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The relationship between food insecurity and tobacco or alcohol use in Great Britain: A representative population-based survey

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ABSTRACT

Introduction: Tobacco and alcohol use are linked to health disparities. In recent years, food insecurity, an indicator of disparities, has increased in Great Britain. This study examined the associations between food insecurity and tobacco or alcohol use.

Methods: Data were drawn from a representative cross-sectional study of people aged ≥16 years in Great Britain (N = 4,056), conducted in January–February 2025. Food insecurity was measured with the 6-item Household Food Security Scale, divided into high/marginal, low, or very low food security. Logistic regression models with food insecurity (combining low and very low food insecurity) as the outcome and adjusted for age, gender, nation of residence, socioeconomic position, financial hardship and smoking or alcohol consumption (measured using AUDIT-C score), were used to derive odds ratios (OR_{adj}).

Results: Overall, 7.9 % (95 % CI: 6.9, 8.9) reported low and 9.6 % (8.6, 10.7) very low food security. Smoking was associated with food insecurity (OR_{adj} = 1.75; 95 % CI: 1.32, 2.31). People who abstained from alcohol were more likely to be food insecure compared with those who drank at increasing (AUDIT-C 5: OR_{adj} = 0.62; 0.41, 0.93) or higher risks of harm (AUDIT-C 8: OR_{adj} = 0.63; 0.40, 0.97); however, this relationship was moderated by psychological distress.

Conclusion: Food insecurity was associated with higher smoking prevalence. Among people experiencing distress, those abstaining from alcohol and at risk of dependence appeared more likely to experience food insecurity than those drinking at other levels. These findings suggest the need for interventions that offer support for smoking, alcohol and which address underlying stressors of food insecurity.

1. Introduction

Food insecurity, defined as the inability to access adequate or sufficient food in socially acceptable ways (Dowler & O'Connor, 2012), is one of the most apparent signs of poverty, contributing to health and socioeconomic disparities (Marmot et al., 2020). In the UK in 2022/23, an estimated 5 % of households experienced low food security (e.g., reduced food quality, variety, or desirability of diet (Department for Work and Pensions, 2024a)) and another 5 % very low food security (i.e., reduced and disrupted food intake due to lack of money or other resources (Department for Work and Pensions, 2024a)) within the past 30 days (Department for Work and Pensions, 2024b). Food insecurity is associated with poorer mental and physical health outcomes (Elgar et al., 2021; Pourmotabbed et al., 2020) and, based on North American data (Bergmans et al., 2019; Kim-Mozeleski & Pandey, 2020; Kim-Mozeleski et al., 2021; Nagata et al., 2021; Pitman et al., 2024), with

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higher rates of smoking and alcohol use. However, such associations remain underexplored in the British context.

The UK consists of four nations: England, Northern Ireland, Scotland, and Wales. Of these, Scotland had the highest proportion of food insecure households (12 % within the past 30 days) in 2022/23 (Department for Work and Pensions, 2024b). In 2023, 13 % reported low and 13 % very low food security when asked about the past 12 months, across England, Wales, and Northern Ireland (Food Standard Agency, 2024). The proportion of people experiencing food insecurity has increased since 2010 due to economic instability following the 2008 recession and the subsequent introduction of public sector cuts (i.e., so-called 'austerity'), stagnating wages, increasing costs of essential items (such as food), and reforms or cuts to state welfare benefits (Marmot et al., 2020), all exacerbated from 2020 onwards by the COVID-19 pandemic and the cost-of-living crisis. Policies like the two-child limit have increased child poverty (i.e., parents cannot afford the basics of food, clothing and shelter) and reliance of families on food aid (Brewer et al., 2023). As no immediate changes to these economic and structural issues are anticipated, it is unlikely that food insecurity on the population level will improve substantially in the foreseeable future. Constantly worrying about not having enough food for yourself or your family, skipping meals, or being hungry causes psychological distress, especially in countries where most people are not food insecure (Elgar et al., 2021; Townsend, 1993). Therefore, food insecurity has wider implications than just hunger.

People experiencing food insecurity may use tobacco or alcohol to cope with the psychological impact of food insecurity. Some people may use tobacco to cope with hunger when experiencing food insecurity as nicotine suppresses appetite (Jo et al., 2002; Kim-Mozeleski, Shaw, et al., 2022). Parents, particularly mothers, may reduce their own food intake to ensure their children have enough to eat and then smoke to cope with hunger and stress (Kim-Mozeleski et al., 2022; Stevens, 2010; Journal article). When people suffer from hunger, quitting smoking can be harder because cravings can become more difficult to resist (Leeman et al., 2010). Furthermore, people may deter quitting cigarettes out of fear of weight gain (Kim-Mozeleski, Shaw, et al., 2022), as food insecurity is linked to obesity (Carvajal-Aldaz et al., 2022). A longitudinal study in the US found that people who smoked and then become food insecure were less likely to stop smoking than those who maintained food security (Kim-Mozeleski et al., 2019). This was even the case after adjusting for sociodemographic characteristics, poverty and psychological distress at follow-up and number of cigarettes smoked at baseline (Kim-Mozeleski et al., 2019). Moreover, the likelihood of starting smoking was higher among people who became food insecure than among people who maintained food security, when controlling for covariates (Kim-Mozeleski et al., 2019).

