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Caffeinated energy drinks and effects in UK young people: A secondary analysis of population-level datasets

Final report

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Any amendments to the protocol: We were unable to conduct an Individual Patient Data (IPD) meta-analysis as stated in the protocol, due to limitations of the datasets. A latent class analysis was conducted in its place.

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Executive Summary

Background

Energy drinks are increasingly prevalent in everyday life (1). Most energy drinks contain caffeine. As no upper limit of caffeine intake has been established for children (2), calls for regulation of caffeinated energy drink sales to children have been made (3). A recent overview of systematic reviews suggested that between half and two thirds of children surveyed internationally have tried caffeinated energy drinks at least once. Associations were reported between consumption of caffeinated energy drinks and a range of physical and psychological symptoms plus educational and social behaviours (4). Little UK research evidence was found, and where it was available it tended to be based on small regional samples. A better understanding of patterns of caffeinated energy drink consumption amongst different sociodemographic groups of children across the UK is needed. The research reported here attempts to draw together population-level data sets to address key questions about:

- the frequency of and context for caffeinated energy drink consumption in UK children and young people under 18 years of age;
- how caffeinated energy drink consumption varies by child and family sociodemographic characteristics; and
- caffeinated energy drink consumption and physical/psychological symptoms, education/social behaviours and health consequences.

Methods

A secondary analysis of existing population-level UK datasets was conducted. To identify and access relevant datasets we searched the UK Data Service (5) (a repository of UK datasets), harvested UK datasets identified in the overview of reviews (4) and contacted UK survey investigators. Datasets were screened for inclusion according to relevance to our research questions. To be included datasets had to i) be nationally representative of the UK, or representative of constituent countries (England, Wales, Scotland and Northern Ireland); ii) hold data on children or young people under 18 years of age ('children') and iii) include measures of caffeinated energy drink consumption. Study investigators were contacted for access permissions and survey methodology documentation. Information on coverage, sampling methods and content was extracted about each dataset. Within each dataset, data on sociodemographic characteristics, consumption and physical, psychological, educational, social and behavioural effects were described, then relationships between caffeinated energy drink use and other factors were explored using adjusted measures of association (STATA v13) (6). Factors that were found to be significantly associated with caffeinated energy drink consumption were prioritised for inclusion in logistic regression analyses to identify the typical characteristics of caffeinated energy drink users. Further analyses were undertaken to clarify the

way in which consumption of caffeinated energy drinks overlapped with clusters of health states. All estimates were weighted for representativeness and estimates were adjusted for study design. Results from each dataset were then combined narratively, exploring similarities and differences in the estimates to explore potential reasons for variation. The study was registered on PROSPERO (7) and ethics approval granted by UCL's Ethics Committee.

Results

A total of five datasets met our inclusion criteria: England's Smoking and Drinking Survey of Young People (SDSYP); two waves of the Health Behaviour in School Children (Wales) (HBSC-W) Survey; England's National Diet and Nutrition Survey (NDNS); Northern Ireland's Young People's Behaviour and Attitudes (YPBAS) Survey; and the UK Millennium Cohort Study (MCS). These are summarised in Table 1 below.

Table 1: Details of the five datasets

Data set (*used to explore associations)	Abbreviation	Region	Collection period(s)
Smoking and Drinking Survey of Young People*	SDSYP	England	2014
Health Behaviour in School Children (Wales)*	HBSC-W	Wales	2013/14 & 2017/18
National Diet and Nutrition Survey	NDNS	England	2014 & 2016
Young People's Behaviour and Attitudes	YPBAS	N Ireland	2016
Millennium Cohort Study	MCS	UK	2008

These datasets provided differing amounts of data related to caffeinated energy drink consumption. While all five were used to explore prevalence, associations between caffeinated energy drink consumption and symptoms, behaviours and wellbeing were explored using the two most detailed datasets (SDSYP; HSBC-W). Both contributed to different sets of regression analyses, with the SDSYP being used primarily to explore sociodemographic characteristics of caffeinated energy drink consumers, and the HBSC Wales 2013/14 being used primarily to explore the overlap between health status and psychological adjustment characteristics and caffeinated energy drink consumption. It was not possible to secure access permissions for HBSC England and Scotland data for 2013/14 within the timescale of the project, although their inclusion would improve our understanding of the (cross-sectional) associations between caffeinated energy drink consumption and health characteristics; data from the 2017/18 wave of data collection for England and Scotland were unavailable at the time of analyses.

Key findings

- The proportion of children reporting consumption of one or more caffeinated energy drinks per week is similar across the UK; and increases with age.
    - Up to a quarter of children aged 11-12 years consume one or more caffeinated energy drinks per week compared to between a quarter and a third of those aged 13-14 years and those aged 15-16 years.

  - Caffeinated energy drink consumption appears to have fallen in recent years amongst all age groups, although these findings are indicative only.
- Associations with gender, regional differences and eligibility for free school meals were found.
  - Boys consistently reported higher use than girls (OR 1.89, 95% CI 1.60 to 2.24).
  - Children in Northern England regions reported higher use than those in the Southern England regions (OR 2.70, 95% CI 1.87 to 3.89).
  - Consumption was slightly more common among those eligible for free school meals than among those not eligible (OR 1.32, 95% CI 1.09 to 1.61).
- Associations with adverse physical and mental health symptoms and unhealthy or risk behaviours were found. Regular caffeinated energy drink consumption of one or more cans per week was more likely among:
  - Children who had tried smoking or drinking.
  - Children who had been excluded from school or truanted.
  - Children who reported low levels of wellbeing.
  - Children who reported adverse physical symptoms such as headaches, sleep problems and stomach problems.
- Children who consume caffeinated energy drinks on a weekly basis are more likely to experience low psychological, physical and educational wellbeing than those who consume them less frequently. This relationship holds even after controlling for other factors that could influence child wellbeing such as age, gender, rurality, smoking status, alcohol status and family affluence.
- Findings indicate that compared to those who never consume caffeinated energy drinks, those who consume them on a daily basis are:
  - twice as likely to have low psychological wellbeing (RR 2.11, 95% CI: 1.56-2.85) or low physical wellbeing (RR 2.52, 95% CI: 1.76-3.61)
  - four times as likely to have low educational wellbeing (RR 4.81, 95% CI: 3.59-6.44) or low overall wellbeing (RR 4.15, 95% CI: 2.85-6.00).
- Because of the cross-sectional nature of the data, these associations cannot imply that weekly caffeinated energy drink consumption is a trigger of low wellbeing.

Discussion

This project sought UK population-level datasets about the overall consumption of caffeinated energy drinks in children under 18 years of age, patterns of use and any associated symptoms, behaviours or wellbeing. Our analyses are innovative in two ways: they demonstrate the utility of drawing from multiple datasets to build knowledge and use novel methods to explore patterns of caffeinated energy drink use among children.

Findings suggest that across the UK, there are consistent patterns between caffeinated energy drink use and sociodemographic characteristics, including age, gender, region and free school meals. Consumption of caffeinated energy drinks is associated with risk behaviours such as

alcohol use and smoking, and with adverse physical and psychological symptoms including low wellbeing, nervousness, irritability, sleep difficulties, headaches and stomach aches. Exploration of different patterns of use suggests that even after controlling for confounding factors, older children, boys, children in the North of England, children in receipt of free school meals, children who currently smoke and children who drank alcohol in the week before the interview all have higher odds of having drunk at least one can of caffeinated energy drink in the past week. Perhaps most striking, children who were frequent (daily) caffeinated energy drink consumers were also more likely to report poor wellbeing across these domains, after controlling for potential confounders.

Our findings are similar to those reported from recent population-level analyses based on English children (3, 8) and from smaller studies that have examined mental health, educational attainment and problem behaviour (9-11). The findings reported here build on existing knowledge in three ways. First, they add strength to existing (more narrowly focused) research, due to wider coverage across the included datasets; second, they add depth in relation to consumption of alcohol with caffeinated energy drinks and contextual factors (i.e. ethnicity and region); and third, by grounding this work in findings from our previous overview of reviews. We also note some differences. We did not find consistent associations between ethnicity and caffeinated energy drink consumption as have been reported elsewhere. This is likely due to population differences across countries. In addition, while our findings suggest lower use of alcohol with caffeinated energy drinks by UK children, it is possible that due to the sampling frames used, older children's use will be underrepresented.

Some limitations were noted. Crucially, the absence of longitudinal data inhibits our ability to draw conclusions about cause and effect. Further, the lack of consistent information in these datasets about the specific type or volume of caffeinated energy drinks restrict our understanding of the specific role that caffeine plays in energy drink consumption and related effects.

Conclusions and recommendations

Findings suggest that many children in the UK consume caffeinated energy drinks with higher consumption reported by older children, by boys, and by those living in northern areas or in more deprived regions. No patterns emerged in relation to ethnic groups. Findings also suggest associations between consumption and a range of physical, psychological, social and educational symptoms, behaviours and wellbeing. However, we were unable to conclusively determine the particular role (if any) of caffeine and energy drink consumption and associated symptoms, behaviours and wellbeing, due to limitations in the way energy drink consumption is currently measured (i.e. not reporting the volume or specific type of energy drinks consumed using longitudinal designs, which would allow estimates of caffeine consumption to be made and the

impact on outcomes). Importantly, data are generally unavailable within these datasets to compare caffeine consumption and energy drink use.

UK-wide longitudinal cohort observational studies are needed to understand changes in caffeinated energy drink consumption over time and strengthen confidence in associations reported with adverse symptoms, risk behaviours and attitudes. Studies should examine the influence of geographic region and deprivation on caffeinated energy drink consumption. There is a need to standardise the measurement of caffeinated energy drink consumption so that a clearer picture of frequency, timing and dosage can be established. Finally, UK-wide exploration of the context and reasons for caffeinated energy drink consumption is needed, given the consistent relationships seen between caffeinated energy drink consumption, physical and psychological symptoms, risk behaviours and wellbeing. This should include examining consumption of caffeinated energy drinks with alcohol in older children (i.e. those aged 16 and 17 years) at a population level, to understand whether use is higher in this age group than was seen across these datasets. These findings will be of interest to those involved in UK health care, social care, public health policy, and service delivery provision to children and young people.

1 Background

Caffeinated energy drinks are increasingly prevalent in everyday life, with global sales estimated to top USD 60 billion in the next five years (1). Energy drinks containing caffeine include Red Bull©, Monster Energy©, and Rockstar©. These are typically marketed with claims that they can boost energy, decrease fatigue, improve concentration and enhance mental alertness. However concerns about marketing and consumption have led some countries to regulate a name change from 'energy' drinks to 'stimulant' (12). In the UK, guidance on the sale of caffeinated energy drinks to children and youth is still in development, with recent public consultation sought (13). Caffeinated energy drinks are sold in most EU member states, with cautionary labelling required for those that contain more than 150 mg per litre of caffeine, aimed at children and pregnant women (14). Recently, several large UK supermarkets have voluntarily stopped selling caffeinated energy drinks to those under 16 (15) and the British Soft Drinks Association introduced a voluntary code of practice (16); however, sales are likely to continue in smaller convenience stores nationwide. Some professional organisations suggest banning sales of caffeinated energy drinks to children and young people (17). In the UK, EU labelling laws require that warning labels are in place against use in children for caffeinated energy drinks over 150 mg of caffeine per litre; and a government commitment has been made to introduce legislation concerning caffeinated energy drink sales to children and adolescents (2).

