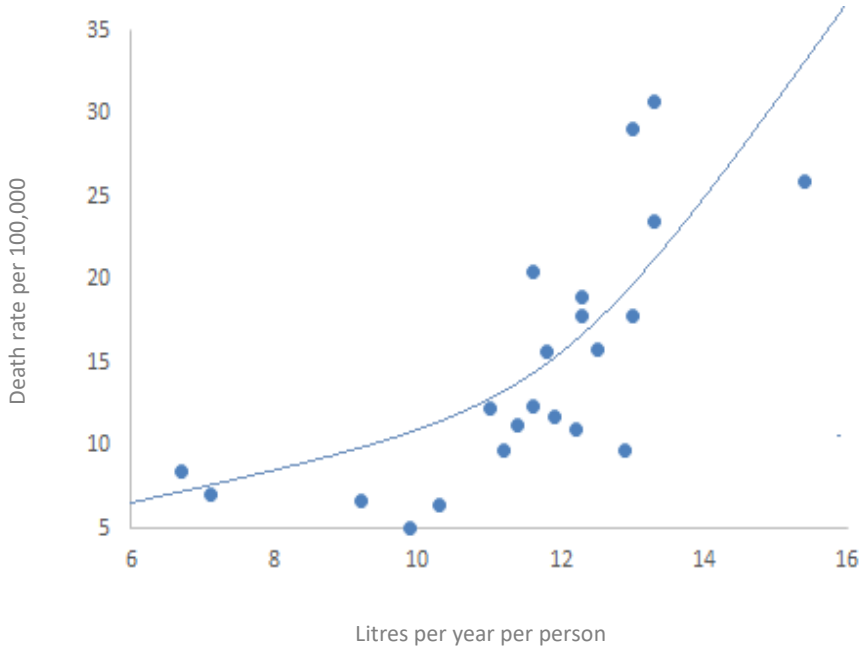
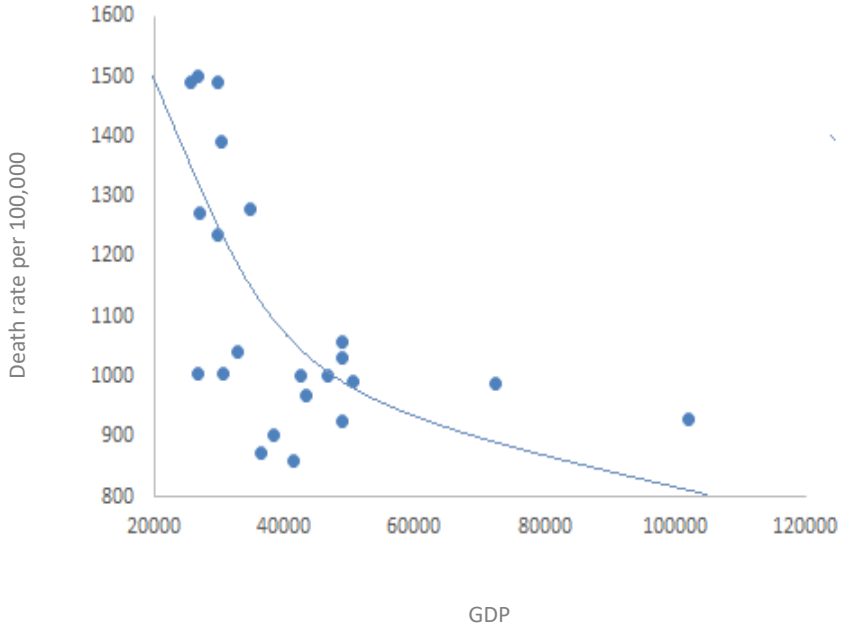


Figure 2: Relationship between GDP and age standardised rate of deaths from all causes (2014) across 22 EU countries



Methodology for the case study

This case study is based on data analysis involving eight European countries: Austria, Denmark, France, Germany, Italy, Netherlands, Spain and the UK. These were countries for which sub-national level data (NUTS-2 level) were available[6] for the following measures: poverty rate; rates of deaths from alcohol-related conditions (chronic liver disease; mental and behavioural disorders due to alcohol), alcohol consumption (percent current drinkers; percent binge drinkers), rates of current smoking and rates of obesity. See Appendix 1 for variable definitions. Smoking and obesity were included in data collection to explore alcohol harm paradox theories around the clustering of risk behaviours in low SES groups.