The relationship of food insecurity with alcohol consumption is less clearly established than that with smoking. While some studies found a positive association, others have only found it for specific subgroups (Baek et al., 2024; Bergmans et al., 2019; Nagata et al., 2021; Pitman et al., 2024). The relationship between alcohol (ethanol) and appetite is complex but under-researched (Engel & Jerlhag, 2014; Jeynes & Gibson, 2017; Koopmann et al., 2018). Some evidence suggests restricted eating may increase alcohol use (Cummings & Tomiyama, 2018). Potentially, people who experience higher levels of distress might be more likely to drink high levels of alcohol to cope with food insecurity. Additionally, it is possible that individuals with alcohol use disorder who live with children in the household might have particular difficulty making ends meet financially, which could make them more vulnerable to food insecurity than individuals without children. Fig. 1 provides a non-exhaustive summary of the different factors that may be associated with food insecurity and tobacco or alcohol use.

Understanding how food insecurity uniquely contributes to tobacco or alcohol use, beyond the general effects of poverty, may inform more

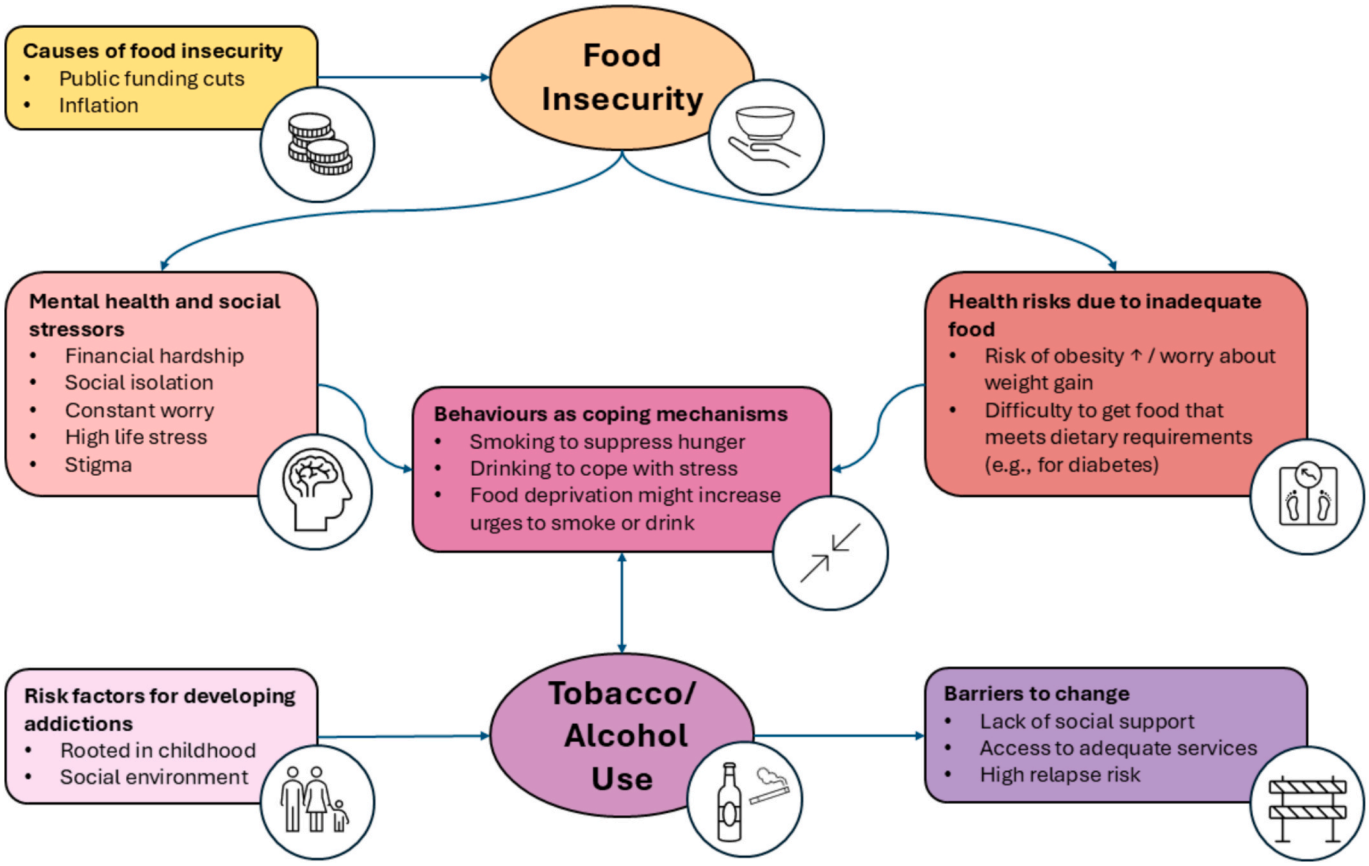

Fig. 1. Factors associated with food insecurity, tobacco and alcohol use.

targeted public health initiatives and policies that address both simultaneously and potentially help to reduce health disparities more effectively. Recovery from tobacco or alcohol dependence is not only about addressing the addiction itself, but it also requires tackling the wider determinants of health (Boyd et al., 2022; Hiscock et al., 2012; Nyakutsikwa et al., 2021). If individuals struggle to meet basic nutritional needs, they might find it harder to engage with treatment or maintain abstinence. Furthermore, addressing food insecurity could serve as a preventive measure against the development of substance use disorders by reducing stress levels, as people may turn to smoking or drinking to cope with the stress of being food insecure.