Many energy drinks contain large amounts of sugar and stimulants, such as caffeine and guarana, as well as varying amounts of carbohydrate, protein, amino acids, vitamins, sodium, and other minerals. While the sugar content is associated with obesity and dental caries (18), less is known about the behavioural and psychological effects of caffeine in energy drinks, with most evidence coming from animal studies (3). Caffeine may potentiate the action of the sugar content, causing insulin to be released (19). While sugar content has been reduced or replaced with sugar substitutes, caffeine levels remain high (20). For high caffeine drinks, the total amount of caffeine from all sources (including guarana) must be given in mg/100 ml of drink.

Consumption of caffeinated energy drinks in children and young people has been widely studied and synthesised, but the findings remain equivocal. Reviews and surveys conducted in Canada, New Zealand and the USA suggest that between 30% and 74% of adolescents consume caffeinated energy drinks (21-23), with a significant number of young people exceeding the recommendations for maximum daily consumption (21). A large multinational EU project noted that of all those surveyed, 68% were adolescents aged 10-18 years and 18% were children aged three to nine years (24). Energy drinks accounted for 13% of young people's and 43% of children's total daily caffeine exposure. In the UK, children and adolescents' consumption was the seventh highest of 16 EU countries surveyed (24). While the next wave of data collection from this survey has been conducted across Scotland, Wales and England, not all datasets are publicly available (25, 26).

Young people are thought to be at more risk of ill effects from chronic caffeinated energy drink consumption, compared to older people, who may experience beneficial effects (1). Almost half of all caffeine overdoses reported in the USA in 2007 were amongst people under 19 years of age, with a large proportion resulting from energy drink overuse. This indicates that young people are a high-risk group (22). Caffeine is contained in other food and drink; and caffeine intake from energy drinks must be considered in the context of this background intake of caffeine (18).

It is unclear how much caffeine is too much for children and young people. For example, some authors suggest that no adverse effects of caffeine are noted in children who consume less than 3 mg per kg of body weight per day (18). This is the amount supported by the Food Standards Agency (27). Others claim that an intake of 2.5 mg per kg of body weight per day, equating to one or two cups of tea or one small cup of coffee should be the maximum allowed (28). Further, it is unknown whether caffeine exerts an independent action on the effects or symptoms seen or whether other energy drink additives may also contribute (1, 29-31).

A range of physical, psychological and behavioural factors has been reported to be associated with high or chronic consumption of caffeinated energy drinks (18, 22, 23, 28, 31-36). Consumption rates have been found to be higher in young males than females and independent associations are noted amongst minority ethnic and lower socio-economic groups (21, 23, 24, 29, 36, 37). Questions remain however, about UK children and young people's patterns of use of caffeinated energy drinks, effects on their physical, mental and social health and wellbeing, and subsequent effects on behaviour and life-course outcomes.

Aims of study

This study aimed to:

1. Identify suitable UK quantitative datasets that could be used to explore patterns of caffeinated energy drink consumption among children and young people and conduct analyses of these data to:
    a. Provide estimates of the frequency of caffeinated energy drink consumption
    b. Establish how consumption patterns vary by the sociodemographic characteristics of the child and family
    c. Pool estimates of caffeinated energy drink consumption among children from different population groups
2. Identify suitable UK quantitative datasets to assess (longitudinal) associations between caffeinated energy drink consumption and outcomes (for example mental health outcomes) *
    a. Investigate the robustness of associations between caffeinated energy drink consumption and important outcomes as identified in an accompanying review of reviews (4).

*Where no or few suitable UK data are available, we anticipated utilising international data sources where appropriate. Note that we were unable to identify population-level longitudinal datasets measuring caffeinated energy drink consumption among children.

2 Methods

2.1 Rationale

Secondary data analysis can 'lend new strength to the body of fundamental social knowledge'(p.11) (38). Secondary data analysis is conducted on a population-level dataset originally collected for a different purpose (39, 40). Sources include longitudinal and cross-sectional survey microdata, aggregate statistics, census data, and transcripts from qualitative and mixed methods investigations (41). UK examples include the General Lifestyle Survey, Health Survey for England/Wales, the Millennium Cohort Study and the Families and Children Study (5).

General surveys of lifestyle behaviours provide nationally representative samples. Secondary data analysis of these allows the examination of associations between caffeinated energy drink use and ethnicity, gender or age that may not have been examined in the original published studies, and with subsequent data collection points, progressive use and related effects can be compared over time (41). The original context, quality of data and ethics around using the data for different purposes must be considered (39, 42). Re-analysis of existing datasets offers an innovative way to examine behaviours, attitudes and knowledge amongst large numbers of the population and the method is particularly suited to answering policy relevant questions in a timely way (5, 43-45).

2.2 Identification of evidence

As our aim was to estimate caffeinated energy drink consumption among children in the UK, we confined our searching to the UK's largest repository of individual data, hosted by the UK Data Service. The UK Data Service provides access to over 6,000 sources of population, social and economic data. While multidisciplinary in nature, the repository hosts several well-known data sources focused on health (for example the annual Scottish, Welsh and English Health Surveys) and ageing (for example the English Longitudinal Study of Ageing).

A range of terms were used to search within the repository, including: "caffeine", "energy", "drink", "drinking", "drinks", "diet", "sugar", "soda", "carbonated", "beverage", "sport drink", "sports drink", "guarana", "taurine". Records were screened based on information contained within the abstract initially, and where appropriate the study documentation including the original questionnaire to establish relevance (equivalent to full-text screening). Because the repository does not allow records to be exported which facilitates screening, identification of duplicate records; and allows additional information to be attached to records (e.g. published studies that use the data), the search was conducted in a similar way to website searching (46). We (i) detailed the rationale for the search and the selected website(s); (ii) utilised the resources in a consistent way; and (iii) recorded details of executing the searches using the templates

suggested (46). One limitation is that few details can be recorded about the flow of studies through the process (as recommended in the 'Preferred Reporting Items for Systematic reviews and Meta-Analyses' (PRISMA statement)) (47, 48).

Additional sources from outside the UK Data Archive were also identified through the accompanying overview of reviews and searched through contact with researchers (4). Ethics approval was granted by UCL's Ethics Committee.

2.3 Assessment of eligibility

Data sources were included in the review if they met the following criteria:

2.3.1 Type of data

- Collect information that can be used to determine levels and patterns of caffeinated energy drink consumption in the UK.

Data sources were excluded that were not representative of specific defined populations; for example, those that do not collect data from representative samples or have defined parameters (e.g. tracking the health status of a specific cohort of people) but are based on convenience samples or other non-robust methods where further inference cannot be easily made. To be included, data must also be available for download and further analysis; this may sometimes be available through the UK Data Service Secure Lab only (see https://www.ukdataservice.ac.uk/use-data/secure-lab); here, further applications were made here, where appropriate.

2.3.2 Type of participants

- Children and young people aged 17 and under.

Surveys may include responses from parents and other household members, and may be focused on children alone, or households or other units. Data reflecting child and parent reports of caffeinated energy drink consumption were eligible, and differences in modes of data collection were noted (see section 3.2).

2.3.3 Type of intervention/exposure

- Consumption and non-consumption of caffeinated energy drinks.

Caffeinated energy drink consumption is the 'exposure'. In order to estimate the impact of consumption, information about children who do not consume drinks must be available. This means that surveys that solely seek to understand profiles of caffeinated energy drink consumers were not eligible.

In order to explore whether there are differences between children who consume caffeinated energy drinks and those who do not in terms of wellbeing (e.g. mental health or educational circumstances), we needed to account for other potential differences (confounders) between children and young people who do and do not consume caffeinated energy drinks. Potential confounders included age, gender, ethnicity, area, measures of family socioeconomic status and in some models, other health behaviours (e.g., smoking and drinking alcohol).

2.3.4 Type of outcome

Primary outcomes: These were based on UK data sources only:

(i) Frequency of consumption
(ii) Amount consumed
(iii) Occurrence of consumption

Secondary outcomes: These were based on data from the accompanying systematic overview of reviews (4):

(i) Sugar or calorie consumption
(ii) Cardiovascular health
(iii) Mental health (e.g. hyperactivity)
(iv) Neurological conditions (e.g. headaches)
(v) Educational attainment, truancy, exclusion
(vi) Substance misuse (e.g. patterns of alcohol consumption)
(vii) Sports performance
(viii) Sleep characteristics

2.4 Study selection and data extraction

After a pilot phase where reviewers (DK/GB) ran a search independently and discussed their screening decisions, reviewers independently screened records on the Data Archive (46).

Before undertaking the analysis, details about the study were extracted to consider the comparability of the data. These included:

(i) Provenance and design – Study date, date of collection of the sweep, data collectors, study design (e.g. cross-sectional or longitudinal);
(ii) Study characteristics – Sample size, geographic and/or population coverage, sampling design (e.g. information about stratification and weighting);
(iii) Participants – method of identifying caffeinated energy drink consumption in the dataset, age distribution of sample, gender, ethnicity, indicator of social class, health and wellbeing status;
(iv) Data available to explore wellbeing; data available to explore potential confounders;

(v) Missing data;
(vi) Additional variables recommended within the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines for reporting observational studies (49) and the PRISMA-IPD (48).

2.5 Methodological quality assessment

Established criteria for assessing data sources, as opposed to published analyses, are rare. To help us understand the influence of the datasets quality on our analyses, we used criteria included in the National Institute of Health quality assessment tool: exposure, sample frame, and level of participation (50). These characteristics are reported in brief in Appendix 1 (although we do not provide an overall rating for the studies we analysed ourselves).

2.6 Overall analysis and synthesis approach

The analyses were guided in part by gaps identified in our accompanying systematic overview of reviews (4). The protocol for this secondary analysis was registered in PROSPERO (ID: CRD42018110498).

Each data source was analysed separately due to anticipated differences in sample design between surveys. Raw data from each study were analysed using STATA v13 (6). Estimates on the frequency and outcomes of consumption, adjusted for study design factors, are presented separately for different sources. Because we planned to use the underlying raw survey data, we were able to explore the way in which frequency of consumption varies by characteristics of interest (e.g. age, gender and ethnicity). We present exploratory data analysis for each study, before moving on to more complex analyses adjusting for the impact of potential confounding factors in regression analyses (full outputs are available on request). In the datasets used for the mainstay of the analyses, missing data was a relatively minor issue for the caffeinated energy drink variables of interest; due to the breadth of datasets and indicators. However it was not possible to adequately assess whether data were missing at random, and no imputation strategy were imposed.

The results from each data source were combined narratively. We describe the features of included datasets e.g. country of origin, year of data collection, design, sampling frame and relevant variables studied. We explore groupings in terms of methods (e.g. when different datasets made similar types of comparison) and in terms of findings, e.g. similarities or differences in the estimates across data sets. Where possible we transform the data into a common metric and use ‘vote counting’ to provide an initial description of variation across sources; using the additional depth of analysis possible with access to raw data to explore potential drivers of variation.

