

## Research Paper

# How is alcohol consumption and heavy episodic drinking spread across different types of drinking occasion in Great Britain: An event-level latent class analysis

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## ARTICLE INFO

## Keywords:

Drinking practices  
Drinking occasions  
Event-level  
Heavy episodic drinking  
Typology

## ABSTRACT

**Background:** This paper aimed to (i) update a previous typology of British alcohol drinking occasions using a more recent and expanded dataset and revised modelling procedure, and (ii) estimate the average consumption level, prevalence of heavy drinking, and distribution of all alcohol consumption and heavy drinking within and across occasion types.

**Methods:** The paper uses a cross-sectional latent class analysis of event-level diary data that includes characteristics of 43,089 drinking occasions in 2019 reported by 17,821 adult drinkers in Great Britain. The latent class indicators are characteristics of off-trade only (e.g. home), on-trade only (e.g. bar) and mixed trade (e.g. home and bar) drinking occasions. These describe companions, locations, purpose, motivation, accompanying activities, timings, consumption volume in units (1 UK unit = 8g ethanol) and beverages consumed.

**Results:** The analysis identified four off-trade only, eight on-trade only and three mixed-trade occasion types (i.e. latent classes). Mean consumption per occasion varied between 4.4 units in *Family meals* to 17.7 units in *Big nights out with pre-loading*. It exceeded ten units in all mixed-trade occasion types and in *Off-trade get togethers*, *Big nights out* and *Male friends at the pub*. Three off-trade types accounted for 50.8% of all alcohol consumed and 51.8% of heavy drinking occasions: *Quiet drink at home alone*, *Evening at home with partner* and *Off-trade get togethers*. For thirteen out of fifteen occasion types, more than 25% of occasions involved heavy drinking. Conversely, 41.7% of *Big nights out* and 16.4% of *Big nights out with preloading* were not heavy drinking occasions.

**Conclusions:** Alcohol consumption varies substantially across and within fifteen types of drinking occasion in Great Britain. Heavy drinking is common in most occasion types. However, moderate drinking is also common in occasion types often characterised as heavy drinking practices. Mixed-trade drinking occasions are particularly likely to involve heavy drinking.

## Introduction

Epidemiological research increasingly examines alcohol consumption at the occasion- or event-level (Stevely, Holmes, & Meier, 2020). This work draws on diverse disciplinary and methodological traditions to address topics including the levels of alcohol consumption associated

with different types of drinking occasions, the population groups that participate in those occasions, and the occasion characteristics that are associated with heavy drinking and harmful outcomes (Ally et al., 2016; Dietze et al., 2014; Mäkelä et al., 2021; Mustonen et al., 2014; Stanesby et al., 2019; Stevely, Holmes, McNamara, et al., 2020; Stevely, Holmes, & Meier, 2020). This differs sharply from the traditional focus of

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<https://doi.org/10.1016/j.drugpo.2024.104414>

alcohol-related prevention research on individual-level factors, such as long-term alcohol consumption, psychological traits and sociodemographic characteristics. The findings offer a distinct perspective on alcohol consumption to inform public debate, engage stakeholders and guide prevention strategies (Meier et al., 2017). In particular, they shift attention away from the characteristics of individual drinkers and instead focus on the wider social, commercial and environmental forces that shape alcohol consumption.

However, few event-level studies use nationally representative data (Stevely, Holmes, & Meier, 2020). This reflects the resource-intensive nature of event-level designs, such as diary studies, ecological momentary assessment and street intercept surveys, which often impose considerable burdens on researchers or their participants (Clapp et al., 2007; Gmel & Rehm, 2004; Graham et al., 2014; Jones et al., 2019). Event-level studies often rely instead on small or unrepresentative samples that are temporally- or spatially-concentrated. There are, however, some exceptions. Paradis et al. used occasion-level data from a nationally representative Canadian telephone survey to show that reduced heavy drinking in parenthood may arise from fewer opportunities to drink in high consumption contexts, rather than lower consumption per occasion (Paradis, 2011; Paradis et al., 2011). Finnish researchers used a latent class analysis (LCA) of survey data on participants' most recent drinking occasions to develop an occasion typology (Mäkelä et al., 2021; Mustonen et al., 2014). They found that 40% of all reported alcohol consumption was within the 54% of occasions characterised as *At home with family* or *Home alone*, while *Big party nights* accounted for 11% of all drinking occasions but 30% of heavy drinking occasions. We conducted a similar typological analysis for Great Britain using one-week diary data and identified eight predominant occasion types, including *Drinking at home alone* (13.4% of occasions), *Drinking at home with family* (12.8% of occasions) and *Sociable get-togethers at someone's house* (14.4% of occasions) (Ally et al., 2016). Stevely et al. used the same diary data for 2018 to show that accounting for the common ways in which characteristics of occasions combine explains more variance in alcohol consumption than treating each characteristic as an independent variable (Stevely et al., 2021).

Given the sparse literature in this area, further development and updating of such studies is important to provide basic epidemiological surveillance of event-level alcohol consumption. This paper therefore updates and extends our previous typology of British drinking occasions in 2009–2011 to address four key limitations (Ally et al., 2016). First, it uses data from 2019 since there have been marked shifts in British drinking since 2011 (British Beer and Pub Association, 2019; NHS Digital, 2020; Oldham & Holmes, 2018). Second, our previous analysis estimated a single latent class model that included all off-trade (e.g. home), on-trade (e.g. pub, restaurant or nightclub) and mixed-trade (e.g. home and pub) occasions. This limited the model's ability to identify multiple occasion types within each trade sector and meant we only identified one mixed-trade and two on-trade occasion types. As additional on-trade occasion types are readily identifiable within public discourse (e.g. big nights out, Sunday pub lunches, dinner dates), we now estimate separate models for each trade sector to better capture the diversity of drinking within these trade sectors. Third, our 2019 dataset includes information on additional occasion characteristics (e.g. food consumption and accompanying activities such as watching TV) that permit better differentiation of occasions within the latent class model. Fourth, we undertake secondary analyses of the LCA results to deepen understanding of the occasion types associated with greater levels of alcohol-related harm.

Specifically, this paper aims to estimate a new typology of the predominant drinking occasions observed in Great Britain during 2019 using an expanded dataset and improved modelling procedure. It then aims to estimate the average consumption level and prevalence of heavy drinking associated with each occasion type and the proportion of all reported alcohol consumption and heavy drinking occasions that lie within each occasion type.