We aimed to explore the associations between food insecurity and tobacco and alcohol use among adults in Great Britain using data from a representative population-based survey, the Smoking and Alcohol Toolkit Study (Beard et al., 2015; Fidler et al., 2011; Kock et al., 2021). We also examined whether these associations differ by the presence of children in the household and the level of psychological distress. Additionally, we assessed whether there are differences in smoking or drinking behaviour and food insecurity. The specific research questions were: (1) Is there an association between food insecurity (i.e., low or very low food security) and tobacco smoking or alcohol consumption? (2) Do these associations differ by the presence of children in the household or past-month psychological distress? (3) Is there an association between food insecurity and tobacco dependence, cigarettes per day, motivation to quit, quit attempts, or receipt of quit support among people who smoke? (4) What are the associations between food insecurity and urges to drink, alcohol units per week, motivation to cut down, attempts to cut down, and receipt of support to cut down among people who drink at risky levels?

2. Methods

2.1. Study design and participants

The study used data collected in Great Britain in January and February 2025 as part of the Smoking and Alcohol Toolkit Study. Generally, the survey is conducted monthly and asks participants about smoking and drinking behaviour (Beard et al., 2015; Kock et al., 2021; Kock et al., 2022). In January and February 2025, additional questions about food insecurity were included in the questionnaire. Each month, a sample of approximately 2,450 households are selected from 227,403 output areas across Great Britain, with each area comprising of roughly 300 households. The sampling strategy consists of a hybrid of random location and quota sampling. Areas are stratified by an established geodemographic classification of the British population. Interviews are conducted via telephone by a market research company until the monthly quotas are fulfilled. The research team has access to anonymised data only. The manuscript follows the STROBE statement (von Elm et al., 2007). The study protocol was pre-registered on the Open Science Framework (https://osf.io/qhvf3/). Ethics approval for the Smoking and Alcohol Toolkit Study was provided by the University College London Ethics Committee (ID 0498/001, amendment request for food insecurity questions ID 2808/005).

2.2. Outcome measure

All measures were self-reported. Food insecurity was measured with the 6-item Household Food Security Scale (Economic Research Service, 2025). The scale consists of 6 items (see supplementary file for exact wording) and has been shown to robustly classify the food security of households in the general US population when compared to the full 18-items scale (Blumberg et al., 1999; Economic Research Service, 2025). The scale is also used, with small variations, in the UK Family Resources Survey (conducted by the UK Department for Work and Pensions (2010)) and the Food and You Survey (conducted by the Food Standard Agency (2024)). The score is the sum of affirmative responses (i.e., "often", "sometimes", "yes", "almost every month", or "some months but not every month"), with 0 to 1 indicating high or marginal food security, 2 to 4 low food security, and 5 to 6 very low food security. For descriptive statistics, a categorical variable was derived (high or marginal food security, low food security, and very low food security). For regression analyses, a binary variable was derived, indicating whether someone experiences food insecurity by combining low and very low food security (score $\geq$2).

2.3. Independent measures and covariates

Smoking status was measured with the question "Which of the following best applies to you?". People who replied: "I smoke cigarettes (including hand-rolled) every day", "I smoke cigarettes (including hand-rolled), but not every day", or "I do not smoke cigarettes at all, but I do smoke tobacco of some kind (e.g., Pipe, cigar or shisha)", were classified as using tobacco. Further smoking-related variables included tobacco dependence (based on urges to smoke), motivation to quit, quit attempt, receipt of quit support, and cigarettes per day. Risky drinking was measured with the Alcohol Use Disorder Identification Test for Consumption (AUDIT-C) score: People who scored 5 or above were classified as drinking at risky levels (Bradley et al., 2007; Office for Health Improvement and Disparities, 2017). Further alcohol-related variables included urges to drink, alcohol units per week, motivation to drink less, attempts to cut down, and receipt of support to cut down. Further measures of deprivation that we included were occupational social grade (Collis, 2009) as a measure of socioeconomic position (more advantaged ABC1 vs. less advantaged C2DE) and financial hardship. Sociodemographic variables included age, gender, nation, and presence of children in the household. Further, we included past-month distress measured using the Kessler-6 screener (Kessler et al., 2003; Kessler et al., 2010). Details on these variables are provided in the supplementary file.

2.4. Analysis

Responses collected as "Don't know", "Prefer not to say", or "Refused" were classified as missing. In total, 402 participants had at least one missing variable, which represents 10 % of participants. Therefore, we performed multiple imputations using the mice package in R. We created five sets of imputations, which were analysed separately and then estimates combined using Rubin's rule. Details on the number of missing values per variable and the imputation method are provided in the supplement (supplementary Tables S1-2). To check the robustness of the imputations, we also ran the analyses including only those participants who had complete data on all relevant variables. The analysis was conducted on weighted data using raking (Lumley, 2010) to match the population of Great Britain. Unweighted results are in the supplement. All analyses were conducted in RStudio (version 2022.07.2, R version 4.2.1).