Dataset limitations meant that we were unable to conduct an Individual Patient Data (IPD) meta-analysis as described in our protocol. Instead, a Latent Class Analysis was conducted. The indicators of physical, mental, educational and social wellbeing were selected on the basis of the findings from the earlier systematic review and policy feedback (4). It was anticipated that these indicators identified from the dataset would address one or more common underlying mechanisms. To avoid running multiple separate models that were underpowered, and to explore how these characteristics overlap into different profiles of wellbeing, we undertook Latent Class Analysis (LCA). LCA is a statistical method for finding latent or unobservable subgroups within a population (51). This method relates a set of observed multivariate variables (in this case, eleven indicators of child wellbeing) to a set of latent variables (five profiles (or classes) of child wellbeing derived from the data). We undertook a two-stage modelling strategy where, once we had identified the best fit of Latent Class models, we subsequently explored how different characteristics, including caffeinated energy drink consumption, were associated with different probabilities of class membership. To do this we undertook multinomial logistic regression modelling, using each class membership as the dependent variable (52). In the second stage of the modelling strategy, we explored how different characteristics, including caffeinated energy drink consumption, were associated with different probabilities of class membership.

3 Results

3.1 Flow of studies

A total of five datasets met our inclusion criteria: England's Smoking and Drinking Survey of Young People (SDSYP); two waves of the Health Behaviour in School Children (Wales) (HBSC-W) Survey; the UK National Diet and Nutrition Survey (NDNS); Northern Ireland's Young People's Behaviour and Attitudes (YPBAS) Survey; and the UK Millennium Cohort Study (MCS). These are summarised in Table 1 below.

Table 1: Details of the five datasets

Data set (*used to explore associations)	Abbreviation	Region	Collection period(s)
Smoking and Drinking Survey of Young People*	SDSYP	England	2014
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These datasets provided differing amounts of data related to caffeinated energy drink consumption. While all five were used to explore prevalence, associations between caffeinated energy drink consumption and symptoms, behaviours and wellbeing were explored using the two most detailed datasets (SDSYP; HSBC-W). Both contributed to different sets of regression analyses, with the SDSYP being used primarily to explore sociodemographic characteristics of caffeinated energy drink consumers, and the HBSC Wales 2013/14 being used primarily to explore the overlap between health status and psychological adjustment characteristics and caffeinated energy drink consumption. It was not possible to secure access permissions for HBSC England and Scotland data for 2013/14 within the timescale of the project, although their inclusion would improve our understanding of the (cross-sectional) associations between caffeinated energy drink consumption and health characteristics; data from the 2017/18 wave of data collection for England and Scotland were unavailable at the time of analyses. Characteristics of each dataset are provided in **Appendix 1**. Data tables for each analysis are presented in the **Appendix 2**.

3.2 Overall prevalence

Across the UK, the proportion of children reporting consumption of one or more caffeinated energy drinks per week is similar and increases with age. Prevalence findings from across the five datasets for children in Years 7, 9 and 11 are shown in **Figure 1.** Prevalence estimates from the National Diet and Nutrition survey (NDNS) use a different data collection method (food and drink diaries collected over a four-day window) and were much lower than other datasets, at 3

to 6% (**Table 51**). All other datasets asked children about their caffeinated energy drink consumption as a defined question in a broader survey, and we focus on estimates from these sources below. Values among Year 7 children ranged from 12% (SDSYP, **Table 1**) to 23% (HBSC-W 2013, **Table 32**), suggesting that typically less than a quarter of 11 to 12-year-olds consume caffeinated energy drinks on a weekly basis. Proportions among Year 9 children ranged from 24% (YPBA) (**Table 50**) to 32% (HBSC-W 2013) (**Table 32**), suggesting that typically between a quarter and a third of 13 to 14-year-olds consume caffeinated energy drinks on a weekly basis. Between 29% (HBSC-W 2017) (**Table 32**) and 31% (SDSYP) (**Table 1**) of Year 11 children (15 to 16-year-olds) reported consuming one or more caffeinated energy drinks per week[1]. Caffeinated energy drink consumption appears to have fallen in recent years amongst all age groups when examining two data collection waves of one dataset (HBSC-W 2013 and 2017), although due to some differences in the sampling frame between the two data collection waves, these findings are only indicative (**Table 32**) (**Table 48**).

We draw on two datasets for further exploration (HBSC-W 2013 and SDDYP). Both asked similar questions, although the SDDYP focused on whether children had consumed a can of caffeinated energy drink in the past week (as well as whether they had ever consumed a caffeinated energy drink, the number of cans, and whether they consumed caffeinated energy drinks with alcohol). In contrast, the HBSC-W 2013 asked children how many days they had consumed a caffeinated energy drink. Indicators of interest were mainly coded to reflect weekly behaviour (frequency of consumption and consumption of a can), and while these suggest similar behaviours, the question wording does mean that they are interpreted slightly differently. In addition, in some analyses we coded the data slightly differently, in order to examine differences between very frequent consumption (e.g. daily consumption) and rare consumption (e.g. less than weekly or never).

3.3 Patterns of consumption

Exploration of the prevalence of caffeinated energy drink consumption across two of these datasets (HBSC-W 2013; SDSYP) suggested **consistent associations between caffeinated energy drink consumption and sociodemographic factors, including age, gender, regional differences and eligibility for free school meals.** No relationship was observed between ethnicity and frequency or amount of caffeinated energy drinks consumed (SDSYP, HBSC-W 2013).

Children consume more caffeinated energy drinks on a weekly basis as they get older. In England, 12% of children in Year 7 reported consuming one can or more per week compared to 55% who never consumed caffeinated energy drinks. In Year 11 respondents, this had changed to 31% of children consuming one or more cans of caffeinated energy drinks per week compared to 15% who reported never consuming them (SDSYP) (**Table 1**). Between 10% of Year

[1] Note differences in measures between frequency of occurrence (HBSC) and number of cans (SDYP)

7 children and 29% of Year 11 children reported consuming between one and eleven cans or more per week (SDSYP) (**Table 8**). In Wales, between 24% and 32% of children report consuming caffeinated energy drinks at least weekly, although highest use is in Year 9 students (HBSC-W 2013) (**Table 32**). The age gradient was therefore less pronounced in Wales compared to England.

Boys consistently reported higher use than girls. Across all ages in England, 29% of boys consumed one or more cans per week compared with 18% of girls (SDSYP) (**Table 2**). In Wales, 35% of boys and 22% of girls reported consuming caffeinated energy drinks once a week or more (HBSC-W 2013) (**Table 33**). When consumption was examined by age separately for boys and girls in Wales, a slightly different pattern emerged. While no clear relationship between age and caffeinated energy drink consumption was noted for boys (Table 34), for girls a moderate non-linear relationship did exist, peaking at 26% among girls in Year 9 (HBSC-W 2013) (**Table 35**).

A difference between regions was noted. Northern England regions reported up to 33% of children consuming one or more cans per week compared to southern regions (South East, South West and London) where fewer than 20% of children reported consuming one or more cans a week (SDSYP) (**Table 4**). In Wales, a fifth of children (19%) in Powys region[2] reported consuming caffeinated energy drinks at least once a week compared to 38% of children in the Cwm Taf region (HBSC-W 2013) (**Table 37**). Eligibility for free school meals was also associated with caffeinated energy drink use. In England, 30% of children eligible for free school meals also consumed one or more caffeinated energy drinks per week compared to 26% of children who did not receive free school meals (SDSYP) (**Table 5**).

Analyses of the characteristics of (weekly) caffeinated energy drink consumers: We explored whether the characteristics that pattern caffeinated energy drink consumption (above) remain significant once we controlled for the influence of other factors. Most of these remain significant and are presented as odds ratios (**Figure 2**). An odds ratio above one (and with a confidence interval that does not fall below one) indicates that a characteristic increases the chance that a child will be a weekly caffeinated energy drink consumer. Similarly, an odds ratio below one (with a confidence interval that does not rise above one) suggests that the characteristics reduce the odds of weekly caffeinated energy drink consumption. These characteristics are compared to a baseline category that has a value of exactly one (e.g. the odds of a girl being a weekly caffeinated energy drink consumer is compared to the odds of boys (the latter taking the value of one)).

Compared to baseline categories, **the odds of having at least one can of caffeinated energy drink in the last week are higher among (all from SDYP):**

- **older children** (children in year 11 vs year 7; OR 1.96, 95% CI 1.56 to 2.47);
- **boys** (OR 1.89, 95% CI 1.60 to 2.24);

[2] Refers to health board regions;

- **children in the North of England, in particular the North East** (compared to South East) (OR 2.70, 95% CI 1.87 to 3.89);
- **children in receipt of free school meals** (OR 1.32, 95% CI 1.09 to 1.61);
- **children who currently smoke** (OR 2.64, 95% CI 1.92 to 3.64); and
- **children who drank alcohol in the week before the interview** (OR 2.08 95% CI 1.60 to 2.71) (SDDYP).

High versus regular caffeinated energy drink consumption

We explored whether the characteristics of high frequency consumers of caffeinated energy drinks differed from non-consumers and those with more moderate consumption of caffeinated energy drinks. 'High frequency' was defined as those children who self-reported drinking five or more small cans in a week (SDYP) or were drinking caffeinated energy drinks on a daily basis or multiple times a day (HBSC). According to these thresholds, 6.8% (SDYP) and 5.5% (HBSC) of children were high frequency consumers of caffeinated energy drinks. Detailed descriptive statistics showing these characteristics are shown in **Tables 8-12** (SDYP) and **Tables 32-37** (HBSC).

Below, our focus changes from most other analyses in this report, from exploring how different social characteristics influence caffeinated energy drink consumption (e.g. how many boys drink caffeinated energy drinks) to comparing different patterns of drinking (e.g. how many high frequency caffeinated energy drink consumers are boys vs how many regular caffeinated energy drink consumers are boys).

Compared to regular consumers (1-4 cans in the past week) or those who did not consume a caffeinated energy drink in the past week, high frequency (5+ cans in the past week) caffeinated energy drink consumers (SDYP) were:

- similar to regular consumers, less likely to be in the younger age group (year 7; age 11-12) (9% of high frequency drinkers were in year 7 vs 9.7% of regular drinkers), compared to 22% of children who did not consume EDs
- more likely to be male (63% of high frequency drinkers were male vs 60.5 % of regular drinkers and 47% of children who did not drink)
- more likely to have truanted or been excluded (46% of high frequency drinkers had truanted/been excluded vs 27% of regular drinkers and 11% of children who did not drink)
- more likely to have tried alcohol (71% of high frequency drinkers had tried alcohol vs 52.8% of regular drinkers and 29% of children who did not drink)
- more likely to have tried smoking (50% of high frequency drinkers had smoked vs 33% of regular drinkers and 10% of children who did not drink)
- more likely to be living in the North of England than other parts of England

When we undertook multinomial regression modelling to explore how different characteristics were associated with high frequency vs regular consumers in the data, we found that differences remained with respect to age, experience of truancy/exclusion and experience of alcohol and smoking. Compared to regular consumers (based on SDYP), high frequency consumers of caffeinated energy drinks were more likely:

- to **have smoked** (RR 1.32, 95% CI: 1.04-1.86)
- to **have tried alcohol** (RR 1.89, 95% CI: 1.37-2.60)
- to **have truanted/been excluded** (RR 1.93, 95% CI: 1.45-2.57).