## Methods

### Data

The data come from Alcovision, a continuous, cross-sectional, online study that surveys approximately 30,000 adults (18+) resident in Great Britain each year. The data are collected for market research purposes by Kantar, who draw quota samples each week based on age, gender, socioeconomic status and geographic region from their online managed access panels. Invitations to participate are timed to ensure that fieldwork includes every day of the year. Alcovision oversamples residents of Scotland and 18–34 year-olds to allow detailed analyses of these smaller populations. Kantar then construct sampling weights based on age-gender groups, social class and geographic region using UK census data. We have updated these weights using a bespoke raking technique (Battaglia et al., 2009).

Alcovision's main component is a one-week, retrospective drinking diary in which participants report the characteristics of up to two on-trade and two off-trade drinking occasions per day. The dataset contain little missing data as the computerised survey logic prevents respondents missing individual items and Kantar data checks remove poor quality responses. Most additional missing data are undetectable as the survey uses many 'tick all options that apply' questions that prevent us from distinguishing between data that is missing because participants failed to respond as opposed to them responding but no options being applicable. However, we did remove <0.1% of occasions from the dataset where most or all data were missing. This study therefore uses a complete case analysis of the remaining 2019 Alcovision data, which includes 43,089 drinking occasions reported by 17,821 individuals who consumed alcohol in the diary week.

### Measures

#### Occasion trade sector

Kantar define an occasion as a significant time-period (e.g. lunchtime, late evening) within either the on-trade or off-trade. However, as familiar occasions such as 'pre-drinking before a night out' span both trade sectors, we use an alternative definition to better characterize an occasion. Using the reported start-time and duration of each occasion in Alcovision, we define an occasion as a period of alcohol consumption with no more than two hours between drinks (Mustonen et al., 2014). This allows us to separate occasions into three categories: off-trade only, on-trade only and mixed-trade (i.e. occasions involving both trade sectors).

#### Occasion characteristics

Participants record detailed information about each drinking occasion in a series of categorical variables that are summarised below and described fully in Appendix 2, Table A2.1. We have previously argued that these variables capture key concepts that are important to a social practice perspective on alcohol consumption (Ally et al., 2016).

For each location within a drinking occasion, participants report the drinks they consumed at brand-level (e.g. Carlsberg, Smirnoff), serving or packaging sizes, and the amount consumed in 'serves'. We convert serves into grams of ethanol using additional information we compiled via online searches to identify each products' alcoholic strength. As a small number of respondents report unrealistically high values, we cap consumption using thresholds informed by consultation with clinicians. The data are structured as specific products consumed (e.g. Brand X beer), nested within occasions, nested within days, nested within weeks and we cap brands, occasions and days at 320g (40 UK units, 1 unit = 8g ethanol), meaning each diary week cannot involve drinking more than 2,240g (280 UK units; 2.8% of occasions capped).

Two measures capture the people present: the *sex composition of the participants* (e.g. male alone, female pair; see Appendix 2, Table A2.1. for full list for all measures) and who any *companions* were (e.g. family,

friends). Four measures capture on-trade locations: the *venue* (e.g. own home, modern bar), the *venue location* (e.g. village or rural, city centre), the *reasons for choosing the venue* (e.g. friendly atmosphere, cheap) and a dichotomous variable for visiting *multiple on-trade venues*. Two measures capture the nature of the occasion: the *purpose* (e.g. quiet night in, going clubbing) and the *motivation* for the occasion (e.g. to wind down, to have a laugh). Two measures capture activities accompanying drinking: *general activities* (e.g. watching TV, doing a pub quiz) and *food eaten* (no food, a snack, a meal). Four measures capture the occasion temporalities: the *duration* (e.g. <1 hour, 4-7 hours), the *start-time* (e.g. lunch-time, night-time), the *day of the week* (Monday to 17:00 on Friday, 17:00 on Friday to 23:59 on Saturday, Sunday) and the *sequencing* of off-trade and on-trade drinking in mixed-trade occasions (e.g. pre-loading [off then on], post-loading [on then off]). Two measures capture alcohol consumption: *volume consumed* based on units (continuous variable in most analyses but entered into the latent class model as a categorical variable with categories based on spikes in the distribution to approximate typical serving sizes or multiples of these; e.g. 0.0-2.0 units, 5.0-12.0 units) and the *predominant beverage type*, which the respondent reports consuming most servings of (e.g. beer, wine).

To avoid redundancy, we collapsed response options with few responses or where our previous analyses suggested these measured similar concepts. We then converted measures into categorical variables if the characteristic could have only one value per occasion (e.g. start-time, volume consumed) and used binary variables where the characteristics could have multiple values (e.g. venue, company, purpose). This meant we had 63 indicators of occasion characteristics across categorical and binary variables for the off-trade only models, 92 for the on-trade only models, and 109 for the mixed-trade models. See Appendix 2, Table A2.1 for details.

#### Summary consumption measures

The summary measures describe the mean and standard deviation of units consumed in each occasion type, and the percentage of all units, off-trade units, on-trade units and units of each beverage type observed in the dataset that are consumed in each occasion type. We use the original continuous consumption data, rather than the categorised variable, for this purpose. We also calculate the percentage of all occasions within each type that involve heavy drinking and the percentage of all observed heavy drinking occasions that are within each type. Heavy drinking occasions are identified using the standard UK definition of >6 units (48g) for women and >8 units (64g) for men.

#### Analysis

The analysis has four stages. First, a description of the dataset using summary statistics. Second, estimation of the LCA model. Third, assignment of observed occasions to latent classes (i.e. occasion types). Fourth, calculation of the summary consumption measures for the observed occasions in each class. The first and fourth stages are descriptive analyses, so we focus on methods for the second and third stages below.

We estimated separate LCA models for off-trade only, on-trade only and mixed-trade occasions. LCA assumes that the cases in a dataset can be separated into different classes (i.e. drinking occasion types) that are 'latent' as they cannot be observed directly. It uses variables describing each case (i.e. drinking occasion characteristics) to infer which cases may belong to each class together with a model that estimates the probability each case belongs to each class. The model uses appropriate parametric specifications for each occasion characteristic variable; specifically probit models for binary variables, ordered probit models for ordinal variables, and multinomial logit models for nominal variables. The probability of class membership is modelled using a multinomial logit model. The analyst iteratively determines the number of classes the LCA model should identify by assessing the impact of additional classes on model fit and interpretability. We used the Bayesian Information Criterion (BIC), Sample-Size Adjusted BIC, Akaike's Information

Criterion, and model entropy as standard goodness of fit measures, and also used the Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT), the Lo-Mendell-Rubin adjusted LRT and the parametric bootstrapped LRT to test whether each additional class improved model fit. These tests require careful interpretation as they are sensitive to the sample size and number of model parameters, both of which are large in this analysis (Tein et al., 2013). This meant the model selection process also relied on qualitative assessments of interpretability and parsimony using the research team's topic expertise and in consultation with our project's expert advisory group. After estimating the final occasion typology, we deterministically assigned each occasion to a latent class based on predicted posterior probabilities.