For the first research questions, we measured the associations between food insecurity and tobacco smoking using a logistic regression model and reported unadjusted and adjusted odds ratios (OR/OR_{adj}) and their 95 % confidence intervals (CI). We adjusted for age, gender, nation, social grade, alcohol consumption, and financial hardship. Age and AUDIT-C were included as continuous variables modelled using restricted cubic splines to allow for non-linear trends (Bates et al., 2015; Harrell, 2015). Knots were placed at the minimum, median, and maximum for age and AUDIT-C, respectively. In a separate model, we measured unadjusted and adjusted associations (same adjustments except smoking status instead of alcohol consumption) between food insecurity and alcohol consumption using the AUDIT-C score continuously. We calculated ORs for selected AUDIT-C scores (5, 8, and 11 – with 0 as the reference group) and plotted the continuous relationship between AUDIT-C scores and the proportion of food insecurity. In a sensitivity analysis, we categorised AUDIT-C scores into the following groups: low (0–4), increasing (5–7), high (8–10) risk and potential

dependence (11–12).

For the second research question, we examined whether the associations between food insecurity and tobacco or alcohol use, respectively, differed by the presence of children in the household (no or any children, and in sensitivity analyses categorised into 0/1/2/≥3 children) or past-month psychological distress (none or any distress, and in sensitivity analyses categorised into none/moderate/serious). For this purpose, we used the adjusted models outlined under research question 1, with an interaction term between tobacco smoking or alcohol consumption, respectively, and presence of children in the household or psychological distress. For alcohol consumption, we could not directly check from the model output whether the interaction term was statistically significant because it was modelled using restricted cubic splines. Therefore, we checked whether including the interaction terms improved model fit by comparing the models with and without interaction terms using the Wald test. When we identified a significant difference, we presented stratified results.

For the third research question, we assessed the associations between food insecurity and (i) tobacco dependence, (ii) motivation to quit, (iii) quit attempts, and (iv) receipt of quit support among people who smoked tobacco. Among people smoking cigarettes, we also assessed the associations between food insecurity and cigarettes smoked per day.

For the fourth research question, we assessed the associations between food insecurity and (i) urges to drink, (ii) alcohol units per week, (iii) motivation to cut down, (iv) attempts to cut down, and (iv) receipt of support to cut down among people who drank at risky levels. We calculated unadjusted and adjusted (including age, gender, social grade, nation, financial hardship, and alcohol consumption or tobacco smoking, respectively) ORs and their 95 % CIs. It did not result in any issues adjusting for social grade and financial hardship in the models.

3. Results

The study included 4,056 participants (unweighted). Overall, 7.9 % (95 % CI: 6.9, 8.9) experienced low food security and 9.6 % (95 % CI: 8.6, 10.7) experienced very low food security (Table 1). When comparing people experiencing high or marginal food security to those experiencing very low food security, the latter group had a lower median age and higher proportions of people identifying as non-binary, from less advantaged social grades, experiencing financial hardship, experiencing past-month distress, smoking tobacco, and drinking at low risk levels (AUDIT-C scores 0–4).

People who smoked tobacco had significantly higher odds of experiencing food insecurity than those who did not, even after adjusting for age, gender, nation, social grade, hardship, and AUDIT-C score (OR_{adj} = 1.75, 95 % CI: 1.32, 2.31; Table 2). The interaction terms between tobacco smoking and psychological distress or children in the household were not statistically significant (p = 0.765 and p = 0.430), suggesting that the associations between food insecurity and smoking status were similar by distress and children living in the household.

People who abstained from alcohol were more likely to be food insecure compared with those who drank at increasing (AUDIT-C 5: OR_{adj} = 0.62; 0.41, 0.93) or higher risks of harm (AUDIT-C 8: OR_{adj} = 0.63; 0.40, 0.97; Table 2). Generally, the highest proportion of food

Table 2
Associations between food insecurity and tobacco or alcohol use ($N_{unweighted}$ = 4,056).

	Stratified	Odds ratio (95 % CI)	Adjusted[a] odds ratio (95 % CI)
Tobacco smoking (ref: no)	–	2.57 (2.05, 3.21)	1.75 (1.32, 2.31)
AUDIT-C: 5 (ref: 0)	–	0.52 (0.41, 0.65)	0.62 (0.41, 0.93)
AUDIT-C: 8 (ref: 0)	–	0.59 (0.46, 0.76)	0.63 (0.40, 0.97)
AUDIT-C: 11 (ref: 0)	–	0.85 (0.55, 1.30)	0.73 (0.39, 1.35)
AUDIT-C: 5 (ref: 0)	Distress	0.52 (0.39, 0.70)	0.52 (0.31, 0.88)
AUDIT-C: 8 (ref: 0)	Distress	0.63 (0.46, 0.86)	0.62 (0.36, 1.08)
AUDIT-C: 11 (ref: 0)	Distress	0.99 (0.57, 1.71)	0.95 (0.44, 2.05)
AUDIT-C: 5 (ref: 0)	No distress	0.67 (0.44, 1.01)	0.89 (0.46, 1.72)
AUDIT-C: 8 (ref: 0)	No distress	0.54 (0.31, 0.93)	0.58 (0.26, 1.27)
AUDIT-C: 11 (ref: 0)	No distress	0.44 (0.15, 1.28)	0.32 (0.08, 1.26)

[a] Adjusted for age, gender, nation, social grade, hardship, and smoking status or AUDIT-C score, respectively.