Four further variables were created to measure levels of alcohol-related deaths per percentage of current drinkers / binge drinkers in a given region. These variables give a crude indication of how much alcohol-related harm takes place at a comparable level of alcohol consumption. They were calculated as the death rate divided by the percentage of current drinkers / binge drinkers and referred to as 'deaths per current drinking' and 'deaths per binge drinking'. These were calculated for both chronic liver disease and mental and behavioural disorders due to alcohol.

Data were analysed using generalised linear modelling to identify which aspects and theories of the alcohol harm paradox it was possible to explore with sub-national level data across all countries. In particular, it aimed to identify whether there was less alcohol consumption and greater alcohol-related deaths among NUTS-2 areas with higher poverty rates. Analyses were conducted to identify whether alcohol-related harm was higher in NUTS-2 areas with higher levels of binge drinking. Analyses were also conducted for individual countries using Pearson correlation. Here, however, analyses were restricted by the small number of data points for each country. This was a particular problem for Denmark and the Netherlands[6], which included only 5 (Denmark) and 6 (Netherlands) data points, making it more difficult to identify associations.

The strengths of this methodological approach include the low cost and effort to collect data, as well as the ability to explore associations between poverty, health behaviours, and health outcomes for a large population using routinely available data. Moreover, the use of routine data allows analyses to be repeated year on year to examine changes in relationships

[6] Within the Netherlands, data on alcohol were only available for 6 out of 12 NUTS-2 level areas. These data were included within analyses and are presented in the graphs that follow, however they do not represent the Netherlands as a whole.

that may relate to policy interventions. However, there are also limitations. Aggregated data cannot be used to establish a causal effect and therefore can only be used to describe associations, which may merit further research to identify causality. In addition, NUTS-2 classifications can vary substantially by population (from less than 500,000 to over 12 million) and number of classifications within a country (some countries contain one NUTS-2 area, others are split into many, depending on the size of the country). Furthermore, NUTS-2 areas are not separated by level of urbanisation, deprivation or other measures related to inequality. Alcohol consumption data rely on national and sub-national health surveys which are self-reported and may be biased, and where questions may vary across countries/regions. Lastly, measures of poverty are often relative to country level medians (low income in comparison to other residents in that country) rather than absolute levels. They indicate, but do not necessarily describe low and high standards of living. In addition, there is variation in the range of poverty rates between countries, with the range being much narrower in some countries (e.g. Denmark, France) than others (e.g. Italy, Spain). Where ranges are narrow, there may be less possibility to assess or detect poverty rate as a causal factor for alcohol consumption patterns and alcohol-related harm.

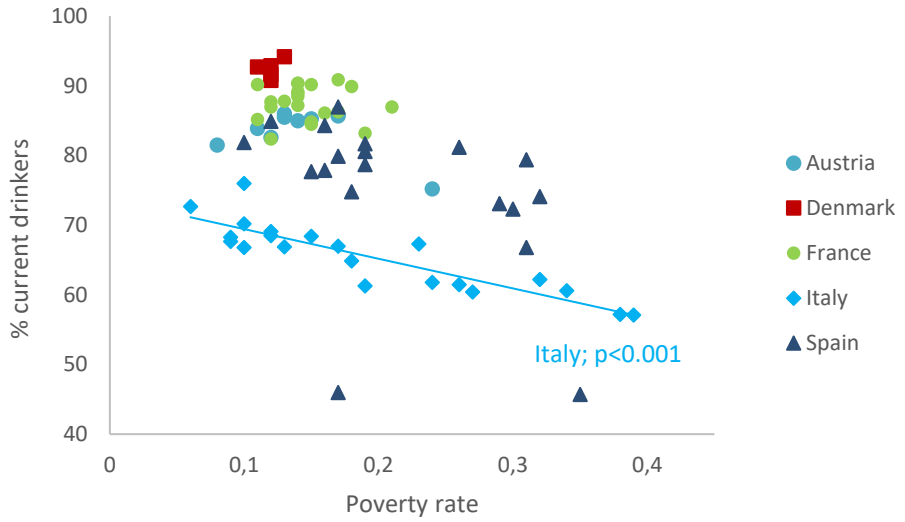
Results and key findings

The sub-national level data was useful in exploring a number of different aspects of the alcohol harm paradox across European countries:

1. Whether those living in more deprived areas consume less or equivalent amounts of alcohol than those living in less deprived areas.