Our overall approach, and the emphasis placed on identifying interpretable and parsimonious models aligns with the exploratory, as opposed to theory-testing, purpose of our analysis. While still attending to model fit statistics, we sought to ensure the results were useful for further research and informing stakeholders' policy-thinking. This meant we avoided selecting final models that included uninterpretable classes or classes that described only minor variations on practices that were already present in simpler models.

All models used weighted data and also included clustered standard errors to account for the nesting of occasions within individuals. The LCA models were estimated via maximum likelihood using Mplus v8.3.0.1. The analyses were not pre-registered and should be considered exploratory.

## Results

### Descriptive analysis of occasion characteristics

Table 1 provides summary statistics for selected variables (see Appendix 2, Table A2.1 for all variables). Approximately two-thirds (68.9%) of drinking occasions were off-trade only, 20.8% were on-trade only and 10.3% were mixed-trade. The mean number of units consumed was lowest in off-trade only occasions at 7.2 units, compared to 8.1 units in on-trade only occasions and 14.9 units in mixed-trade occasions. Off-trade only occasions were also less likely to involve heavy drinking than on-trade only or mixed-trade occasions. However, off-trade only occasions still accounted for 58.2% of all alcohol consumed and 59.7% of heavy drinking occasions. In contrast, mixed-trade occasions accounted for 20.4% of all alcohol consumption, 76.6% involved heavy drinking and these accounted for 19.3% of all heavy drinking occasions.

### Latent class model estimation results

We estimated models with between two and eight latent classes for each trade sector, and also estimated models with further classes for the on-trade only sector (see Appendix 1, Figs. A1.1-A1.3 and Table A1.1 for model fit statistics) as the preferred number of classes for this sector was eight. The off-trade only model showed decreasing improvements in most fit statistics (e.g. AIC, BIC, adjust-BIC) beyond four classes. The additional classes in larger models were also uninterpretable or represented only minor variations on the four-class model that offered little extra information. The on-trade only model showed continued improvements in model fit and interpretability up to eight classes, but did not always converge when identifying models with nine and ten classes due to low frequencies in some of the observed variables. When models did converge by forcing parameters to specific values (e.g. by imposing conditional item-response probabilities to zero when their frequency is particularly low), the additional classes were uninterpretable. The mixed-trade models showed limited interpretability beyond three classes and no improvements in model fit beyond four or five classes using the Vuong-Lo-Mendell-Rubin LRT and Lo-Mendell-Rubin adjusted LRT. We therefore selected final models with four latent classes for off-trade only occasions, eight latent classes for on-trade only occasions, and three

**Table 1**  
Summary statistics for occasion characteristics and alcohol consumption for drinking occasions in Great Britain, 2019.

Characteristic <sup>1</sup>	Occasions		Units consumed			% of all consumption <sup>2</sup>			% that are HDO <sup>3</sup>	% of all HDO
	N	%	Mean	SD	Median	Total	Off	On		
All	43,089	100.0	8.2	8.4	5.3	100.0	100.0	100.0	41.1	100.0
<b>Trade sector</b>										
Off-trade	29,678	68.9	7.2	7.6	4.2	58.2	84.1	-	35.6	59.7
On-trade	8,956	20.8	8.1	8.0	5.4	21.4	-	69.5	41.6	21.0
Mixed	4,455	10.3	14.9	10.8	12.0	20.4	15.9	30.5	76.6	19.3
<b>Sex composition</b>										
Mixed sex group	16,630	37.0	10.6	10.1	7.0	52.1	47.2	63.0	49.2	47.9
Mixed sex pair	14,064	31.3	6.7	6.8	4.1	22.8	26.2	15.2	31.9	26.2
Male alone	5,187	11.6	7.8	7.8	9.1	10.6	11.8	7.9	34.3	10.4
<b>Companions</b>										
Partner	19,518	43.5	7.8	8.0	5.1	39.2	42.9	30.9	37.1	42.3
Friends	12,069	26.9	11.7	10.2	8.4	42.7	34.8	60.3	55.4	39.1
Family	9,024	20.1	9.2	9.6	5.6	23.9	24.1	23.4	41.9	22.1
<b>Venue</b>										
Own home (off-trade)	29,513	65.7	7.7	8.1	4.7	59.0	76.3	20.4	35.7	61.7
Other's home (off-trade)	4,506	10.0	11.8	10.7	8.0	16.4	20.4	7.4	54.1	14.3
Traditional pub (on-trade)	5,074	11.3	11.9	10.0	9.0	16.9	5.5	42.3	57.5	17.1
Modern bar (on-trade)	2,566	5.7	13.1	11.0	9.4	10.6	3.5	26.4	60.1	9.0
Multiple venues (on-trade)	2,182	4.9	17.5	11.8	6.1	12.5	3.4	32.9	78.6	10.0
<b>Purpose of occasion</b>										
Quiet drink (off-trade)	11,146	24.8	7.9	7.8	5.3	23.0	30.7	5.9	37.8	24.7
Regular drink (off-trade)	11,032	24.6	7.7	8.0	4.7	20.6	27.6	5.0	35.4	22.8
Other (on-trade)	6,663	14.8	10.4	9.8	6.9	20.0	7.8	47.3	55.6	47.3
Sociable (on-trade)	2,870	6.4	11.1	9.4	8.3	8.8	3.0	21.8	49.0	21.8
<b>Food eaten</b>										
None	17,806	39.7	7.3	7.3	4.5	34.4	29.6	45.2	33.8	35.2
Snack	6,880	15.3	8.7	8.8	5.5	16.9	18.3	13.8	41.1	16.6
Meal	20,207	45.0	8.8	9.1	5.5	48.7	52.1	41.0	40.8	48.3
<b>Duration</b>										
Less than 1 hour	11,641	25.9	3.4	3.9	2.3	9.7	11.6	5.5	8.2	5.6
1-4 hours	26,888	59.9	8.3	7.6	5.8	59.6	59.9	59.0	41.7	65.7
4-7 hours	5,418	12.1	15.8	10.6	13.7	24.9	23.1	29.0	77.0	24.4
<b>Start-time</b>										
Evening	26,922	60.0	7.9	7.9	5.3	56.8	60.2	49.1	38.0	59.9
Afternoon	9,360	20.8	9.6	9.6	5.8	24.6	23.3	27.5	43.6	23.9
Lunchtime	3,718	8.3	8.1	9.1	4.5	7.9	6.5	11.0	34.2	7.4
<b>Day of week</b>										
Mon – Fri (17:00)	17,175	38.3	7.4	7.9	4.4	34.8	34.6	35.3	33.2	33.3
Fri (17:00) – Sat	20,744	46.2	8.9	8.7	5.7	50.5	50.1	51.2	42.5	51.6
Sunday	6,974	15.5	8.0	8.4	5.0	14.7	15.2	13.4	37.0	15.1
<b>Units of alcohol consumed</b>										
0.0 – 2.0	7,554	16.8	1.4	0.4	1.4	2.5	2.9	1.6	0.0	0.0
2.0 – 3.5	8,249	18.4	2.5	0.4	2.7	5.1	5.4	4.5	0.0	0.0
3.5 – 5.0	6,204	13.8	4.1	0.4	4.0	6.1	6.3	5.5	0.0	0.0
5.0 – 12.0	13,745	30.6	8.0	2.0	7.9	28.1	28.8	26.5	57.9	46.5
12.0 – 20.0	5,069	11.3	15.6	2.3	15.3	22.0	21.3	23.4	100.0	29.7
> 20.0	4,071	9.1	29.7	7.1	28.3	36.3	35.2	38.5	100.0	23.8
<b>Predominant beverage</b>										
Beer	15,702	35.0	8.0	7.9	43.1	33.1	28.7	43.1	37.0	34.0
Wine	12,976	28.9	7.9	7.6	14.5	24.4	28.8	14.5	40.2	30.5
Spirits	10,584	23.6	9.2	10.0	28.2	29.6	30.3	28.2	39.9	24.7