Table 1
Participant characteristics ($N_{unweighted}$ = 4,056), overall and by food security status.

Characteristic		Weighted sample size	Weighted estimate, % (95 % CI)/median (IQR)		
			High or marginal food security	Low food security	Very low food security
All	–	4458	82.4 (81.0, 83.8)	7.9 (6.9, 8.9)	9.6 (8.6, 10.7)
Age	Median in years	–	50 (33, 64)	37 (25, 53)	35 (27, 48)
Gender	Women	2185	81.4 (79.5, 83.4)	7.9 (6.5, 9.3)	10.7 (9.1, 12.3)
	Men	2242	83.8 (81.9, 85.7)	8.0 (6.6, 9.5)	8.2 (6.7, 9.6)
	Non-binary	31	57.4 (40.0, 74.7)	6.4 (0.0, 14.9)	36.3 (19.4, 53.2)
Nation	England	4144	82.2 (80.8, 83.7)	8.2 (7.2, 9.3)	9.5 (8.4, 10.7)
	Scotland	198	88.4 (84.6, 92.2)	3.5 (1.3, 5.6)	8.2 (4.9, 11.4)
	Wales	116	78.6 (72.4, 84.7)	5.4 (2.3, 8.5)	16.0 (10.3, 21.8)
Children in household	No	2180	83.2 (81.6, 84.8)	7.7 (6.5, 8.8)	9.1 (7.9, 10.4)
	Yes	1278	80.5 (77.7, 83.3)	8.6 (6.7, 10.6)	10.9 (8.7, 13.1)
Social grades	More advantaged	2513	88.9 (87.6, 90.2)	5.6 (4.6, 6.5)	5.5 (4.6, 6.4)
	Less advantaged	1945	74.0 (71.4, 76.7)	11.0 (9.1, 12.9)	17.5 (10.3, 24.6)
Financial hardship	No	3818	89.3 (88.1, 90.5)	6.2 (5.2, 7.2)	4.5 (3.7, 5.3)
	Yes	640	41.5 (36.9, 46.1)	18.3 (14.5, 22.1)	40.2 (35.5, 44.9)
Past-month distress	No	2743	93.1 (91.9, 94.3)	3.9 (3.0, 4.8)	3.0 (2.2, 3.9)
	Yes	1715	65.4 (62.6, 68.1)	14.4 (12.3, 16.5)	20.2 (17.8, 22.5)
Tobacco smoking	No	3725	85.1 (83.7, 86.5)	7.2 (6.2, 8.3)	7.7 (6.6, 8.7)
	Yes	733	69.0 (64.8, 73.1)	11.4 (8.6, 14.3)	19.6 (16.0, 23.2)
AUDIT-C	Median score	–	3 (1, 5)	2 (0, 5)	2 (0, 4)
	Score 0–4)	3118	81.2 (79.6, 82.9)	8.0 (6.8, 9.1)	10.8 (9.4, 12.1)
	Score 5–7	68	86.7 (83.8, 89.5)	6.9 (4.7, 9.1)	6.5 (4.5, 8.5)
	Score 8–10	385	81.6 (76.6, 86.7)	10.5 (6.3, 14.7)	7.8 (4.4, 11.2)
	Score 11–12	887	85.2 (75.5, 94.8)	6.0 (0.0, 12.8)	8.8 (1.5, 16.2)

insecurity seemed to be among individuals who did not drink alcohol (Fig. 2, unadjusted in supplementary Fig. S1). Including an interaction term between AUDIT-C score and presence of children in the household did not improve model fit (unadjusted model: Wald test $F(2,4011) = 0.38$, $p = 0.684$), indicating the associations between alcohol consumption and food insecurity were similar by children living in the household. However, there was a difference between the odds of being food insecure by alcohol consumption depending on whether the person experienced psychological distress (Wald test for adjusted model with interaction term $F(2,4011) = 2.91$, $p = 0.05$). Among individuals not experiencing psychological distress, the proportion being food insecure was lower compared to those experiencing psychological distress at any AUDIT-C score (supplementary Fig. S2 unadjusted and Fig. S3 adjusted). There were no significant differences in the odds of being food insecure by AUDIT-C score among those not experiencing distress. However, among people experiencing distress, those abstaining and at risk of dependence appeared more likely to experience food insecurity than those drinking at other levels (see Fig. 2).

Among people who smoked, receiving quit support ($OR_{adj} = 4.25$, 95 % CI: 1.45, 12.48) was positively associated with being food insecure (Table 3). There was uncertainty around the associations with tobacco dependence ($OR_{adj} = 1.17$, 95 % CI: 0.98, 1.40) and number of cigarettes smoked ($OR_{adj} = 1.02$, 95 % CI: 1.00, 1.05). Neither motivation to quit nor making a quit attempt in the past year were associated with being food insecure.