However, age did not show a consistent relationship with high frequency caffeinated energy drink consumption. Although older children were much more likely to be consuming any caffeinated energy drinks, compared to children in year 7 (age 11-12), the risk of those in year 11 (age 15-16) being very frequent consumers of caffeinated energy drinks compared to being regular drinkers was lower 0.49 (95% CI: 0.29-0.84) once we controlled for the factors above simultaneously (age, gender, region, truancy/exclusion, tried alcohol and tried smoking).

Compared to regular consumers (drinking once a week) or those who did not consume caffeinated energy drinks in the past week, high frequency (daily) caffeinated energy drink consumers (HBSC) were:

- less likely to be in the younger age group (year 7 – age 11-12) (16% of daily drinkers were in year 7 vs 16% of regular drinkers and 20% of children who did not drink)
- more likely to be male (65% of high frequency drinkers were male vs 61% of regular drinkers and 45% of children who did not drink)
- less likely to come from affluent families (55% of high frequency drinkers were from affluent families vs 58% of regular drinkers and 64% of children who did not drink)
- more likely to have tried alcohol at some point in their lives (65% of high frequency drinkers had tried alcohol vs 59% of regular drinkers and 42% of children who did not drink)
- more likely to have smoked at some point in their lives (35% of high frequency drinkers had smoked vs 19% of regular drinkers and 7% of children who did not drink
- children who were living in the Cwm Taf region were more likely to be very frequent consumers than children living in other parts of Wales
- age differences were less marked in the data and, similar to earlier results, there were no differences by ethnicity

Multinomial regression modelling of the above characteristics (using HBSC-W 2013 data) suggested that **differences between high and regular frequency caffeinated energy drink consumers remained only with respect to smoking**. The relative risk of children who had smoked being very frequent consumers of caffeinated energy drinks compared to being regular caffeinated energy drink consumers was 2.90 (95% CI: 2.07-4.07).

3.4 Associated symptoms, behaviours and wellbeing

A range of symptoms, behaviours and wellbeing indicators was explored in two datasets (HBSC-W 2013; SDSYP), suggesting **overlaps between caffeinated energy drink consumption and physical and mental health symptoms and with unhealthy or risk behaviours.** The included datasets contained no data relevant to cardiovascular symptoms or sports performance; however, all other outcomes of interest were examined encompassing physical, mental and educational wellbeing. For each outcome of interest, we examined association with the proportion of children reporting regular consumption of caffeinated energy drinks (i.e. one or more cans per week). While many of the analyses below suggest large differences in health circumstances, mental wellbeing and educational adjustment, between children who regularly consume caffeinated energy drinks and those who consume them less frequently or not at all, these patterns do not imply causal relationships (i.e. that caffeinated energy drink consumption is the cause of poorer health), and may be explained by other factors, including (but not limited to) the characteristics described above. The absence of longitudinal data particularly hinders attributing causality to the observed patterns.

Relationships with unhealthy and risky behaviours were found with caffeinated energy drink consumption. A larger proportion of children who had tried alcohol reported regular consumption of caffeinated energy drinks (i.e. one or more cans per week) (38%) compared to the proportion of children who had never tried alcohol (15%) (SDSYP) (Table 13). Whilst children who drank alcohol were more likely to consume caffeinated energy drinks, there were comparatively few children who reported concurrent use. Only 16% of children in year 11 (age 15 to 16) reported sometimes drinking alcohol and caffeinated energy drinks together whilst 68% of children consumed caffeinated energy drinks but not with alcohol (either because they did not drink alcohol or because they did not combine drinks) (SDSYP) (Table 17). A larger proportion of children who had tried smoking reported regular consumption of caffeinated energy drinks (54%) compared to the proportion of children who had never tried smoking (17%) (SDSYP) (Table 22). Children who ate sweets daily were more likely to consume caffeinated energy drinks at least on a weekly basis (40%) compared to children who ate sweets less frequently (19% of those who ate sweets only on a weekly basis) or who never ate sweets (23%) (HBSC-W 2013) (Table 39); the largest group of children (51% of the sample) consumed sweets 2-6 times a week and over a quarter (27.7%) also consumed caffeinated energy drinks at least on a weekly basis.

A consistent relationship emerged between caffeinated energy drink use and education behaviours and attitudes. Children who had ever been excluded or truanted from school were over twice as likely to report consuming at least one can of caffeinated energy drink in the last week (50%) compared to those who had not been truant (19%) (SDSYP) (Table 6). Children who reported a strong dislike of school were over twice as likely to report that they consumed caffeinated energy drinks on a weekly basis (44%) compared to children who reported that they liked school a lot (18%) (HBSC-W 2013) (Table 40). Similarly, far fewer children who rated their

own academic achievement as 'above average' reported consuming caffeinated energy drinks on a weekly basis (19%) compared to children who rated their academic achievement as 'below average' (57%) (HBSC-W 2013) (Table 49).

A relationship with psychological wellbeing emerged, with children who drink caffeinated energy drinks also having poorer wellbeing. Children with high levels of mental wellbeing were substantially less likely to report consuming at least one can of caffeinated energy drink in the last week (21%) compared to those who had low levels of wellbeing (36%) (SDSYP) (Table 7). There were also a number of other indications that children who were weekly consumers of caffeinated energy drinks had poorer mental health. Children who reported feeling irritable frequently were more likely to report weekly consumption of caffeinated energy drinks than those who were rarely irritable (47% vs. 23%) (HBSC-W 3013) (Table 46); more modest disparities were observed between children who frequently felt nervous (35% reporting weekly caffeinated energy drink consumption) compared to those who rarely felt nervous (30%) (HBSC-W 2013) (Table 44).

A pattern emerged for multiple adverse physical symptoms findings with children who drink caffeinated energy drinks being at higher risk. Those who reported headaches on a daily basis were much more likely to report consuming caffeinated energy drinks on a weekly basis or more (39%) compared to those who rarely reported headaches (26%); of those children reporting daily headaches, 12% reported consuming a caffeinated energy drink on a daily basis (HBSC-W 2013) (Table 41). Similarly, weekly caffeinated energy drink consumption was higher among those who reported daily dizziness (41%) (Table 43) or difficulties sleeping (38%) compared to those who reported rare instances of these conditions (25% and 23% respectively) (HBSC-W 2013) (Table 42). Children who reported daily stomach aches were more likely to be weekly drinkers of caffeinated energy drinks (36%) than those who rarely experienced stomach aches (27%) (HBSC-W 2013) (Table 47).

Analyses of low wellbeing among children: As above, we explored whether an association continues to be observed between (low) wellbeing[3] and weekly caffeinated energy drink consumption once other characteristics of children are accounted for (see **Figure 3**). The cross-sectional nature of these analyses do not imply that weekly caffeinated energy drink consumption is a trigger of low wellbeing. These analyses are intended to examine the extent of the overlap between weekly caffeinated energy drink consumption and low wellbeing, once we accounted for other characteristics. Findings suggested that **children who drink a caffeinated energy drink on a weekly basis had a higher chance of being classified as having low wellbeing (OR:1.63; 95% CI: 1.31-2.04) than those who drink caffeinated energy drinks less frequently or not at all, even after controlling for a range of sociodemographic characteristics** (SDDYP).

[3] Using the Student Life Satisfaction Survey

Latent class analysis (HSBC-W 2013): In total eleven potential indicators of physical, mental, and educational wellbeing were identified and then grouped into five profiles (or 'classes') of wellbeing (proportions refer to proportion of the HSBC-W 2013 sample). The derived classes reflect that children can appear to have low wellbeing concerning some domains alone (e.g. classes 1, 3 and 4) or appear to have low wellbeing concerning most indicators (class 5):

- Class 1. Low psychological wellbeing: children in this group were likely to report frequently feeling nervous, irritated and have low satisfaction with life (18.2%)
- Class 2. High overall wellbeing: children in this group were unlikely to report low physical, psychological or educational wellbeing (48.6%)
- Class 3. Low educational wellbeing: children in this group were likely to report that they did not like school, felt under pressure because of schoolwork, or viewed their educational performance as just average or below average (6.7%)
- Class 4. Low physical wellbeing: children in this group were highly likely to report frequent headaches or stomach aches (13.0%)
- Class 5. Overall low wellbeing: children in this group were likely to report low wellbeing across a range of physical, mental and educational wellbeing indicators (13.5%)

Multinomial logistic regression modelling indicated that, even after controlling for other potential factors that could influence child wellbeing (including age, gender, rurality, smoking status, alcohol status and family affluence scale[4]), **weekly consumption of caffeinated energy drinks increased the risk of being in classes associated with low wellbeing** (classes 1, 3, 4 or 5 above) compared to the high wellbeing class (class 2). Further comparisons between children who reported never consuming caffeinated energy drinks and those who consumed them almost on a daily basis (five days or more) suggested that daily caffeinated energy drink consumers were **two times more likely to have**:

- **low psychological wellbeing** (RR 2.11, 95% CI: 1.56-2.85)
- **low physical wellbeing** (RR 2.52, 95% CI: 1.76-3.61)

and were over **four times more likely to have**:

- **low educational wellbeing** (RR 4.81, 95% CI: 3.59-6.44)
- **low overall wellbeing** (RR 4.15, 95% CI: 2.85-6.00).

These data suggest that caffeinated energy drink consumption is a powerful marker of low wellbeing. However, we emphasise that these results do not imply that caffeinated energy drinks themselves place children at risk of low wellbeing, only that low wellbeing and caffeinated energy drink consumption tend to co-occur.

[4] This is a measure of socioeconomic status – for more information see: Hartley, J. E., Levin, K., & Currie, C. (2016). A new version of the HBSC Family Affluence Scale-FAS III: Scottish qualitative findings from the international FAS development study. *Child indicators research*, 9(1), 233-245.

4 Discussion

4.1 Main Findings

Our secondary analysis of population-level datasets revealed several key findings:

- In England, the proportion of children reporting consumption of one or more caffeinated energy drinks per week is similar across the UK; and increases with age.
    - Up to a quarter of children aged 11-12 years consume one or more caffeinated energy drinks per week compared to between a quarter and a third of those aged 13-14 years and those aged 15-16 years.
    - Caffeinated energy drink consumption appears to have fallen in recent years amongst all age groups.
- Associations with gender, regional differences and eligibility for free school meals were found.
    - Boys consistently reported higher use than girls (OR 1.89, 95% CI 1.60 to 2.24).
    - Children in Northern England regions reported higher use than those in the Southern England regions (OR 2.70, 95% CI 1.87 to 3.89).
    - Consumption was slightly more common among those eligible for free school meals than among those not eligible (OR 1.32, 95% CI 1.09 to 1.61).
- Associations with adverse physical and mental health symptoms and unhealthy or risk behaviours were found. Regular caffeinated energy drink consumption was more likely among:
    - Children who had tried smoking or drinking.
    - Children who had been excluded from school or truanted.
    - Children who reported low levels of wellbeing.
    - Children who reported adverse physical symptoms such as headaches, sleep problems and stomach problems.
- Children who consume caffeinated energy drinks on a weekly basis are more likely to experience low psychological, physical and educational wellbeing than those who consume them less frequently (OR:1.63; 95% CI: 1.31-2.04). This relationship holds even after controlling for other factors that could influence child wellbeing such as age, gender, rurality, smoking status, alcohol status and family affluence.
- Findings indicate that compared to those who never consume caffeinated energy drinks, those who consume them on a daily basis are:
    - twice as likely to have low psychological wellbeing (RR 2.11, 95% CI: 1.56-2.85) or low physical wellbeing (RR 2.52, 95% CI: 1.76-3.61)
    - four times as likely to have low educational wellbeing (RR 4.81, 95% CI: 3.59-6.44) or low overall wellbeing (RR 4.15, 95% CI: 2.85-6.00).