<sup>1</sup> Selected variables and highest prevalence categories within each variable only. See Appendix Table A2.1 for full data. Categories labelled off-trade or on-trade relate to those trade sectors only. <sup>2</sup>Percentage of overall consumption in trade sector occurring in occasions with this characteristic. Occasions with off-trade characteristics account for a proportion of on-trade consumption (and vice versa) if they are mixed-trade occasions. <sup>3</sup>HDO: Heavy drinking occasions.

latent classes for mixed-trade occasions. The entropy value was above 0.8 for all classes. We reran the alcohol consumption analyses excluding the 9.5% of occasions with a class membership probability below 0.8 but this did not substantively affect our results, so we include all occasions in the results below.

*Description of occasion types derived from latent class models*

Fig. 1 reports selected characteristics for each class (see Appendix 2, Table A2.2 for full results). The descriptions in Fig. 1 and below do not discuss alcohol consumption levels as the final section of the analysis addresses this and we encourage readers to focus first on the wider characteristics of each occasion type. For clarity, we refer to latent classes as occasion types henceforth. Further, although we identify one occasion type with almost exclusively male participants, we did not

identify any such types for female participants, perhaps due to men accounting for a large proportion of all occasions.

Three of the four off-trade only occasion types involve drinking with other household members or alone and jointly account for 76.1% of off-trade only occasions. We labelled these: *Quiet drink at home alone*, *Family time at home*, and *Evening at home with partner*. These are quiet, regular occasions accompanied by low-key activities, such as eating a meal or watching TV. They are typically short, in the evening and occur throughout the week, but particularly at weekends. The remaining off-trade only occasion type is *Off-trade get together*. It involves larger groups of friends and family, an emphasis on sociability, and playing games or other leisure activities. These occasions are often longer, more likely to start earlier in the day and more concentrated on weekends.

The on-trade only occasion types are more diverse and can be grouped into pub-drinking occasions, longer occasions, and meals or

Quiet drink at home alone 19.6% of all occasions 28.5% of off-trade only occasions	Family time at home 9.3% of all occasions 13.5% of off-trade only occasions	Evening at home with partner 23.5% of all occasions 34.1% of off-trade only occasions
<p><b>Nearly always</b><sup>1</sup>: Own home, less than four hours.</p> <p><b>Commonly</b><sup>2</sup>: Alone, quiet or regular drink, watching TV, no food, evening, Mon-Fri, Fri-Sat.</p>	<p><b>Nearly always</b>: Mixed sex group, partner or family, own home, less than four hours.</p> <p><b>Commonly</b>: Quiet or regular drink, watching TV, meal, Fri-Sat.</p>	<p><b>Nearly always</b>: Mixed sex pair, partner, own home, less than four hours.</p> <p><b>Commonly</b>: Quiet or regular drink, watching TV, meal, evening, Fri-Sat, wine.</p>
Off-trade get together 16.5% of all occasions 23.9% of off-trade only occasions	Meeting friends at the pub 3.8% of all occasions 18.0% of on-trade only occasions	Male friends at the pub 2.7% of all occasions 12.9% of on-trade only occasions
<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex group, friends, own or other's home, sociable, games or leisure activities, meal, less than four hours, evening, Fri-Sat.</p>	<p><b>Nearly always</b>: Mixed sex group.</p> <p><b>Commonly</b>: Friends, traditional pub, regular or local place, no food, less than four hours, evening, Fri-Sat, beer.</p>	<p><b>Nearly always</b>: Friends, Male group or pair.</p> <p><b>Commonly</b>: Traditional pub, regular or local place, convenient location, no food, evening, 1-4 hours, Fri-Sat, beer.</p>
Quiet drink at the pub 2.9% of all occasions 13.8% of on-trade only occasions	Big night out 1.3% of all occasions 6.1% of on-trade only occasions	Extended occasion (on-trade) 3.0% of all occasions 14.4% of on-trade only occasions
<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Male alone, traditional pub, convenient place, no food, Mon-Fri, beer.</p>	<p><b>Nearly always</b>: Evening or nighttime.</p> <p><b>Commonly</b>: Mixed sex group, friends, club, city centre, clubbing or night out, having a laugh, live music, no food, 1-4 hours, Fri-Sat, spirits.</p>	<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex group, friends, child present, multiple venues, traditional pub, quality of food and drinks, games, meal, 1-4 hours, more than four hours, evening, Mon-Fri, Fri-Sat.</p>
Family meal 2.3% of all occasions 11.2% of on-trade only occasions	Meal with friends 2.3% of all occasions 10.8% of on-trade only occasions	Going out with partner 2.6% of all occasions 12.7% of on-trade only occasions
<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex group, family, food pub or restaurant, quality of food or drinks, meal, lunchtime or afternoon, beer.</p>	<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex group, friends, food pub or restaurant, quality of food or drinks, meal, 1-4 hours, Mon-Fri, Fri-Sat.</p>	<p><b>Nearly always</b>: Mixed sex pair, partner, less than four hours.</p> <p><b>Commonly</b>: Food pub or restaurant, quality of food or drinks, convenient location, having time for partner, meal, no food, evening, Fri-Sat, beer.</p>
Big night out with pre-drinking 2.3% of all occasions 22.6% of mixed-trade occasions	Quiet drink at home and with friends in the local. 4.1% of all occasions 39.2% of mixed-trade occasions	Extended occasion (mixed-trade) 3.9% of all occasions 38.1% of mixed-trade occasions
<p><b>Nearly always</b>: Friends, own or other's home.</p> <p><b>Commonly</b>: Mixed sex group, city centre, pre-drinking, having a laugh, games or leisure activities, no food, 1-4 hours, more than four hours, evening, Fri-Sat, off→on.</p>	<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex pair, partner, friends, own home, traditional pub, chilling out, watching TV, 1-4 hours, evening, off→on, on→off, beer.</p>	<p><b>Nearly always</b>: N/A</p> <p><b>Commonly</b>: Mixed sex group, family, friends, partner, child present, own home, meal, 1-4 hours, more than 4 hours, lunchtime or afternoon, evening or night-time, off→on.</p>

Fig. 1. Summary of drinking occasion typology for Great Britain, 2019 (see Appendix A2 for full results).