Among people who drank at risky levels, there was an indication that greater urges to drink were positively associated with being food insecure ($OR_{adj} = 1.14$, 95 % CI: 0.94, 1.38). There were no associations between motivation to cut down, cut-down attempts in the previous year, and mean weekly alcohol consumption and being food insecure among people drinking at risky levels (Table 3). There is uncertainty around the association between receipt of cut-down support and being food insecure, due to small sample sizes resulting in wide CIs: In the unweighted sample, two expericing food insecurity and 13 not experiencing food insecurity reported receiving cut-down support.

Table 3
Associations between food insecurity and tobacco- or alcohol-related behaviours among people who smoke or drink at risky levels, respectively.

	Odds ratio (95 % CI)	Adjusted[d] odds ratio (95 % CI)
Tobacco dependence[a]	1.30 (1.11, 1.52)	1.17 (0.98, 1.40)
Motivation to quit smoking[a]	1.08 (0.98, 1.18)	0.99 (0.88, 1.12)
Smoking quit attempt[a]	1.41 (0.92, 2.15)	1.29 (0.77, 2.14)
Receipt of smoking quit support[a]	2.61 (0.99, 6.88)	4.25 (1.45, 12.48)
Number of cigarettes smoked[b]	1.01 (0.98, 1.03)	1.02 (1.00, 1.05)
Urges to drink alcohol[c]	1.28 (1.10, 1.50)	1.14 (0.94, 1.38)
Motivation to cut down on drinking[c]	1.05 (0.97, 1.14)	1.00 (0.89, 1.12)
Cut-down drinking attempt[c]	1.21 (0.80, 1.83)	1.02 (0.63, 1.65)
Receipt of alcohol cut-down support[c]	0.82 (0.18, 3.79)	0.30 (0.03, 2.91)
Mean weekly alcohol consumption[c]	1.07 (0.98, 1.17)	1.04 (0.93, 1.16)

[a] Among people smoking tobacco $n_{unweighted} = 597$;
[b] Among people smoking cigarettes $n_{unweighted} = 546$;
[c] Among people drinking at risky levels $n_{unweighted} = 1218$;
[d] Adjusted for age, gender, nation, social grade, hardship, and AUDIT-C score for smoking or smoking status for risky drinking.

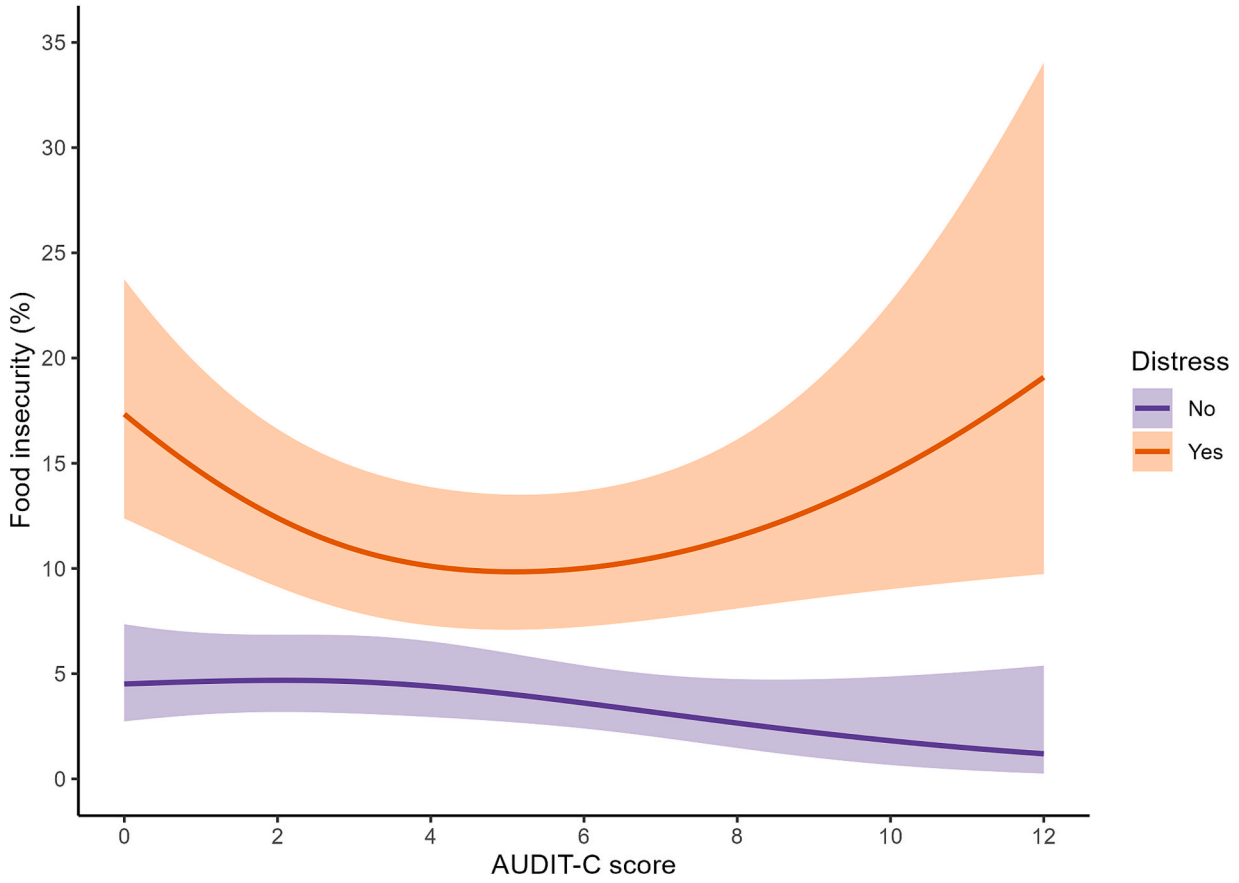

Fig. 2. Association between AUDIT-C score and prevalence of food insecurity stratified by psychological distress, when adjusting for age, gender, nation, social grade, hardship, and smoking status. AUDIT-C scores were modelled using restricted cubic splines with 3 knots.