Across all countries with available data, there was an association between poverty rates and the percentage of current drinkers (Figure 3; Appendix 2). However, the possibility to analyse this association was limited by the unavailability of data in Germany, the Netherlands and the UK. At a country level, only Italy had a significant relationship, where NUTS-2 areas with higher poverty rates had lower percentages of current drinkers. Most countries had relationships in the same direction (where NUTS-2 areas with higher poverty rates had lower percentages of current drinkers; Appendix 2). Figure 3 also highlights the very narrow range of poverty rates for some countries, most notably Denmark, that may limit the possibility to assess poverty rate as a causal factor (see also limitations in the methodology).

Figure 3: Relationship between poverty rate and % of current drinkers

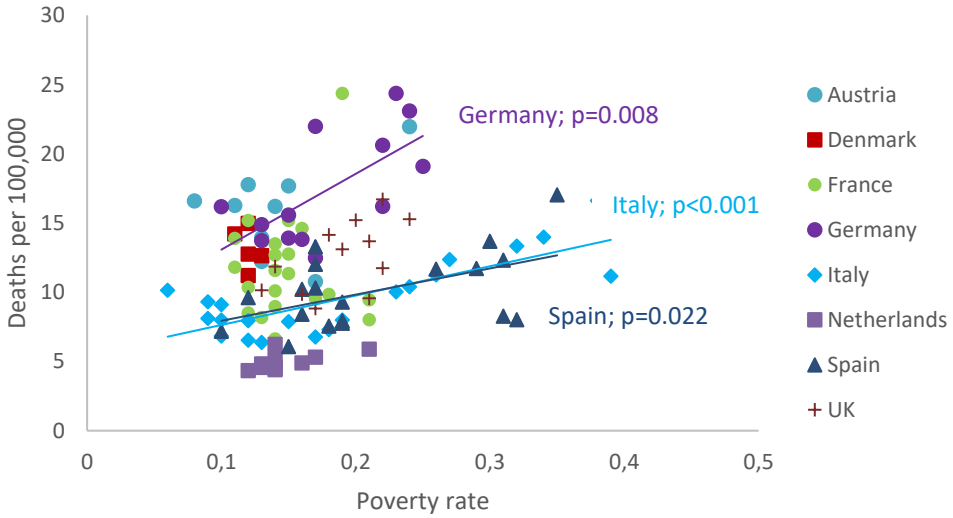


Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 203.39; p<0.001. Graphs show trend lines only for countries with significant associations.

2. Whether those living in more deprived areas experience greater levels of alcohol-related harm than those living in less deprived areas.

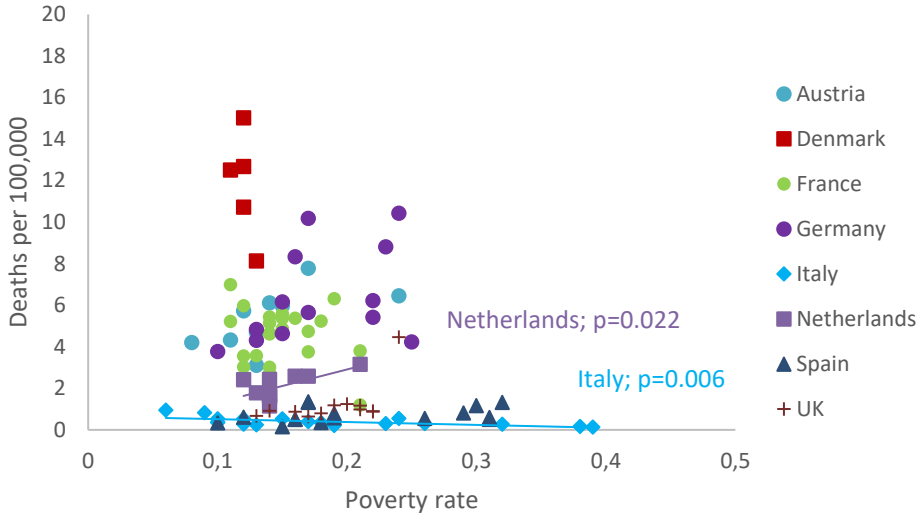
Across all countries, there was an association between sub-national rates of poverty and rates of death for both chronic liver disease (Figure 4; Appendix 2) and mental and behavioural disorders due to alcohol (Figure 5; Appendix 2). For chronic liver disease, most countries had higher death rates in NUTS-2 areas with higher poverty rates (significant for Germany, Italy and Spain only; Appendix 2). Denmark was the only country to have a negative (but non-significant) relationship (but also a very narrow range of poverty rates making it harder to detect associations). For mental and behavioural disorders due to alcohol, associations differed between countries (Appendix 2). For instance, higher sub-national poverty rates were associated with higher death rates in the Netherlands (significant), Austria, Germany, Spain and the UK (all non-significant), and with lower death rates in Italy (significant), Denmark and France (both non-significant). For both chronic liver disease and mental and behavioural disorders due to alcohol, there were substantial differences in the rates of deaths between countries (lower in the Netherlands, Spain and Italy than other countries).