Notes: <sup>1</sup>Nearly always: Item response probability  $\geq 0.9$ . <sup>2</sup>Commonly: Item response probability is  $\geq 0.4$  and  $< 0.9$ . Item response probability for categories are sometimes combined for interpretability. Item response probability is the probability that an occasion of this type has this characteristic. See Appendix Table A2.2 for full results. Dark cells are off-trade only occasions, mid-grey cells are on-trade only occasions, light grey cells are mixed-trade occasions.

dates. The three pub-drinking occasions jointly account for 44.7% of on-trade only occasions. We labelled them: *Meeting friends at the pub*, *Male friends at the pub* and *Quiet drink at the pub*. They involve beer-drinking in traditional pubs or similarly convenient, local or regular venues and are unlikely to involve a meal or other accompanying activities. The *Quiet*

*drink at the pub* type is lower-key than the other two occasion types, more often involves males alone, is shorter, and more likely to occur earlier in the day.

The two longer occasions often involve multiple venues. These jointly account for 20.5% of on-trade only occasions and we labelled

them: *Big night out* and *Extended occasion (on-trade)*. *Big nights out* typically involve groups of friends having an upbeat evening in lively bars or clubs with music or dancing in city centres on a weekend. Spirits are often the dominant beverage. *Extended occasions (on-trade)* share these characteristics but are more heterogeneous. They additionally involve edge of town retail or entertainment complexes, take place on weekdays, start earlier in the day, and often involve a meal and activities such as dancing, karaoke or barroom games. They are also more likely to involve family members and children.

The remaining three on-trade only occasion types are *Family meal*, *Meal with friends* and *Date with partner* and account for 34.8% of on-trade only occasions. *Family meals* typically involve family, partners and children in food-serving venues at lunchtime, afternoon or evening on all days, with wine more commonly the dominant beverage than in the occasion types above. *Meals with friends* share many of these characteristics, excepting friends being present, a greater emphasis on socialising and a lower likelihood of taking place on Sundays. *Going out with partner* occasions are also similar but are more likely to involve mixed sex pairs, spending time together and a wider range of venues, although food-serving venues and meals remain common.

The three mixed-trade occasion types are distinct from each other and often include significant diversity within each type. *Big nights out with pre-drinking* share the characteristics of their on-trade only equivalent, but start earlier in the day and often involve pre-drinking at someone's home while getting ready and participating in games and other leisure or online activities. Bars and nightclubs in city centres remain common venues but these mixed-trade nights out are more likely to involve traditional pubs and less likely to involve dancing and live music, or eating a meal or snack. *Quiet drinks at home and with friends in the local* are generally, but not exclusively, low-key occasions that involve socialising but also spending quality time with family or alone at home and in traditional pubs that are convenient, local or friendly. Finally, *Extended occasions (mixed-trade)*, like their on-trade counterpart, appear fluid and heterogenous, variously involve groups of friends, family and sometimes children, having an upbeat occasion across a range of venues and longer time periods starting at any time of day.

*Alcohol consumption within occasion types*

Table 2 presents descriptive statistics on the alcohol consumption associated with each occasion type (see Appendix 2, Table A2.3 for units by beverage type). The mean units consumed by respondents varies across occasion types from 4.4 units in *Family meals* to 17.7 units in *Big nights out with pre-drinking*. It is markedly higher in *Off-trade get togethers* (10.4 units) compared to other off-trade only occasions (5.9-6.9 units). It is also higher in *Mixed-trade extended occasions* (15.9 units), *Big nights out* (11.1 units) and *Male friends at the pub* (10.2 units) occasions compared to other on-trade only occasions (4.4-7.4 units). Mean consumption is over 12 units in all mixed-trade occasion types. Respondents' alcohol consumption also varies substantially within occasion types, as shown by the standard deviations in Table 2 and item response probabilities for consumption in Appendix A2.2.