3.1. Sensitivity analyses

When categorising according to the number of children living in the household (0, 1, 2, ≥3), a greater proportion of those experiencing very low food security had three or more children (7.4 %, 95 % CI: 4.2, 10.6) than of those with high or marginal food security (3.5 %, 95 % CI: 2.8, 4.3; supplementary Table S3). When using this categorisation to test a moderating effect (research question 2) on the odds of being food insecure, we did not find significant interactions with smoking (reference 0 children: 1 child p = 0.019, 2 children p = 0.800, ≥3 children p = 0.539) or alcohol consumption (Wald test for adjusted analysis F (6,4005) = 1.50, p = 0.176). When categorising psychological distress into three groups (none/moderate/serious), there was a much greater proportion of people experiencing very low food security with serious distress (39.0 %, 95 % CI: 33.2, 44.8) than among those with high or marginal food security (5.1 %, 95 % CI: 4.2, 5.9; supplementary Table S3). There were no significant interactions between this categorised variable of psychological distress and tobacco (reference none: moderate p = 0.480, serious p = 0.830) or alcohol use (Wald test for adjusted analysis F(4,4008) = 1.58, p = 0.178).

When using AUDIT-C as a categorical variable, the results were similar to those of the main analysis modelling AUDIT-C continuously using restricted cubic splines (supplementary Table S4). The unweighted (supplementary Tables S3-8, Figs. S4-S5) and the complete-case analyses (supplementary Tables S9-12, Figs. S6-S7) yielded comparable results to the ones presented in the main manuscript using multiple imputations on weighted data.

4. Discussion

This study aimed to explore the associations between food insecurity and tobacco and alcohol use, whether these associations differ by the presence of children in the household and the level of psychological distress, and whether there are differences in smoking or drinking behaviour and food insecurity.

Almost one in five reported experiencing food insecurity, with 8 % classified as having low and 10 % very low food security. Individuals who smoked had nearly twice the odds of experiencing food insecurity than those who did not smoke, even after adjusting for their age, gender, nation of residence, socioeconomic position, financial hardship, and alcohol consumption. This suggests a distinct relationship between smoking and food insecurity that extends beyond other indicators of disadvantage. US studies showed that smoking prevalence increases with the number of social needs or markers of socioeconomic disadvantage (Kim-Mozeleski, Chagin, et al., 2022; Leventhal et al., 2019).

In contrast, the relationship between alcohol consumption and food insecurity followed a different pattern, with people abstaining from alcohol more likely to be food insecure overall. However, the relationship between food insecurity and alcohol consumption depended on psychological distress. Food insecurity was similar across alcohol consumption levels among those not experiencing distress but among people experiencing distress, those abstaining and at risk of dependence appeared more likely to experience food insecurity than those drinking at other levels. It is not clear whether people were drinking more or less before experiencing food insecurity and future research should examine the direction of this relationship (e.g., does food insecurity result in reduced drinking or is this relationship more complex). The observed association overall for drinking aligns with broader trends showing that less socioeconomically advantaged groups tend to consume less alcohol (Boyd et al., 2022). This finding seems to differ from US studies indicating a positive association between food insecurity and alcohol use (Bergmans et al., 2019; Nagata et al., 2021; Pitman et al., 2024). However, two of the US studies focused on young adults and the third study only found an association for men but not women. A future study could investigate whether the relationship between food insecurity and alcohol consumption in Great Britain may also be moderated by gender.

This study suggests that people experiencing food insecurity have a higher chance of receiving support when trying to quit smoking. The wide CI indicates some uncertainty, but if confirmed, this would be encouraging in terms of health equity. However, previous research indicates that quit success rates tend to be lower among socioeconomically disadvantaged groups, despite being as motivated to quit as advantaged groups (Hiscock et al., 2012). One study found that smoking to cope with stress can hinder quit success, though it does not reduce the likelihood of making a quit attempt (Yong & Borland, 2008). This may explain why the present study showed no difference by motivation and quit attempts, but a two-to-threefold higher smoking rate among those experiencing low or very low food security. Individuals who are highly dependent on smoking and feel a strong need to quit due to economic pressures may require additional support to achieve abstinence. Seeking quit support could be interpreted as a marker of heightened motivation to stop smoking. However, it may also reflect a history of unsuccessful quit attempts, prompting these individuals to seek professional help. Longitudinal research would be required to establish the direction of these effects.