Figure 4: Relationship between rate of poverty and standardised death rate per 100,000 population for chronic liver disease



Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 222.77; p<0.001. Graphs show trend lines only for countries with significant associations.

Figure 5: Relationship between rate of poverty and standardised death rate per 100,000 population for mental and behavioural disorders due to alcohol

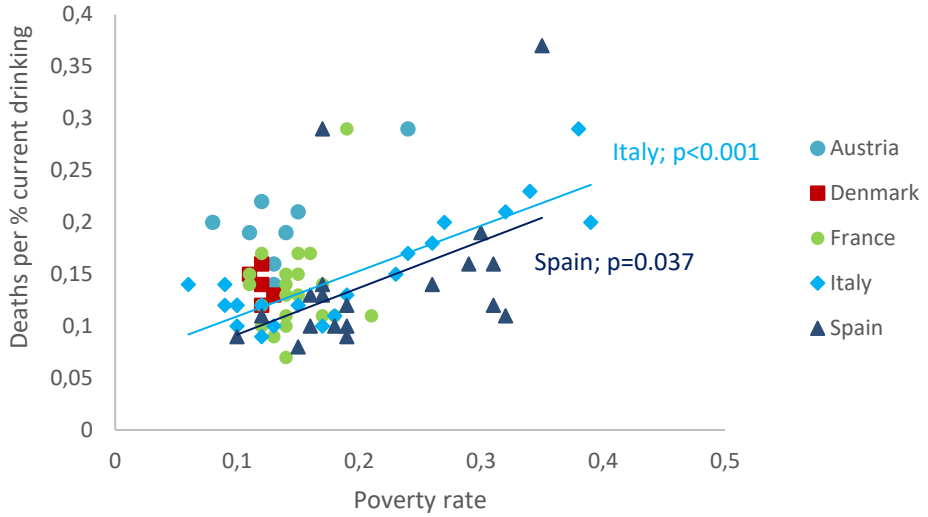


Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 525.25; p<0.001. Graphs show trend lines only for countries with significant associations.

3. Whether those living in more deprived areas experience greater levels of alcohol-related harm than those living in less deprived areas with equivalent levels of alcohol consumption.

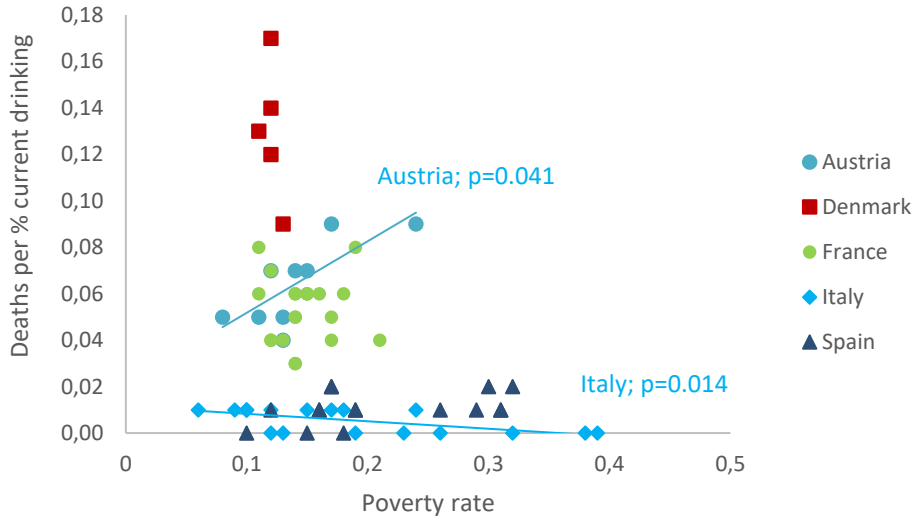
Across all countries, there was a significant association between sub-national poverty rates and deaths per current drinking (see methodology for definition) for both chronic liver disease and mental and behavioural disorders due to alcohol (Figures 6 and 7; Appendix 2). For chronic liver disease, most countries experienced higher deaths per current drinking in NUTS-2 areas with higher poverty rates (significant for Italy and Spain only; Figure 6). Denmark was the only country to have a negative (non-significant) relationship (but again a much narrower range of poverty rates compared to other countries). For mental and behavioural disorders due to alcohol, associations differed by country. For instance, NUTS-2 areas with higher poverty rates had higher levels of deaths per current drinking in Austria (significant) and Spain (non-significant) and lower levels of deaths per current drinking in Italy (significant) and Denmark (non-significant). No association was found within France (Figure 7; Appendix 2).