- Because of the cross-sectional nature of the data these associations do not imply that weekly caffeinated energy drink consumption is a trigger of low wellbeing.

4.2 Fit with the wider literature

Our findings support recent population-level analyses conducted on datasets collected from English children (8, 24) and from smaller studies that have explored mental health, educational attainment and problem behavior in children consuming caffeinated energy drinks. (10, 11, 53).

In contrast to findings from a previous review of international data (36), our analyses suggested ethnicity was not a factor consistently associated with caffeinated energy drink consumption. However, this may be due to differences between the UK and other countries: high caffeinated energy drink consumption has been noted among Canadian First Nations Peoples (21) and in Black American youth (37) (54).

We found low reported alcohol mixed with caffeinated energy drink use in children, with rates that are lower than those reported in other countries (55). However, it is possible that mixed alcohol and caffeinated energy drink use in 16- and 17-year olds is underrepresented across our included datasets. Data collection for children in Year 11 aimed for an average age of 15.5 years, which may have not captured potentially higher use in older children. No data were available to examine directly the relationships between caffeinated energy drink use and cardiovascular events or on sports performance, although the latter is available in toxicity registers as case studies (36, 56-58).

Because children weigh less than adolescents and adults, and because of pharmacokinetic differences due to age, gender, body composition and metabolic function, the amount of caffeine children ingest from energy drinks may have different effects than those experienced by adolescents and adults (24) (59). It has been suggested that limiting caffeine intake to 3mg per kg of body weight per day is suitable for children (3). Other industry-funded studies have suggested that reducing coffee drinking among young people would yield larger effects in terms of reducing caffeine intake (60).

As noted by others, longitudinal and interventions studies are needed to first establish causation that will differentiate caffeine effects from (non-caffeinated) energy drink effects (10). In order to understand the link between caffeinated energy drink use and relevant outcomes, subsequent primary research would need to compare volume, concentration and caffeine content of different energy drinks against relevant health and wellbeing outcomes to determine whether caffeine plays a specific role.

4.3 Limitations

The wide range of caffeinated energy drink measures and lack of longitudinal data limited our analyses. We selected a range of datasets to address a wide range of variables of interest. However, differences in the way variables were measured across datasets largely precluded the combining of variables across datasets. For example, frequency and amount of consumption were measured in overlapping ways, making the data difficult to interpret.

The absence of longitudinal data means we are unable to shed light on causality. Examining differences over time using the two HBSC Wales datasets suggests a change in prevalence; however due to some differences in data collection methods in terms of sampling between the two waves, and the availability of sample weights for only some participants in the later wave of data collection at the time of analysis, these differences should be seen as indicative only. It was not possible to secure access permissions for HBSC England and Scotland data for 2013/14 within the timescale of the project, although their inclusion would improve our understanding of the (cross-sectional) associations between caffeinated energy drink consumption and health characteristics; data from the 2017/18 wave of data collection for England and Scotland were unavailable at the time of analyses. Examination of these new datasets may provide further insights into incidence and causation, as noted by others (53). The data were unable to shed light on patterns of caffeinated energy drink consumption and changes to health circumstances or children's wellbeing over time. Furthermore, some of the factors known to influence caffeinated energy drink consumption (e.g. ethnicity), as well as some of the theorised health outcomes including sports performance, could not be investigated as these data were not available. This might include children's socioeconomic status and access and exposure to caffeinated energy drink vendors. While one of the datasets (SDSYP) allowed more in-depth analysis than the rest, more information is still necessary to understand the context of purchase and consumption of caffeinated energy drinks among children in the UK. This remains a pressing research need (36).

We note that although the extent of missing data was relatively modest, we were unable to implement measures to impute missing data, as we could not establish if data were missing at random. Finally, the reliance on datasets where some of the data were collected around four years ago means that some of the observed trends could have changed. However, while the prevalence of caffeinated energy drink consumption could have changed over time, with indications that it has declined, there are no reasons to assume that the social profile of energy drink consumers, and their health characteristics, would differ.

5 Conclusions and recommendations for research

Findings suggest that caffeinated energy drink consumption is higher in older children, boys, those living in northern areas or more deprived regions. There appears to be no differences between ethnic groups. Findings also suggest an association between caffeinated energy drink use and a range of physical, psychological, social and educational symptoms, attitudes and behaviours. We were unable to determine the particular role of caffeine in energy drink consumption, due to limitations in the way caffeinated energy drink consumption is currently measured. There are no data that would allow us to explore the consumption of caffeinated energy drinks, compared to coffee/tea and their associations with symptoms, behaviour and wellbeing.

UK-wide longitudinal cohort observational studies are needed to understand changes in caffeinated energy drink consumption over time and strengthen the associations seen with adverse symptoms, risk behaviours and attitudes. The influence of geographic regions and deprivation on caffeinated energy drink consumption should also be explored. There is a need to standardise the measurement of caffeinated energy drink consumption so that future research can establish a clearer picture of frequency, timing and dosage. Finally, UK-wide exploration of the context and reasons for caffeinated energy drink consumption is needed. This could usefully include exploration of alcohol and caffeinated energy drink use in older children. These findings will be of interest to those involved in UK health care, social care, public health policy, and service delivery provision to children and young people.

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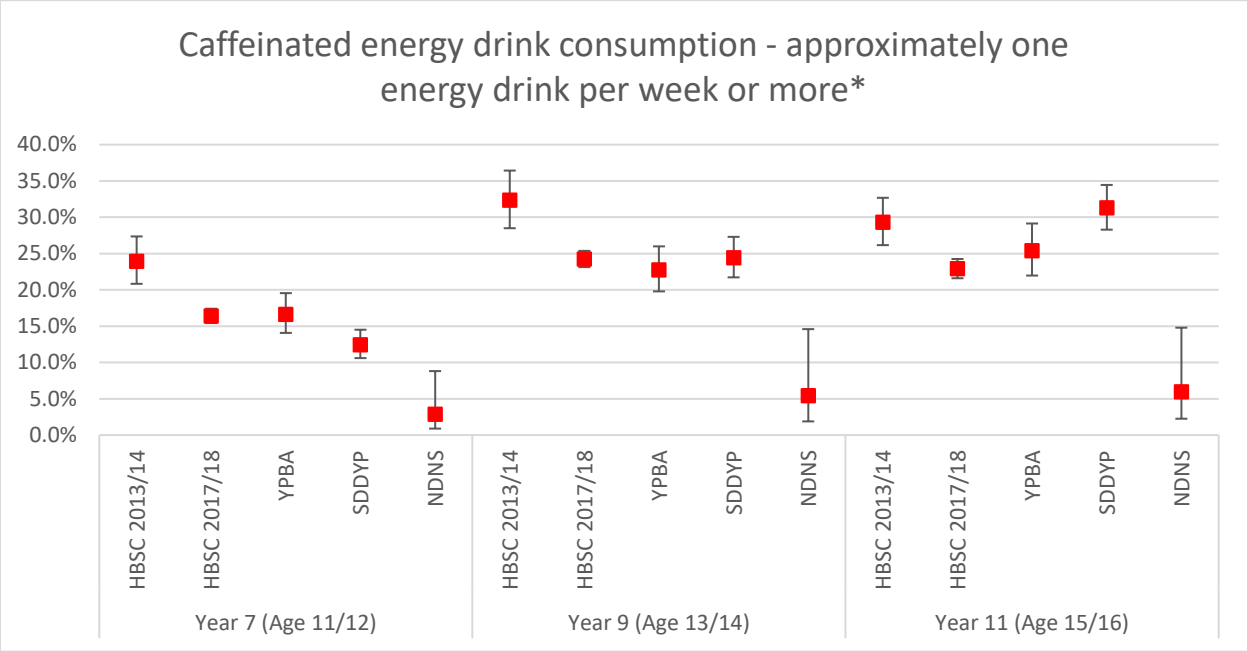
Figures and appendices

Figure 1. Approximate consumption of caffeinated energy drinks on weekly basis (or more frequently), by school year and dataset (note differences in measurement across datasets)



*Explanatory notes: Notes: See Appendix Table 1 for definitions; Northern Ireland school years are numbered differently with year 7 in England and Wales equivalent to year 8 in Northern Ireland.

Figure 2. Odds of weekly caffeinated energy drink consumption by selected characteristics