Similarly to smoking, there were no associations between food insecurity and motivation and attempts made to cut down among people drinking at risky levels. While there may be differences in urges to drink and receipt of support to reduce drinking, these findings are uncertain due to small sample sizes. The potential positive association between urges to drink and food insecurity, along with the observed moderating role of psychological distress on alcohol consumption and food insecurity, may relate to the use of alcohol as a coping mechanism. Previous research has linked drinking to cope with negative emotions with increased risk of alcohol use disorder, even after accounting for overall consumption, as people may develop dependence if they use alcohol to cope with psychological distress (Peirce et al., 1994). This may help explain why in the present study individuals without psychological distress reported lower food insecurity irrespective of their alcohol consumption level, while those with distress showed higher levels of food insecurity, particularly at levels indicative of possible dependence, even after adjusting for age, gender, nation, social grade, financial hardship, and smoking status. Urges to drink may indicate the momentary desire of individuals to drink irrespective of their plans or motivation to reduce alcohol consumption (Beard et al., 2019; West & Brown, 2014). These explanations are speculative and need further investigations to clearly establish links and possible underlying mechanisms.

4.1. Strengths and limitations

To our knowledge, this is the first study to explore the associations between food insecurity and tobacco and alcohol use within the British context. A key strength of the study is the use of data from a nationally representative sample. Among the study's limitations are small sample sizes for some analyses, resulting in greater uncertainty around estimates. Additionally, some of the questions included in the survey were on sensitive topics, which may have led to discomfort among participants and reluctance to answer fully. Although we imputed missing data, there remains the possibility of underreporting, particularly for variables such as food insecurity, alcohol consumption, financial hardship, and psychological distress, due to stigma or social desirability bias. We imputed missing data assuming they are missing at random which may not be true. However, to test the robustness of the imputations, we also conducted a complete-case analysis which yielded comparable results. Further, it is important to note that the study's cross-sectional design does not allow for causal or directional inferences; the results only represent associations with food insecurity. Finally, while the survey included a validated measure of food insecurity, more comprehensive tools are available and may provide more accurate and detailed assessments.

4.2. Implications

While this study highlights important associations between food insecurity and smoking and alcohol use in Great Britain, it is crucial to recognise the broader context of poverty and food insecurity. Offering targeted interventions to help individuals experiencing food insecurity to quit smoking or reduce alcohol consumption, though beneficial, cannot by itself resolve the structural issues that underpin food insecurity and health inequities. Therefore, addressing the social determinants of health is essential for creating lasting change. However, while advocating for such change, from a social justice perspective, it is equally necessary to address the immediate needs of individuals facing food insecurity. Smoking and harmful alcohol use are not only coping mechanisms but also major contributors to illness and premature death. While smoking was independently associated with higher odds of experiencing food insecurity, the relationship with alcohol was moderated by psychological distress, which itself is associated with increased risk of premature death (Russ et al., 2012). Better social and financial support for individuals with poor mental health or those living in poverty could reduce both the risk of psychological distress and food insecurity (Martin et al., 2016; Ward & Lee, 2022). It may also have a positive impact on the risk of experiencing smoking- or alcohol-related harm in these groups. Furthermore, new approaches to smoking cessation may be needed to reach people experiencing food insecurity who smoke. For example, as part of a new UK Government strategy, the 'Swap to Stop' smoking cessation programme, which consists of behavioural support and free vape kits, has been integrated into existing smoking cessation services as well as new settings, such as job centres and social housing providers (Department of Health & Social Care, 2023).

Future research could investigate whether patterns of tobacco and alcohol consumption differ between individuals experiencing chronic versus temporary food insecurity, in order to identify the most vulnerable groups and to target resources for cessation and support more effectively.

4.3. Conclusions

Almost one in five of the British population experiences food insecurity, highlighting the urgent need for upstream interventions that address the root causes of poverty in this country. At the same time, it is equally important to provide adequate support for reducing behavioural risks such as tobacco smoking and harmful alcohol consumption, both of which contribute substantially to preventable illness and premature death. Smoking is markedly more prevalent among people experiencing food insecurity, despite similar levels of motivation and quit attempts compared to people who smoke and do not experience food insecurity. Targeted support for these groups is crucial, not only to reduce health harms but also to address the underlying stressors that drive these behaviours.

5. Data sharing

Deidentified participant data and the command syntax for the statistical analyses will be available with publication on the Open Science Framework: https://osf.io/qhvf3/.

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Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Microsoft Copilot in order to improve the readability and language of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

CRediT authorship contribution statement

Vera Helen Buss: Writing – original draft, Visualization, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sharon Cox:** Writing – review & editing, Methodology, Conceptualization. **Dimitra Kale:** Writing – review & editing, Methodology, Conceptualization. **Leonie Brose:** Writing – review & editing, Methodology, Conceptualization. **Tessa Langley:** Writing – review & editing, Methodology, Conceptualization. **Megan Blake:** Writing – review & editing, Methodology, Conceptualization. **Laura Hamilton:** Writing – review & editing, Methodology, Conceptualization. **Kerry Brennan-Tovey:** Writing – review & editing, Methodology, Conceptualization. **Lion Shahab:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Jamie Brown:** Writing – review & editing, Validation, Methodology, Funding acquisition, Data curation, Conceptualization.

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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2025.100659.

Data availability

Deidentified participant data and the command syntax for the statistical analyses will be available with publication on the Open Science Framework: (https://osf.io/qhvf3/).

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