Figure 6: Relationship between rate of poverty and standardised death rate per 100,000 population for chronic liver disease per percentage current drinkers (deaths per current drinking)



Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 44.396; p<0.001. Graphs show trend lines only for countries with significant associations.

Figure 7: Relationship between rate of poverty and standardised death rate per 100,000 population, for mental and behavioural disorders due to alcohol per percentage current drinkers (deaths per current drinking)



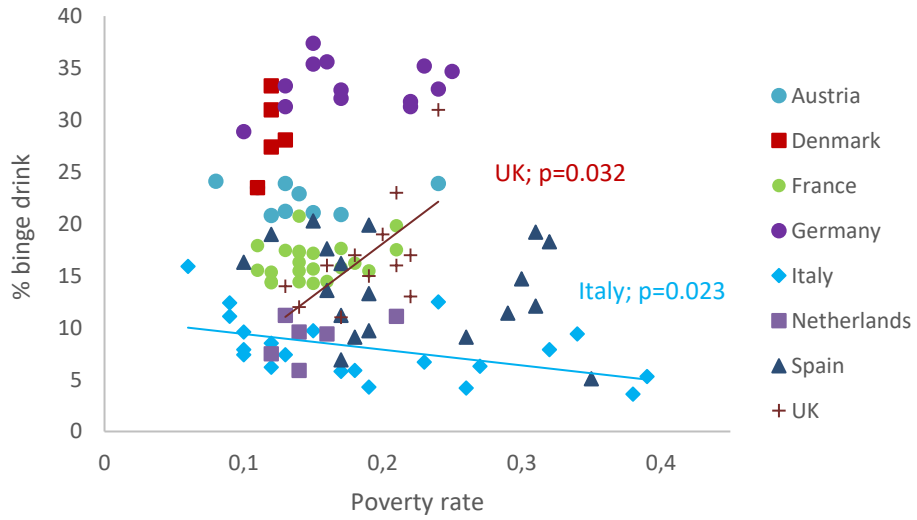
Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 512.27; p<0.001. Graphs show trend lines only for countries with significant associations.

The sub-national level data was also useful in exploring one of the theories of the alcohol harm paradox, that individuals living in more deprived areas may experience greater levels of alcohol-related harm because they engage in higher levels of riskier drinking (e.g. binge drinking). Analyses explored:

4. Whether those living in more deprived areas experience greater levels of risky drinking (binge drinking) than those living in less deprived areas.

Across all countries, there was a significant association between sub-national rates of poverty and the percentage of binge drinkers (Figure 8; Appendix 2). At a country level, the direction of relationships differed. Higher poverty rates were significantly associated with lower rates of binge drinking for Italy, and with higher rates of binge drinking for the UK (Figure 8; Appendix 2). Moderate, but non-significant positive associations were also found for Denmark and the Netherlands (Appendix 2). The non-significance of these associations are likely due to the fewer data points available for these countries (five data points for Denmark, six for the Netherlands).