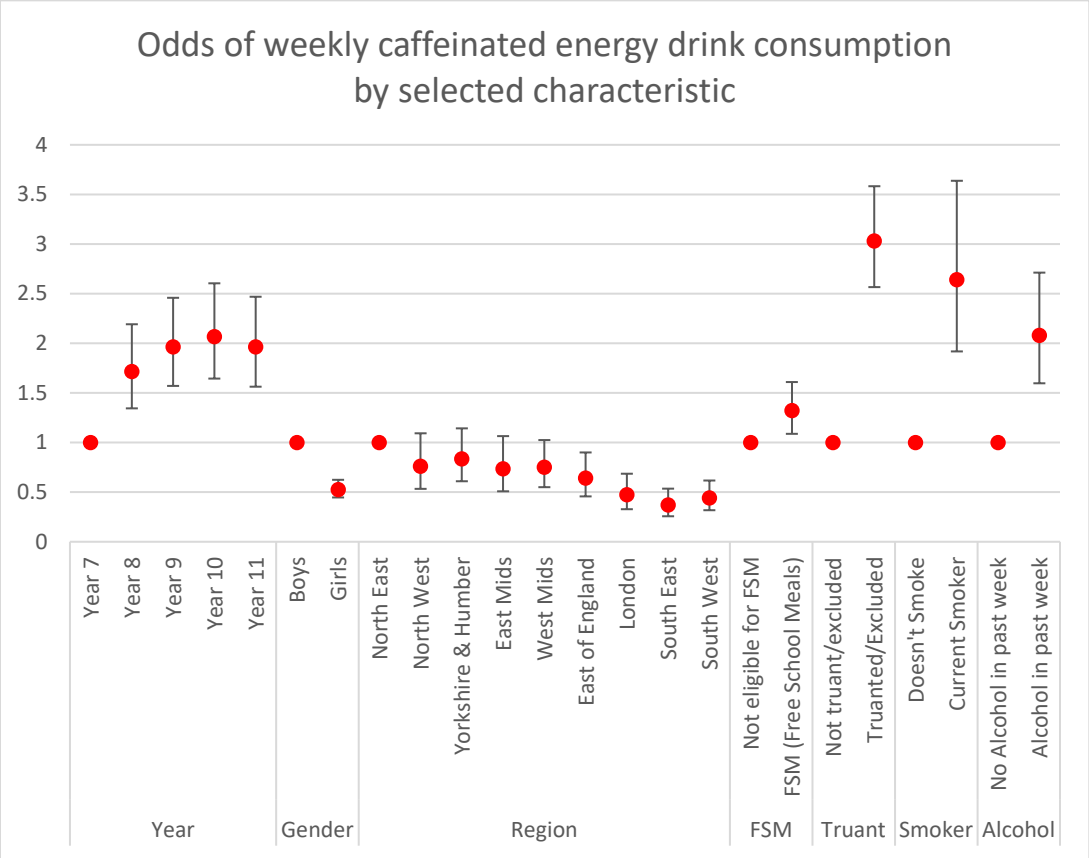
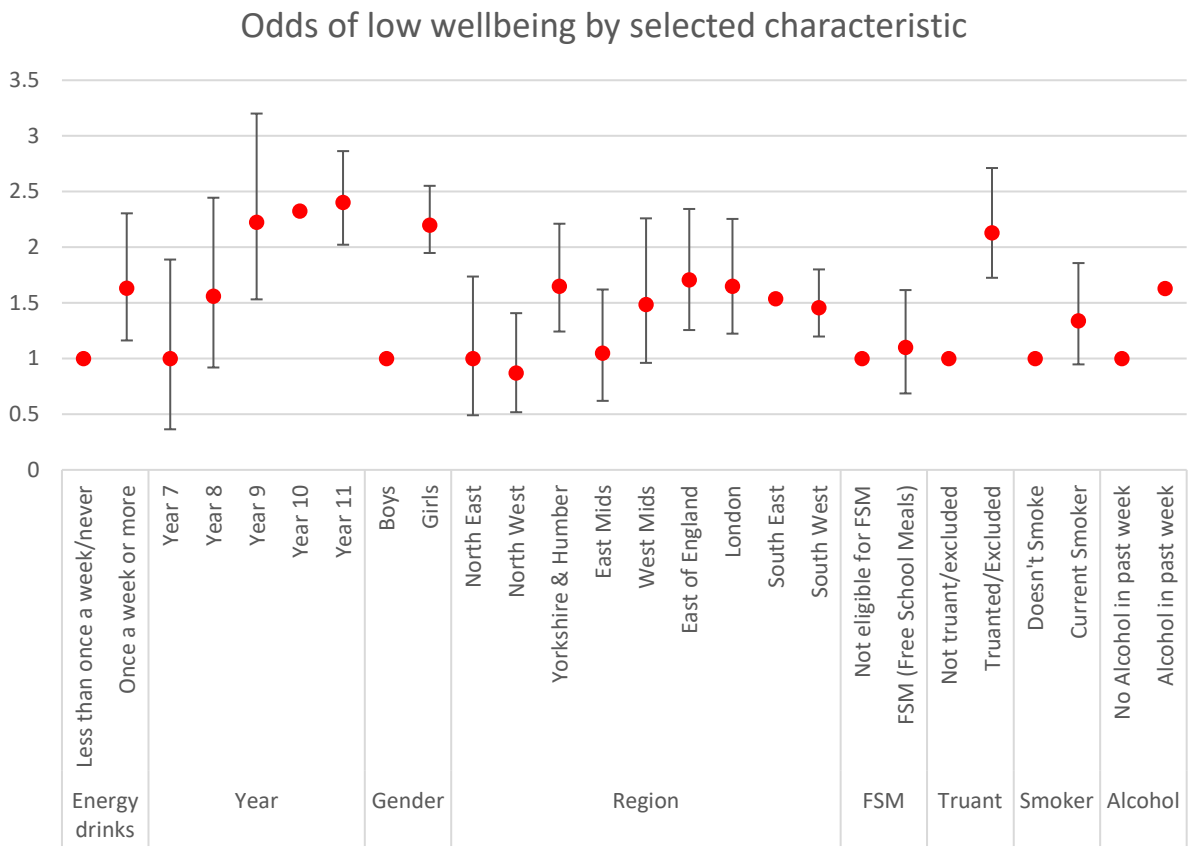


Figure 3. Odds of low wellbeing by selected characteristic



Appendix 1. Characteristics of included datasets (N=5)

Dataset (Country)	**Methods**	**Energy drink consumption variables**	**Main socio-demographic covariates**	**Main risk covariates**
Smoking & Drinking Survey of Young People (England)	**Design** Cross-sectional survey with complex multistage sampling. **Sampling frame** Secondary school children years 7-11 Data available for 6,173 children **Data collection** 2014 **Contribution to Analysis** Exploratory descriptive analysis, binary and multinomial logistic regression	Ever tried high caffeine energy drinks (e.g. Red Bull, Monster, Relentless, Burn etc.) (Weighted response rate: 97.7%) How many energy drinks consumed in the past week (Weighted response rate: 97.1%) How many small cans; how many large/small cans (Weighted response rate: 94.2%) Whether consume energy drinks with alcohol (Weighted response rate: 96.4%)	Gender Year group (proxy for age) Ethnicity Free school meal status (proxy for SES) Region of residence	**Mental health** Wellbeing **Substance use** Age first tried smoking Age first tried an alcoholic drink **Educational attitudes/behaviours** Truancy or exclusion history
Health Behaviour Survey in Children 2013 (Wales)	**Design** Cross-sectional survey with cluster sampling at the unit of school class, stratified by age, school funding and educational authority	How many times a week do you usually drink energy drinks (such as Red Bull, Monster, Rockstar)? -Never	Gender Age Ethnicity Local Authority Family Affluence	**Sugar or calorie consumption** How many times a week do you consume sweets/drinks that contain sugar? **Mental health** How often in past six months felt low

Dataset (Country)	**Methods**	**Energy drink consumption variables**	**Main socio-demographic covariates**	**Main risk covariates**
	Sampling frame N=9,055 Young people in Wales aged 11, 13 and 15 years. **Data collection** 2013/14 **Contribution to Analysis** Exploratory descriptive analysis, binary and multinomial logistic regression	-Less than once a week -Once a week -2-4 days a week -5-6 days a week -Once a day, every day -Every day, more than once (Weighted response rate: 99.7%)		How often in past six months felt irritable How often in past six months felt nervous **Neurological conditions** How often in past six months difficulties in getting to sleep How often in past six months felt dizzy **Substance misuse** On how many days have you smoked cigarettes in your lifetime/in last 30 days? How often do you smoke tobacco at present? On how many days have you drunk alcohol in your lifetime/in last 30 days? At what age did you smoke a cigarette/use cannabis/ drink alcohol/ get drunk? **Educational attitudes/behaviours** How do you feel about school at present? What does your class teacher think about your school performance compared to your classmates?
Health Behaviour Survey in Children 2017 (Wales)	**Design** Cross-sectional survey with cluster sampling at the unit of school class, stratified by age, school funding and educational authority **Sampling frame**	How many times a week do you usually drink energy drinks (such as Red Bull, Monster, Rockstar)? -Never -Less than once a week -Once a week -2-4 days a week	Gender Age Ethnicity Family Affluence Local Authority	**Sugar or calorie consumption** How many times a week do you consume sweets/drinks that contain sugar? **Mental health** How often in past six months felt low How often in past six months felt irritable How often in past six months felt nervous

Dataset (Country)	**Methods**	**Energy drink consumption variables**	**Main socio-demographic covariates**	**Main risk covariates**
	207 maintained schools involved in Wales School Health Research Network and 13 sampled independent schools Young people in Wales aged 11, 13 and 15 years; responses only partially weighted Data with sample weights available for 15,951 participants **Data collection** 2017/18 **Contribution to Analysis** Exploratory descriptive analysis	-5-6 days a week -Once a day, every day -Every day, more than once (Weighted response rate: 98.4% (of cases with sample weight))		**Neurological conditions** How often in past six months difficulties in getting to sleep How often in past six months felt dizzy **Substance misuse** On how many days have you smoked cigarettes in your lifetime/in last 30 days? How often do you smoke tobacco at present? On how many days have you drunk alcohol in your lifetime/in last 30 days? At what age did you smoke a cigarette/use cannabis/ drink alcohol/ get drunk? **Educational attitudes/behaviours** How do you feel about school at present? What does your class teacher think about your school performance compared to your classmates?
Young Persons' Behaviour & Attitudes Survey (Northern Ireland)	**Design** Cross-sectional survey with complex multistage sampling. **Sampling frame** Secondary school children years 8-12 **Data collection** 2016 **Contribution to Analysis** Exploratory descriptive analysis	How often drink energy drinks (e.g. Red Bull) – daily, weekly etc. Rarely and never combined however. (Weighted response rate: 51.0%)	Gender Year group (proxy for age) Free school meal status (proxy for SES) Ethnicity	**Substance misuse** Attitudes to alcohol and drugs

Dataset (Country)	**Methods**	**Energy drink consumption variables**	**Main socio-demographic covariates**	**Main risk covariates**
National Diet and Nutrition Survey (UK)	**Design** Cross-sectional survey with complex multistage sampling **Sampling frame** UK-wide Households; 1306 children aged 1.5-18 years in the 2014-2016 waves **Data collection** 2014-2016 **Contribution to Analysis** Exploratory descriptive analysis	Frequency of consumption of named energy drinks (Weighted response rate: N/A)	Gender Region Economic Activity of household reference person (HRP)	**Substance misuse** Consumption of alcoholic drinks (on same day/within same period)
Millennium Cohort Study (UK)	**Design** longitudinal study **Sampling frame** Families of children born in randomly selected electoral wards, disproportionally stratified to boost representation of children from disadvantaged and ethnic minority families; further booster data sweeps 19,000 children born in the UK in 2000/1; Information collected at 9 months, 3, 5, 7 and 11 years	Parent reports of consumption of drinks in between meals. Potential for parents to report on wide range of drinks. Under 5 parents* reported that their child (out of over 13,500 children) would drink energy drinks (among other drinks) in between meals	N/A – Under 5 reports of ED consumption	N/A – Under 5 reports of ED consumption

Dataset (Country)	**Methods**	**Energy drink consumption variables**	**Main socio-demographic covariates**	**Main risk covariates**
	NOTE: Data on ED consumption recorded among less than 5 children* **Data collection** 2008 **Contribution to Analysis** descriptive analysis			

*Note actual number not shown due to confidentiality reasons

Appendix 2. Data Tables

Table 1. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use by Age (weighted column percentages and unweighted numbers)

		Year 7	Year 8	Year 9	Year 10	Year 11	Total
Never	Weighted %	54.7	38.5	27.8	17.8	15.4	30.4
	Unweighted N	646.0	449.0	330.0	212.0	167.0	1804.0
Not in past week	Weighted %	27.9	31.7	40.7	44.9	46.0	38.5
	Unweighted N	337.0	382.0	498.0	516.0	519.0	2252.0
Less than a can	Weighted %	5.0	9.1	7.2	8.5	7.3	7.4
	Unweighted N	65.0	108.0	90.0	102.0	83.0	448.0
One can or more in past week	Weighted %	12.4	20.6	24.4	28.8	31.3	23.7
	Unweighted N	161.0	268.0	315.0	356.0	383.0	1483.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1209.0	1207.0	1233.0	1186.0	1152.0	5987.0
	Weighted N	1144.4	1167.9	1199.4	1233.9	1249.0	5994.6
Observations		5987					
P		<0.001					