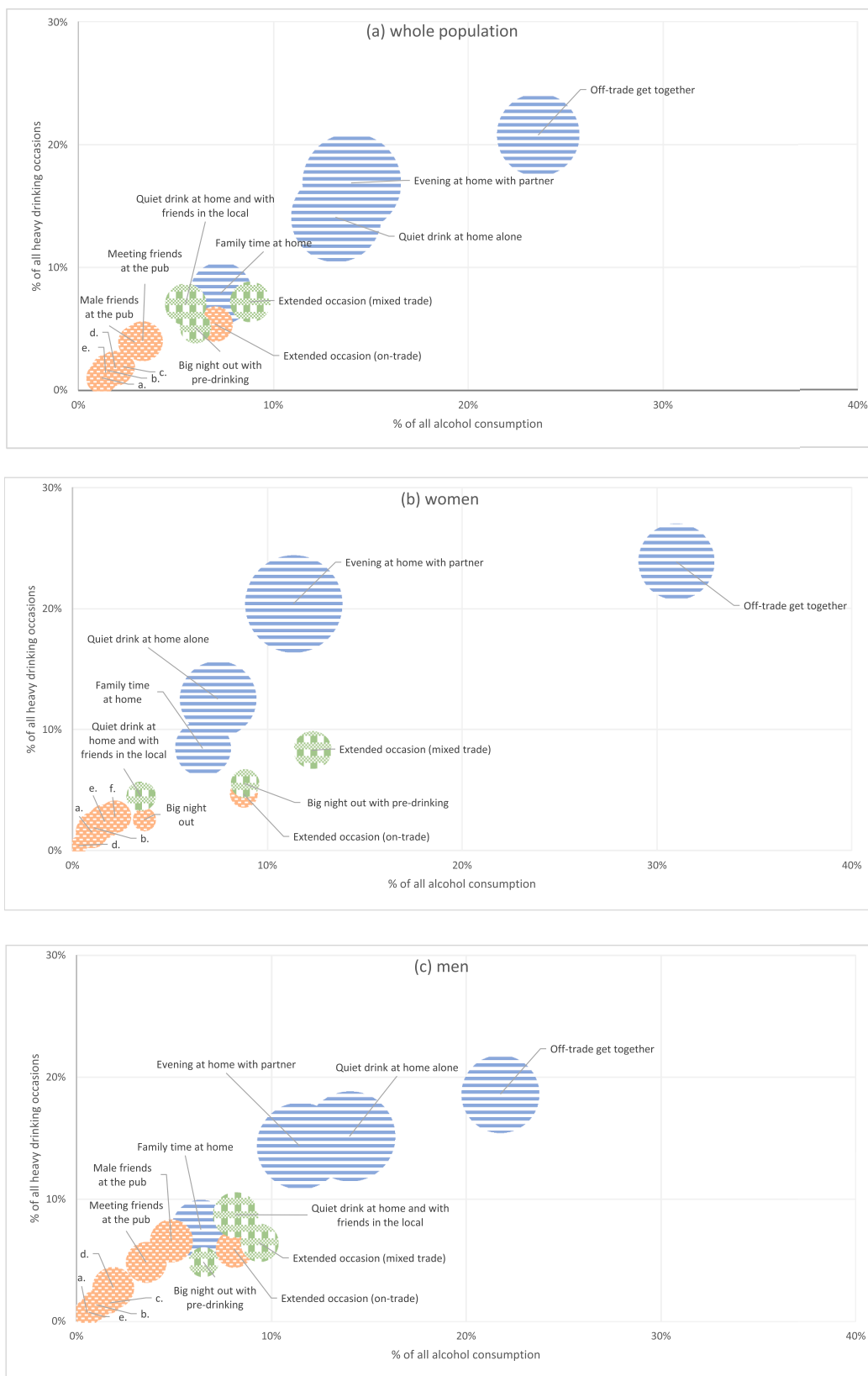
Half (50.8%) of all alcohol consumed and of all heavy drinking occasions (51.8%) were in just three occasion types, which account for 59.6% of occasions: *Quiet drink at home*, *Evening at home with partner* and *Off-trade get together* (Fig. 2a). Among these, *Off-trade get togethers* stand out as accounting for a particularly high proportion of consumption (23.6%) and of heavy drinking occasions (20.8%) despite being only 16.5% of all occasions. The three mixed-trade types account for a further 20.4% of all consumption and 19.3% of all heavy drinking occasions, despite comprising only 10.3% of all occasions. In notable contrast to the off-trade occasion types, *Big nights out* account for just 1.3% of occasions, 2.3% of consumption and 1.9% of heavy drinking occasions, while *Big nights out with pre-drinking* account for 2.3% of occasions, 6.0% of consumption and 5.1% of heavy drinking occasions.

These patterns do not differ substantially by gender (Fig. 2b and c,

**Table 2**  
Levels and distribution of alcohol consumption and heavy drinking occasions across occasion types (latent classes).

Trade sector	Occasion type	% of occasions			Units consumed in occasion						% of total consumption			Heavy drinking occasions (HDOs)		
		All	In trade sector	Total	Off-trade			On-trade			Total	Off-trade	On-trade	% of type <sup>1</sup>	% of all HDOs	
					Mean	SD	Median	Mean	SD	Median						Mean
Off-trade only	Quiet drink at home alone	19.6	28.5	6.2	(6.7)	3.8	(6.7)	3.8	-	-	-	13.2	19.1	-	27.3	14.1
	Family time at home	9.3	13.5	6.9	(7.0)	4.2	(7.0)	4.2	-	-	-	7.3	10.6	-	32.3	7.9
	Evening at home with partner	23.5	34.1	5.9	(5.8)	4.0	(5.8)	4.0	-	-	-	14.0	20.3	-	27.4	16.9
	Off-trade get together	16.5	23.9	10.4	(10.0)	6.8	(10.0)	6.8	-	-	-	23.6	34.2	-	48.1	20.8
	Meeting friends at the pub	3.8	18.0	7.4	(6.1)	5.7	-	-	7.4	(6.1)	5.7	3.3	-	10.6	40.4	4.0
On-trade only	Male friends at the pub	2.7	12.9	10.2	(6.7)	9.1	-	-	10.2	(6.7)	9.1	2.9	-	9.3	55.7	3.9
	Quiet drink at the pub	2.9	13.8	5.5	(4.6)	4.1	-	-	5.5	(4.6)	4.1	1.9	-	6.0	23.5	1.8
	Big night out	1.3	6.1	11.1	(9.1)	8.5	-	-	11.1	(9.1)	8.5	2.3	-	7.5	58.3	1.9
	Extended occasion (on-trade)	3.0	14.4	15.9	(12.2)	13	-	-	15.9	(12.2)	13	7.0	-	22.7	68.9	5.4
	Family meal	2.3	11.2	4.4	(4.3)	2.8	-	-	4.4	(4.3)	2.8	1.2	-	3.9	17.0	1.0
Mixed-trade	Meal with friends	2.3	10.8	5.3	(5.3)	3.8	-	-	5.3	(5.3)	3.8	1.4	-	4.6	24.1	1.4
	Going out with partner	2.6	12.7	5.1	(4.8)	3.2	-	-	5.1	(4.8)	3.2	1.5	-	4.8	22.5	1.6
	Big night out with pre-drinking	2.3	22.6	17.7	(10.8)	15.2	-	-	8.7	(7.5)	6.4	6.0	4.4	9.7	83.6	5.1
	Quiet drink at home and with friends...	4.1	39.2	12.1	(8.5)	10.2	-	-	6.1	(5.9)	4.1	5.5	4.1	8.8	65.2	7.0
Extended occasion (mixed trade)	3.9	38.1	16.2	(12.3)	13	-	-	9.3	(9.2)	5.7	8.8	7.4	12.1	69.6	7.2	

<sup>1</sup> Percentage of occasions within type that are heavy drinking occasions



**Fig. 2.** Distribution of drinking occasions (size of bubble), all alcohol consumption (x-axis) and all heavy drinking occasions (y-axis) across occasion types for (a) the whole population, (b) women and (c) men.

Notes: Colours show off-trade only occasions (blue lines), on-trade only occasions (pink with dots) and mixed trade occasions (green check). Occasion types where names are not shown are (a) Family meal; (b) Going out with partner; (c) Big night out; (d) Quiet drink at the pub; (e) Meal with friends; (f) Meeting friends at the pub.

Appendix 1 Tables A1.3 and A1.4). However, a higher proportion of women's alcohol consumption and heavy drinking occasions is in *Off-trade get-togethers* than men's. A higher proportion of women's heavy drinking occasions are also in *Evening at home with partner* occasions while a higher proportion of men's alcohol consumption is in *Quiet drink at home alone* occasions.