Figure 8: Relationship between poverty rate and % binge drinkers

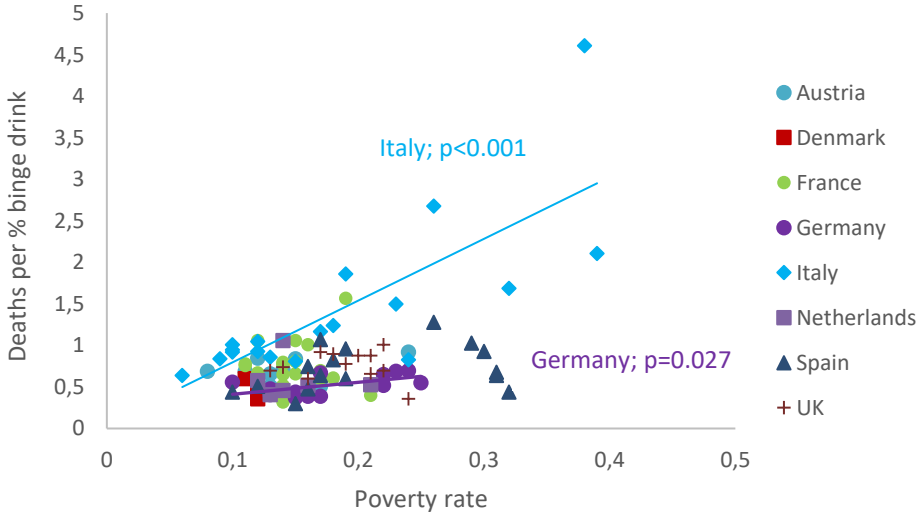


Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 496.28; p<0.001. Graphs show trend lines only for countries with significant associations.

5. Whether those living in more deprived areas experience greater levels of alcohol-related harm than those living in less deprived areas with equivalent levels of risky drinking.

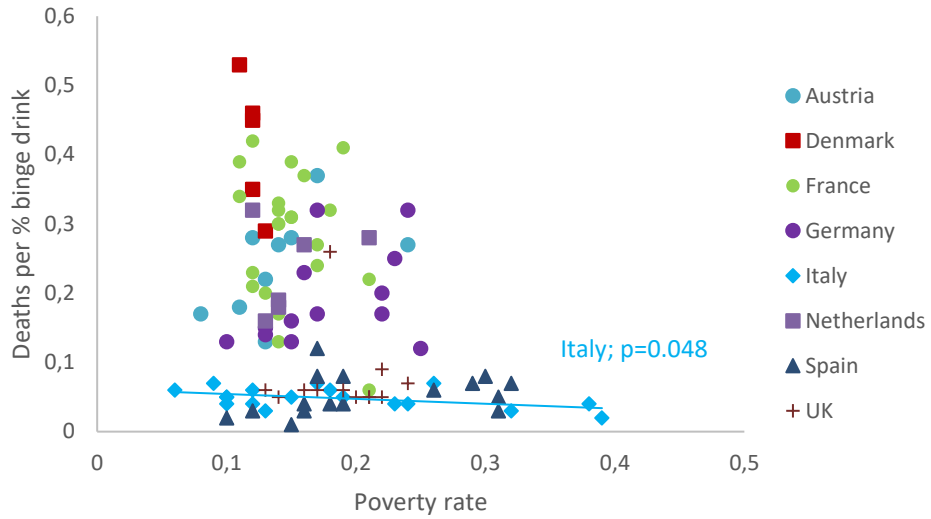
Across all countries, there was a significant association between sub-national poverty rates and deaths per binge drinking for both chronic liver disease and mental and behavioural disorders due to alcohol (Figures 9 and 10; Appendix 2). For both death categories, the direction of associations differed between countries. Only Italy and Germany had significant associations, where NUTS-2 areas with higher rates of poverty had higher levels of deaths per binge drinking (for Germany, significant for chronic liver disease only). However, strong but non-significant relationships were also found for Denmark, where higher rates of poverty were associated with lower rates of deaths per binge drinking. Again, the non-significance of these results are likely due to the low number of data points included within the correlation for Denmark.

Figure 9: Relationship between rate of poverty and standardised death rate per 100,000 population for chronic liver disease per percentage binge drinkers (deaths per binge drinking)



Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 652.80; p<0.001. Graphs show trend lines only for countries with significant associations.

Figure 10: Relationship between rate of poverty and standardised death rate per 100,000 population for mental and behavioural disorders due to alcohol per percentage binge drinkers (deaths per binge drinking)



Generalised linear modelling (linear) with poverty rate nested by country to account for poverty rates relative to country level medians. GLM X^2 = 461.36; p<0.001. Graphs show trend lines only for countries with significant associations.

It was not possible to test any further alcohol harm paradox theories using the sub-national data. This includes the theory that a clustering of risk behaviours such as smoking and poor nutrition combine with alcohol consumption to have a multiplicative effect on health. Whilst sub-national level data on smoking and obesity is available through country level surveys, there are currently insufficient sub-national data points to effectively examine these interactions. This could change if a complete set of sub national data were available across Europe. A brief analysis of the smoking and obesity data suggests that across countries, areas with higher poverty rates also have a greater percentage of current smokers and higher rates of obesity. It is therefore, possible that risk behaviours such as smoking and poor nutrition have a contributory role to play.