Table 2. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use by Gender (weighted column percentages and unweighted numbers)

		Boy	Girl	Total
Never	Weighted %	23.9	36.9	30.4
	Unweighted N	736.0	1068.0	1804.0
Not in past week	Weighted %	39.0	37.9	38.5
	Unweighted N	1145.0	1107.0	2252.0
Less than a can	Weighted %	7.8	7.1	7.4
	Unweighted N	235.0	213.0	448.0
One can or more	Weighted %	29.3	18.1	23.7
	Unweighted N	917.0	566.0	1483.0
Total	%	100.0	100.0	100.0
	Unweighted N	3033.0	2954.0	5987.0
	Weighted N	3019.6	2975.0	5994.6
Observations	Weighted %	5987		
P	Unweighted N	<0.001		

Table 3. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use by Ethnicity (weighted column percentages and unweighted numbers)

		White	Mixed	Asian	Black	Other	Total
Never	Weighted %	30.8	26.0	30.4	24.2	32.3	30.3
	Unweighted N	1436.0	64.0	139.0	57.0	18.0	1714.0
Not in past week	Weighted %	37.6	44.9	41.4	43.6	41.4	38.6
	Unweighted N	1764.0	106.0	188.0	89.0	23.0	2170.0
Less than a can	Weighted %	7.5	8.0	6.9	6.8	2.9	7.4
	Unweighted N	359.0	19.0	33.0	13.0	2.0	426.0
One can or more	Weighted %	24.1	21.2	21.2	25.4	23.4	23.8
	Unweighted N	1197.0	58.0	96.0	55.0	14.0	1420.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	4756.0	247.0	456.0	214.0	57.0	5730.0
	Weighted N	4654.4	269.8	506.4	244.7	64.7	5739.9
Observations		5730					
P		0.340					

Table 4. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use by Region (weighted column percentages and unweighted numbers)

		North east	North west	Yorks & Humber	East Midlands	West Midlands	East of England	London	South east	South west	Total
Never	Weighted %	23.8	27.3	28.4	28.9	26.6	30.0	33.1	34.3	34.7	30.4
	Unweighted N	175.0	166.0	160.0	184.0	214.0	213.0	230.0	256.0	206.0	1804.0
Not in past week	Weighted %	34.3	37.7	33.5	37.2	39.5	36.8	39.8	41.8	40.6	38.5
	Unweighted N	248.0	222.0	185.0	225.0	307.0	254.0	267.0	301.0	243.0	2252.0
Less than a can	Weighted %	8.9	7.5	8.4	8.0	6.2	8.1	7.2	7.4	6.2	7.4
	Unweighted N	65.0	45.0	46.0	48.0	49.0	57.0	48.0	53.0	37.0	448.0
One can or more	Weighted %	33.1	27.4	29.6	26.0	27.6	25.1	19.9	16.5	18.6	23.7
	Unweighted N	240.0	162.0	161.0	157.0	219.0	174.0	133.0	122.0	115.0	1483.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	728.0	595.0	552.0	614.0	789.0	698.0	678.0	732.0	601.0	5987.0
	Weighted N	275.6	793.8	602.6	515.1	650.6	690.6	879.3	1001.4	585.6	5994.6
Observations		5987									
P		<0.001									

Table 5. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use by Free School Meals Eligibility (weighted column percentages and unweighted numbers)

		Not eligible for free school meals	Eligible for Free school meals	Total
Never	Weighted %	30.9	26.3	30.2
	Unweighted N	1544.0	217.0	1761.0
Not in past week	Weighted %	39.4	34.6	38.7
	Unweighted N	1927.0	299.0	2226.0
Less than a can	Weighted %	7.1	9.6	7.4
	Unweighted N	353.0	87.0	440.0
One can or more	Weighted %	22.6	29.5	23.6
	Unweighted N	1169.0	282.0	1451.0
	%	100.0	100.0	100.0
Total	Unweighted N	4993.0	885.0	5878.0
	Weighted N	5012.2	874.1	5886.3
Observations		5878		
P		<0.001		

Table 6. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use and Truancy/Exclusion (weighted column percentages and unweighted numbers)

		No self-reported truancy/ exclusion	Self-reported truancy/ exclusion	Total
Never	Weighted %	34.4	9.1	30.3
	Unweighted N	1695.0	82.0	1777.0
Not in past week	Weighted %	39.8	32.9	38.6
	Unweighted N	1942.0	290.0	2232.0
Less than a can	Weighted %	7.3	8.4	7.4
	Unweighted N	363.0	80.0	443.0
One can or more	Weighted %	18.5	49.6	23.6
	Unweighted N	965.0	491.0	1456.0
Total	%	100.0	100.0	100.0
	Unweighted N	4965.0	943.0	5908.0
	Weighted N	4957.7	958.2	5915.8
Observations		5908		
P		<0.001		

Table 7. Smoking & Drinking Survey: Frequency of Caffeinated Energy Drink use and Wellbeing (weighted column percentages and unweighted numbers)

ED consumed in past week		Low wellbeing	Not low wellbeing	Missing/ Don't know	Total
Never	Weighted %	16.8	32.0	35.0	30.4
	Unweighted N	111.0	1452.0	162.0	1725.0
Not in past week	Weighted %	39.7	39.3	32.3	38.8
	Unweighted N	252.0	1769.0	150.0	2171.0
Less than a can	Weighted %	7.6	7.4	7.9	7.4
	Unweighted N	48.0	340.0	38.0	426.0
One can or more	Weighted %	35.9	21.3	24.8	23.3
	Unweighted N	254.0	1016.0	125.0	1395.0
Total	%	100.0	100.0	100.0	100.0
	Unweighted N	665.0	4577.0	475.0	5717.0
	Weighted N	682.2	4579.0	464.2	5725.4
Observations		5717			
P		<0.001			

Table 8. Smoking & Drinking Survey: Approximate total number of small cans of caffeinated energy drinks consumed in past week by age (weighted column percentages and unweighted numbers)

Number of small cans ED in past week		Year 7	Year 8	Year 9	Year 10	Year 11	Total
None	Weighted %	89.5	82.7	78.6	73.0	70.6	78.7
	Unweighted N	1048.0	940.0	918.0	831.0	769.0	4506.0
One	Weighted %	1.8	2.2	3.3	2.5	2.9	2.6
	Unweighted N	24.0	29.0	37.0	29.0	33.0	152.0
Two	Weighted %	1.9	3.3	4.5	5.2	6.7	4.4
	Unweighted N	25.0	42.0	54.0	64.0	77.0	262.0
3-5	Weighted %	3.7	6.7	7.2	9.4	10.3	7.5
	Unweighted N	48.0	79.0	93.0	111.0	117.0	448.0
6-10	Weighted %	2.4	3.5	3.4	6.3	6.3	4.4
	Unweighted N	28.0	43.0	47.0	78.0	80.0	276.0
11+	Weighted %	0.6	1.7	2.9	3.6	3.2	2.4
	Unweighted N	6.0	23.0	36.0	42.0	43.0	150.0
One or more	Weighted %	10.5	17.3	21.4	27	29.4	21.3
	Unweighted N	131	216	267	324	350	1288
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1179.0	1156.0	1185.0	1155.0	1119.0	5794.0
	Weighted N	1119.2	1122.4	1153.1	1203.7	1215.2	5813.6
Observations		5794					
P		<0.001					

Table 9. Smoking & Drinking Survey: Approximate total number of small cans of caffeinated energy drinks consumed in past week by gender (weighted column percentages and unweighted numbers)

		Boy	Girl	Total
None	Weighted %	73.7	83.6	78.7
	Unweighted N	2116.0	2390.0	4506.0
One	Weighted %	2.9	2.2	2.6
	Unweighted N	86.0	66.0	152.0
Two	Weighted %	4.9	3.8	4.4
	Unweighted N	145.0	117.0	262.0
3-5	Weighted %	9.9	5.2	7.5
	Unweighted N	290.0	158.0	448.0
6-10	Weighted %	5.4	3.5	4.4
	Unweighted N	169.0	107.0	276.0
11+	Weighted %	3.2	1.7	2.4
	Unweighted N	98.0	52.0	150.0
One or more	Weighted %	26.3	16.4	21.3
	Unweighted N	788	500	1288
Total	Weighted %	100.0	100.0	100.0
	Unweighted N	2904.0	2890.0	5794.0
	Weighted N	2897.6	2916.1	5813.6
Observations		5794		
P		<0.001		

Table 10. Smoking & Drinking Survey: Approximate total number of small cans of caffeinated energy drinks consumed in past week by ethnicity (weighted column percentages and unweighted numbers)

Number of cans consumed in past week		White	Mixed	Asian	Black	Other	Total
None	Weighted %	78.2	81.3	79.7	78.0	81.1	78.5
	Unweighted N	3560.0	190.0	360.0	159.0	43.0	4312.0
One	Weighted %	2.5	3.1	2.6	4.0	4.5	2.6
	Unweighted N	118.0	8.0	11.0	8.0	2.0	147.0
Two	Weighted %	4.3	2.6	6.2	4.2	4.1	4.4
	Unweighted N	206.0	8.0	28.0	8.0	2.0	252.0
3-5	Weighted %	7.5	7.6	7.0	10.6	3.5	7.5
	Unweighted N	356.0	18.0	32.0	21.0	3.0	430.0
6-10	Weighted %	4.8	4.1	2.9	2.4	6.9	4.5
	Unweighted N	236.0	12.0	12.0	5.0	4.0	269.0
11+	Weighted %	2.7	1.3	1.6	0.8	0.0	2.5
	Unweighted N	131.0	4.0	8.0	2.0	0.0	145.0
One or more	Weighted %	21.8	18.7	20.3	22	18.9	21.5
	Unweighted N	1047	50	91	44	11	1243
Total	Weighted %	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	4607.0	240.0	451.0	203.0	54.0	5555.0
	Weighted N	4519.1	263.1	500.5	233.9	61.1	5577.7
Observations		5555					
P		0.198					

Table 11. Smoking & Drinking Survey: Approximate total number of small cans of caffeinated energy drinks consumed in past week by free school meal eligibility (weighted column percentages and unweighted numbers)

Number of EDs consumed in past week		No free school meals	Free school meals	Total
None	Weighted %	79.4	74.3	78.7
	Unweighted N	3825.0	603.0	4428.0
One	Weighted %	2.6	2.7	2.6
	Unweighted N	126.0	24.0	150.0
Two	Weighted %	4.4	4.5	4.4
	Unweighted N	221.0	40.0	261.0
3-5	Weighted %	7.4	8.9	7.6
	Unweighted N	366.0	78.0	444.0
6-10	Weighted %	4.0	6.6	4.4
	Unweighted N	205.0	63.0	268.0
11+	Weighted %	2.3	3.0	2.4
	Unweighted N	118.0	28.0	146.0
One or more	Weighted %	20.6	25.7	21.3
	Unweighted N	1036	233	1269
	%	100.0	100.0	100.0
Total	Unweighted N	4861.0	836.0	5697.0
	Weighted N	4888.6	830.1	5718.7
Observations		5697		
P		0.017		