Fig. 3 demonstrates that heavy drinking is common in most occasion types, but is not ubiquitous in any. For example, in 14 of the 15 occasion types at least 20% of occasions involved heavy drinking. This includes *Big nights out with pre-loading*, *Extended occasions (mixed trade)* and *Extended occasions (on-trade)*, where at least two-thirds of occasions involved heavy drinking, but it also includes more prevalent occasion types such as *Off-trade get together*s, where 48.1% of occasions involved heavy drinking, and *Family time at home*, where 32.3% of occasions involved heavy drinking. This aligns with Table 2, which shows 48.7% of heavy drinking occasions are in the eight occasion types where mean consumption was less than eight units. Despite all this, respondents did not drink heavily on 41.7% of *Big night out* occasions and 16.4% of *Big night out with pre-drinking* occasions.

Again, these patterns do not differ substantially by gender (Fig. 3b and c). The main differences are a higher proportion of men's *Meeting friends at the pub* occasions involved heavy drinking than women's, whereas a higher proportion of women's *Extended occasions (on-trade)* occasions involved heavy drinking than men's. For men, 55.7% of *Male friends at the pub* occasions involved heavy drinking.

## Discussion

We used three latent class models to identify 15 types of drinking occasion in Great Britain. The four off-trade only occasion types were mostly low-key and only differed in minor ways from one another, except for the more lively *Off-trade get together*s. The minor distinctions are nonetheless important as they reflect topics of public health relevance, such as drinking alone and drinking with children. The eight on-trade only types were diverse and include occasions of varying sociability in local pubs, lively days or nights out, family occasions and time spent with romantic partners. The three mixed-trade types are even more diverse and merit scrutiny because they involve high levels of alcohol consumption.

The 15 occasions types and their properties align well with the eight types identified in our previous work using a 2009-2011 dataset with fewer variables (Ally et al., 2016). For example, off-trade social occasions, mixed trade occasions, and on-trade occasions with friends all emerged as heavy drinking occasions in the previous study. One key difference is the off-trade occasions with partners and family members no longer divide into light and heavy drinking, as in the previous work. This may be due to our richer dataset allowing other occasions characteristics to play a greater role in classifying occasions during the model estimation, or it may be due to previously evidenced changes in home drinking practices (Holmes et al., 2023).

Overall, the present findings suggest that alcohol consumption varies substantially across and within occasion types. Off-trade only occasion types account for a majority of the units of alcohol consumed and heavy drinking occasions, but heavy drinking is common across almost all occasion types and is not concentrated within particular types of occasion that attract significant policy attention such as *Big nights out*. Indeed, a large proportion of heavy drinking takes place in occasion types such as *Quiet drink at home alone* and *Evening at home with partner*, which are commonly viewed as low-key or moderate. Conversely, people often drink moderately in occasion types usually assumed to involve heavy drinking, such as *Big nights out*. Few previous studies have examined the extent of moderate drinking within stereotypically heavy drinking occasion types, except when examining specific reasons for moderation, such as being a designated driver, a permanent abstainer or looking after intoxicated peers (Graber et al., 2016; Howard et al., 2007; MacLean, 2016). Qualitative research in particular emphasises

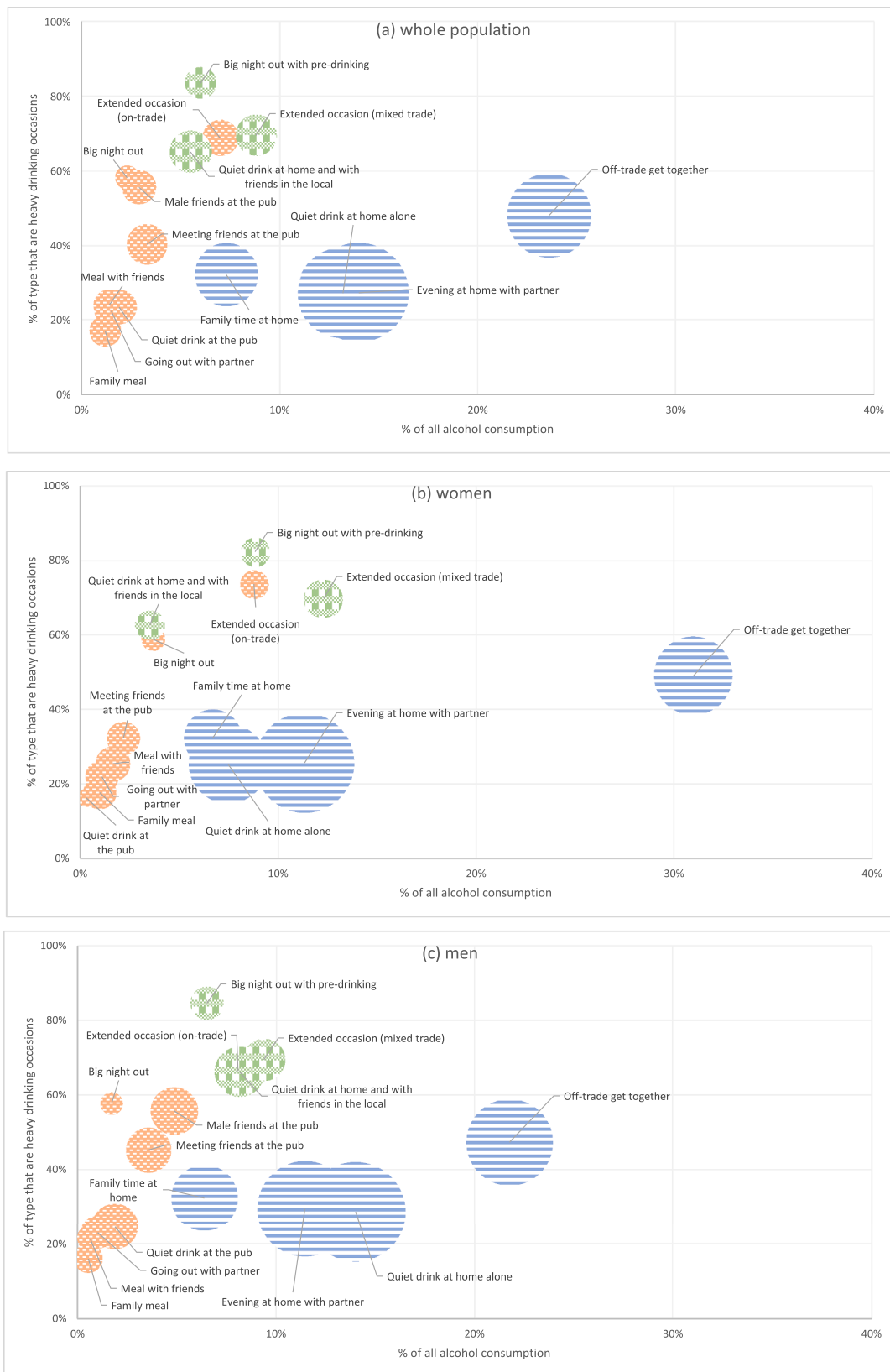
narratives of excess within such occasions, particularly among young adults (Griffin et al., 2009; Haydock, 2015; Hennell et al., 2021; Measham & Brain, 2005). Our novel findings may therefore reflect our focus on a wider age range than previous studies, or perhaps the tendency for policy debate to focus on visible public intoxication rather than unseen private intoxication.