There were a number of challenges to using sub-national data to explore the alcohol harm paradox that also inform the current utility of this data in examining other health policy issues in the EU. Data on poverty and alcohol-related harm at NUTS-2 levels were easily available to download from online sources, although ICD-10 code classifications were restricted, meaning that only certain alcohol-related conditions could be used. Data on alcohol consumption was more challenging to obtain at this level. This was identified by contacting key people/ organisations in each country, with a fee required for data preparation in some countries. Alcohol data was

often not available at geographical areas corresponding to that for poverty rate or alcohol-related deaths. Furthermore, measures of alcohol consumption collected/reported often differed between countries. This was a particular problem for binge drinking, where numerous definitions and timeframes for collection (e.g. per week or per month) were used. These differences restricted how the sub-national level data could be analysed.

Despite these challenges, and wider limitations of NUTS-2 data discussed in the methodology section, the methodological approach was feasible and showed that sub-national level data can be used to explore certain aspects of the alcohol harm paradox, including the role that binge drinking may play. Analyses suggest that for at least some countries (most notably Italy), NUTS-2 areas with higher rates of poverty have lower rates of current drinkers and yet higher rates of deaths from alcohol-related causes such as chronic liver disease. Furthermore, for at least some countries, NUTS-2 areas with higher rates of poverty experience increased rates of alcohol-related deaths per percent current drinkers or percent binge drinkers. Whilst this may suggest that individuals living in NUTS-2 areas with greater poverty rates may be more negatively affected by the use of alcohol than those living in lower poverty rate NUTS-2 areas, individual level studies would be needed to confirm this. Whilst clear relationships could be seen for countries such as Italy however, there were mixed or insignificant findings for the majority of countries, particularly where data points were low and poverty rate ranges narrow (e.g. Denmark).

In general, using sub-national level data to explore the alcohol harm paradox remains limited. In order to use sub-national level data more fully and on a wider scale, greater consistency would be needed for the alcohol consumption data across countries. This includes more consistent definitions of indicators, timeframes and geographical areas. Efforts have been made to increase consistency of data collection on alcohol consumption in the EU by the Reducing Alcohol Related Harm (RAHRA) Joint Action work. This includes conducting a standardised European Alcohol Survey across 17 EU countries, and collating together data from existing national surveys and presenting results in a comparable manner. Accessibility of data at a sub-national level would also need to be improved, ideally with data available at a central location. Greater flexibility with the groupings of ICD-10 codes that can be downloaded from online sources would also be advantageous and would allow the capture of alcohol related deaths from other conditions, such as road traffic collisions and falls / trauma.

Timeliness / Interest from other Member States

The feasibility of using sub-national level data will be of interest and of relevance to all member states as this approach could be used to explore associations between a range of health harming behaviours, health outcomes and inequality indicators such as poverty.

What makes this case study interesting/important?

This is the first time that sub-national level data has been explored to help understand the alcohol harm paradox across EU countries. Although aggregated data is less detailed and more restrictive in terms of the conclusions that can be drawn, the approach could be quicker, more economical and more easily repeatable than conducting large-scale prospective longitudinal studies across Europe. Importantly, however, the approach would first need to be validated with high quality individual level data. Such an approach is important in times of austerity and may support a more sustainable approach to knowledge generation and policy impact assessment that can be used to influence policy decisions, direct future research and support the development of more equal communities in a timely manner.

Generalisability

This case study uses data from eight countries across the European Union. However, if a more consistent dataset is agreed for alcohol measures across Europe and data is made more accessible, a greater number of countries could be included in analyses, increasing the generalisability of results.

Transferability to other countries

Additional countries could be included if data on alcohol becomes available at NUTS-2 areas.

Next steps/Recommendations

Greater reporting and accessibility of sub-national level data on alcohol from national health surveys is recommended, including increased consistency in how such measures are defined. This will ensure that sub-national level data can be compared across Europe as a whole.

Initial conclusion

It is feasible to use sub-national (NUTS-2) level data to explore certain aspects of the alcohol harm paradox. Aspects of the alcohol harm paradox could be seen in at least in some countries using sub-national level data.

Here (most notably Italy), NUTS-2 areas with higher rates of poverty had lower rates of current drinkers and yet higher rates of deaths from alcohol-related causes such as chronic liver disease. However, for the majority of countries, relationships between poverty, alcohol use and alcohol related deaths were mixed.

There are challenges associated with the collection of sub-national level data, particularly for alcohol consumption, which means that this approach is currently limited. With greater consistency and availability of data, this methodological approach could contribute to the growing evidence base on inequalities in alcohol-related harm in a timely manner. As well as increasing our knowledge on the health effects of living in poorer communities, it could reduce the time taken from collection and analysis of EU wide data to using that evidence in developing and implementing policies that address inequalities in alcohol-related harm.

Sources of funding/sponsors for project/policy
The European Commission/European Parliament.

References/Studies/Respondents
This case study has been drafted by Sara Wood (Public Health Wales), Professor Mark Bellis (Public Health Wales / Bangor University) and Dr Rachel Andrew (Public Health Wales).

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Appendix 1: Variables and definitions used in analyses

Variable	Definition
Poverty rate	Poverty rate after taxes and transfers. Sub-national headcount ratios for disposable income, with poverty line set at 60% of the national median income. % of population.
Deaths from chronic liver disease	Age standardised death rate per 100,000 by NUTS 2 region of residence, 3 years average, 2014; ICD-10 codes K70 (Alcoholic liver disease) plus K73 (chronic hepatitis) and K74 (fibrosis and cirrhosis of the liver). These codes were collated together within the data source. It was not possible to download K70 separately.
Deaths from mental and behavioural disorders due to alcohol	Age standardised death rate per 100,000 by NUTS 2 region of residence, 3 years average, 2014; ICD-10 code F10 (Mental and behavioural disorders due to alcohol)
Binge drinking	The percentage of adults who binge drink. Different definitions of binge drinking are used across countries: Austria, France, Germany (6 or more alcoholic beverages on one occasion in last month/each month); Denmark, Netherlands (5 glasses or more on one occasion in past month); Italy (binge drinkers undefined); Spain (5 [male] or 4 [female] alcoholic beverages on the same occasion in past month); UK (males who exceeded 8 units of alcohol on their heaviest drinking day, and females who exceeded 6 units on their heaviest drinking day in past week).
Current drinkers	The percentage of adults who self-reported drinking any alcohol over the past 12 months.
Current smokers	The percentage of adults who self-report smoking daily or occasionally.
Obese	The percentage of adults whose BMI (based on self-reported height and weight) is greater than or equal to 30 (classed as obese).

Appendix 2: Correlations and significance levels for individual countries

Figure Number	Analysis	Austria	Denmark	France	Germany	Italy	Netherlands	Spain	UK
3	Poverty rate and % drinking in last 12 months	-0.529	0.151	-0.66		-0.883 P<0.001		-0.453	
4	Poverty rate and standardised death rate per 100,000 population for chronic liver disease	0.382	-0.256	0.075	0.697 P=0.008	0.785 P<0.001	0.594	0.520 P=0.022	0.545
5	Poverty rate and standardised death rate per 100,000 population for mental and behavioural disorders due to alcohol	0.597	-0.378	-0.275	0.429	-0.620 P=0.006	0.661 P=0.027	0.324	0.120
6	Poverty rate and standardised death rate per 100,000 population for chronic liver disease per % drank in last 12 months (deaths per alcohol consumption)	0.457	-0.250	0.221		0.858 P<0.001		0.480 P=0.037	
7	Poverty rate and standardised death rate per 100,000 population for mental and behavioural disorders due to alcohol per % drank in last 12 months (deaths per alcohol consumption)	0.686 P=0.041	-0.356	0.008		-0.570 P=0.014		0.423	
8	Poverty rate and % binge drinkers	-0.31	0.577	0.285	0.175	-0.494 P=0.23	0.474	-0.278	0.618 P=0.32
9	Poverty rate and standardised death rate per 100,000 population for chronic liver disease per % binge drink (deaths per binge drinking)	0.364	-0.656	0.012	0.609 P=0.027	0.769 P<0.001	-0.100	0.332	-0.097
10	Poverty rate and standardised death rate per 100,000 population for mental and behavioural disorders due to alcohol per % binge drink (deaths per binge drinking)	0.511	-0.775	-0.277	0.413	-0.472 P=0.048	0.313	0.303	-0.058

= association is significant. = unable to test (data unavailable).

[BACK COVER]