Mixed-trade drinking occasions also appear important for understanding harmful alcohol consumption as at least 65% of occasions involved heavy drinking in all three mixed-trade occasion types. Event-level studies identify occasions involving drinking across the on- and off-trade trade sectors as commonplace, associated with higher consumption levels and therefore higher risk (Ally et al., 2016; Cameron et al., 2022; Miller et al., 2016; Stevely et al., 2021). However, beyond the specific practice of pre-drinking among young adults (Ferris et al., 2019; Labhart et al., 2013; Østergaard & Skov, 2014), little is known about the varying forms such occasions may take, who engages in them and how they contribute to some drinkers reaching high levels of alcohol consumption in a single day or across a week. Our findings suggest that some mixed-trade occasions are a distinct type of event (e.g. *Big nights out with pre-drinking*), but others are more nebulous and may reflect individuals participating in several types of bounded occasion across a day (e.g. a family meal followed by meeting friends at the pub). The latter form of mixed-trade occasion may be particularly important for prevention research if it facilitates heavy alcohol consumption while avoiding the informal social controls that limit drinking within a single occasion.

A key strength of our analysis is our large, detailed and nationally-representative dataset, which increases the robustness of the LCA models and permits greater disaggregation of occasion types in each trade sector. The retrospective one-week diary is also likely to minimise recall biases and other forms of misreporting by focusing on specific occasions described by the participants (Casswell et al., 2002). Our analysis also examines mixed-trade occasions, which capture commonplace movements of individuals between trade sectors that are not always incorporated into event-level studies. The analysis does however have important limitations. Alcovision is a market research study designed primarily to provide timely information to commercial clients. The sampling strategy and measures therefore have important limitations that we discuss elsewhere (e.g. the use of quota sampling and unvalidated measures that do not address key public health concerns) (Ally et al., 2016; Holmes et al., 2021). However, estimates of population-level alcohol consumption from Alcovision are typically within 10% of those from sales and taxation data. This is considerably higher coverage than other UK surveys (Meier et al., 2013). Given the exploratory nature of the analysis and importance of providing results of practical value to stakeholders, we gave particular weight to interpretability and parsimony when selecting our final LCA models and less weight to model fit statistics. However, our approach remained methodologically robust. For example, we avoided selecting models with more than eight classes as this required restricting increasingly large numbers of parameters to specific values in order to achieve convergence, which makes model fit statistics unreliable. The large sample size of Alcovision also means model fit statistics will favour identification of more classes; however, our extensive model-testing process ensured that additional classes beyond those in our final models would not provide more informative findings.

The discussion above has three key implications for policy and practice. First, prevention strategies focused primarily on stereotypically heavy drinking practices may not impact the large proportion of heavy drinking that takes place within other practices. Broader strategies are required that recognise heavy drinking occurs routinely within most drinking practices and all trade sectors. This suggests at least some of the problems that arise from alcohol relate to its intrinsic properties and suggest a need for greater control on sales and marketing practices, particularly in the off-trade, which often attracts less policy attention. Second, and conversely, policies that promote moderate drinking within





**Fig. 3.** Distribution of occasion types (size of bubble) and all alcohol consumption (x-axis), and proportion of occasions within type that involve heavy drinking (y-axis) for (a) the whole population, (b) women and (c) men.

Notes: Colours show off-trade only occasions (blue lines), on-trade only occasions (pink with dots) and mixed trade occasions (green check).

stereotypically heavy drinking practices may still reduce harm, as heavy drinking does not appear an intrinsic element of such practices for a significant proportion of drinkers. This may include limiting up-selling or promotional offers that encourage additional purchases in on-trade sales, reducing late-night trading or improved Responsible Beverage Service training (Babor et al., 2022). Third, prevention efforts should attend to how individuals achieve high levels of daily alcohol consumption through participation in both single drinking occasions and multiple consecutive occasions. This may suggest new intervention approaches and provide insights into the mechanisms driving success or failure of current approaches.

Future research should seek further evidence on who is participating in the occasion types described above, and which occasion- and individual-level characteristics are associated with lower and higher consumption levels within each type. It can also explore how individuals combine occasions across days, weeks and months to reach different levels of alcohol consumption. Using this information, researchers can also examine how to tailor interventions to the drinking occasions or target populations or individuals. Greater attention to mixed-trade drinking occasions as a general phenomenon is needed to understand the associated contexts, participants and practices.

## Conclusion

Alcohol consumption levels vary substantially within and across fifteen occasion types in Great Britain. Heavy drinking is not concentrated in particular occasion types and is instead common across all types. However, moderate drinking is also common in some occasion types of that are often characterised as heavy drinking practices. Mixed-trade drinking occasions are particularly likely to involve heavy consumption and merit greater attention from researchers, policy-makers and practitioners.

## CRedit authorship contribution statement

**John Holmes:** Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization. **Alessandro Sasso:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation. **Mónica Hernández Alava:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Rita Borges Neves:** Writing – review & editing, Data curation. **Abigail K Stevely:** . **Alan Warde:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Conceptualization. **Petra S Meier:** .

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

This work was supported by Economic and Social Research Council Grant Number ES/R005257/1. PM's research is also supported by UK Medical Research Council and Chief Scientist Office grants MC\_UU\_00022/5 and SPSU20. For the purpose of open access, the author has applied a Creative Commons Attribution (CC BY) licence\* to any Author Accepted Manuscript version arising. The data provider, Kantar, played no role in the research process, including conception, design, analysis, interpretation, write-up or the decision to publish. Use of the data is allowed under the terms of a contract and nondisclosure agreement between Kantar and the Universities of Sheffield and Glasgow which requires research outputs to be submitted to the data provider ahead of publication. The data providers' right to request changes is limited to matters of accuracy regarding their data. No change

requests were made in relation to this article.

## Data availability statement

Data is not publicly shareable as it is purchased under license, but there is agreement that data, analyses and results can be checked by competent independent reviewers as part of a confidential review process.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2024.104414.

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