Table 12. Smoking & Drinking Survey: Approximate total number of small cans of caffeinated energy drinks consumed in past week and region (weighted column percentages and unweighted numbers)

		North east	North west	Yorks & Humber	East midlands	West midlands	East of England	London	South east	South west	Total
None	Weighted %	70.0	75.2	74.0	76.4	75.2	76.8	82.9	85.0	82.7	78.7
	Unweighted N	488.0	433.0	392.0	457.0	570.0	524.0	545.0	611.0	486.0	4506.0
One	Weighted %	2.8	2.1	2.5	2.5	2.7	3.4	3.7	1.7	2.2	2.6
	Unweighted N	20.0	12.0	13.0	15.0	21.0	23.0	23.0	12.0	13.0	152.0
Two	Weighted %	5.8	5.7	3.5	5.9	4.9	6.6	3.4	2.4	3.0	4.4
	Unweighted N	39.0	32.0	18.0	35.0	36.0	43.0	23.0	18.0	18.0	262.0
3-5	Weighted %	10.1	8.3	11.4	8.0	7.6	5.9	6.3	6.1	7.2	7.5
	Unweighted N	70.0	47.0	59.0	47.0	58.0	40.0	39.0	44.0	44.0	448.0
6-10	Weighted %	7.3	5.0	5.1	4.8	6.1	5.4	3.2	2.7	3.3	4.4
	Unweighted N	50.0	29.0	26.0	27.0	46.0	37.0	21.0	20.0	20.0	276.0
11+	Weighted %	4.0	3.7	3.5	2.5	3.5	1.9	0.6	2.1	1.6	2.4
	Unweighted N	28.0	21.0	18.0	14.0	27.0	13.0	4.0	15.0	10.0	150.0
One or more	Weighted %	30	24.8	26	23.6	24.8	23.2	17.1	15	17.3	21.3
	Unweighted N	207	141	134	138	188	156	110	109	105	1288
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	695.0	574.0	526.0	595.0	758.0	680.0	655.0	720.0	591.0	5794.0
	Weighted N	263.6	766.0	574.3	499.1	625.7	673.7	849.6	985.1	576.5	5813.6
Observations		5794									
P		<0.001									

Table 13. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Alcohol Use, All respondents (weighted column percentages and unweighted numbers)

Ever consumed energy drinks/Age first tried alcohol		Never tried an alcoholic drink	Tried first alcoholic drink at 5-9 yrs	Tried first alcoholic drink at 10-11 yrs	Tried first alcoholic drink at 12-13 yrs	Tried first alcoholic drink at 13-14 yrs	Tried first alcoholic drink at 15+ yrs	Total
Never tried an energy drink	Weighted %	41.9	16.4	9.5	8.9	10.5	16.6	30.7
	Unweighted N	1567.0	17.0	31.0	76.0	53.0	29.0	1773.0
Have tried an energy drink	Weighted %	58.1	83.6	90.5	91.1	89.5	83.4	69.3
	Unweighted N	2190.0	91.0	321.0	800.0	474.0	166.0	4042.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	3757.0	108.0	352.0	876.0	527.0	195.0	5815.0
	Weighted N	3739.9	108.9	335.7	880.9	542.4	216.0	5823.7
Observations		5815						
P		<0.001						

Table 14. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Alcohol Use, Girls (weighted column percentages and unweighted numbers)

GIRLS Ever consumed energy drinks/Age first tried alcohol		Never tried an alcoholic drink	Tried first alcoholic drink at 5-9 yrs	Tried first alcoholic drink at 10-11 yrs	Tried first alcoholic drink at 12-13 yrs	Tried first alcoholic drink at 13-14 yrs	Tried first alcoholic drink at 15+ yrs	Total
Never tried an energy drink	Weighted %	51.1	14.5	10.9	10.6	14.7	24.1	37.1
	Unweighted N	918.0	6.0	17.0	48.0	36.0	22.0	1047.0
Have tried an energy drink	Weighted %	48.9	85.5	89.1	89.4	85.3	75.9	62.9
	Unweighted N	920.0	37.0	136.0	433.0	230.0	74.0	1830.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1838	43	153	481	266	96	2877
	Weighted N	1826.5	47.4	141.3	484.0	279.4	116.1	2894.8
Observations		2877						
P		<0.001						

Table 15. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Alcohol Use, Boys (weighted column percentages and unweighted numbers)

BOYS Ever consumed energy drinks/Age first tried alcohol		Never tried an alcoholic drink	Tried first alcoholic drink at 5-9 yrs	Tried first alcoholic drink at 10-11 yrs	Tried first alcoholic drink at 12-13 yrs	Tried first alcoholic drink at 13-14 yrs	Tried first alcoholic drink at 15+ yrs	Total
Never tried an energy drink	Weighted %	33.2	17.8	8.5	6.9	6.1	8.0	24.4
	Unweighted N	649.0	11.0	14.0	28.0	17.0	7.0	726.0
Have tried an energy drink	Weighted %	66.8	82.2	91.5	93.1	93.9	92.0	75.6
	Unweighted N	1270.0	54.0	185.0	367.0	244.0	92.0	2212.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1919	65	199	395	261	99	2938
	Weighted N	1913.4	61.4	194.3	396.9	263.0	99.9	2928.9
Observations		2938						
P		<0.001						

Table 16. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Alcohol Use, All Year 11 (weighted column percentages and unweighted numbers)

YEAR 11 Ever consumed energy drinks/Age first tried alcohol		Never tried an alcoholic drink	Tried first alcoholic drink at 5-9 yrs	Tried first alcoholic drink at 10-11 yrs	Tried first alcoholic drink at 12-13 yrs	Tried first alcoholic drink at 13-14 yrs	Tried first alcoholic drink at 15+ yrs	Total
Never tried an energy drink	Weighted %	27.2	9.3	5.7	6.9	10.7	17.3	15.7
	Unweighted N	83.0	2.0	4.0	16.0	30.0	28.0	163.0
Have tried an energy drink	Weighted %	72.8	90.7	94.3	93.1	89.3	82.7	84.3
	Unweighted N	232.0	20.0	45.0	224.0	269.0	150.0	940.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	315	22	49	240	299	178	1103
	Weighted N	356.5	23.1	52.4	247.3	320.4	198.4	1198.0
Observations		1103						
P		<0.001						

Table 17. Smoking & Drinking Survey: Alcohol mixed with energy drinks (AMED) use by age (weighted column percentages and unweighted numbers)

AMED by Age		Year 7	Year 8	Year 9	Year 10	Year 11	Total
Drinks EDs, never Alcohol	Weighted %	40.8	47.4	47.1	36.5	25.2	39.2
	Unweighted N	501.0	572.0	579.0	417.0	284.0	2353.0
Drinks EDs and Alcohol but not together	Weighted %	4.1	12.6	21.9	34.8	43.6	23.8
	Unweighted N	53.0	161.0	277.0	418.0	505.0	1414.0
Sometimes drinks EDs and Alcohol together	Weighted %	0.2	1.5	3.1	10.6	15.6	6.4
	Unweighted N	3.0	21.0	40.0	123.0	182.0	369.0
Don't drink EDs	Weighted %	54.9	38.6	27.9	18.0	15.6	30.6
	Unweighted N	646.0	449.0	330.0	212.0	167.0	1804.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1203.0	1203.0	1226.0	1170.0	1138.0	5940.0
	Weighted N	1140.2	1165.6	1192.6	1217.1	1234.1	5949.7
Observations		5940					
P		<0.001					

Table 18. Smoking & Drinking Survey: AMED use by gender (weighted column percentages and unweighted numbers)

AMED by Gender		Boy	Girl	Total
Drinks EDs, never Alcohol	Weighted %	45.7	32.7	39.2
	Unweighted N	1363.0	990.0	2353.0
Drinks EDs and Alcohol but not together	Weighted %	24.8	22.8	23.8
	Unweighted N	745.0	669.0	1414.0
Sometimes drinks EDs and Alcohol together	Weighted %	5.3	7.4	6.4
	Unweighted N	153.0	216.0	369.0
Don't drink EDs	Weighted %	24.2	37.0	30.6
	Unweighted N	736.0	1068.0	1804.0
Total	%	100.0	100.0	100.0
	Unweighted N	2997.0	2943.0	5940.0
	Weighted N	2984.9	2964.8	5949.7
Observations		5940		
P		<0.001		

Table 19. Smoking & Drinking Survey: AMED use by ethnicity (weighted column percentages and unweighted numbers)

AMED by Ethnicity		White	Mixed	Asian	Black	Other	Total
Drinks EDs, never Alcohol	Weighted %	34.0	52.1	61.8	59.5	61.0	38.7
	Unweighted N	1662.0	126.0	282.0	121.0	35.0	2226.0
Drinks EDs and Alcohol but not together	Weighted %	27.8	16.7	5.1	12.4	3.9	24.4
	Unweighted N	1293.0	43.0	22.0	25.0	3.0	1386.0
Sometimes drinks EDs and Alcohol together	Weighted %	7.2	5.2	2.3	3.2	2.6	6.5
	Unweighted N	331.0	13.0	8.0	6.0	1.0	359.0
Don't drink EDs	Weighted %	31.0	26.1	30.8	24.9	32.5	30.5
	Unweighted N	1436.0	64.0	139.0	57.0	18.0	1714.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	4722.0	246.0	451.0	209.0	57.0	5685.0
	Weighted N	4624.5	268.9	501.0	238.2	64.2	5696.9
Observations		5685					
P		<0.001					

Table 20. Smoking & Drinking Survey: AMED use by region (weighted column percentages and unweighted numbers)

AMED by Region		North east	North west	Yorks & Humber	East midlands	West midlands	East of England	London	South east	South west	Total
Drinks EDs, never Alcohol	Weighted %	39.8	37.6	41.1	36.7	38.0	40.7	48.1	35.4	34.5	39.2
	Unweighted N	293.0	227.0	228.0	224.0	305.0	283.0	322.0	259.0	212.0	2353.0
Drinks EDs and Alcohol but not together	Weighted %	27.7	26.1	23.7	27.0	27.8	23.2	13.5	25.0	25.7	23.8
	Unweighted N	196.0	150.0	125.0	159.0	211.0	157.0	88.0	178.0	150.0	1414.0
Sometimes drinks EDs and Alcohol together	Weighted %	8.5	8.9	6.6	7.1	7.4	5.9	4.9	5.2	4.9	6.4
	Unweighted N	57.0	50.0	34.0	41.0	54.0	38.0	30.0	37.0	28.0	369.0
Don’t drink EDs	Weighted %	24.0	27.4	28.7	29.2	26.8	30.3	33.5	34.4	35.0	30.6
	Unweighted N	175.0	166.0	160.0	184.0	214.0	213.0	230.0	256.0	206.0	1804.0
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total	Unweighted N	721.0	593.0	547.0	608.0	784.0	691.0	670.0	730.0	596.0	5940.0
	Weighted N	272.9	791.2	597.0	510.0	646.6	684.4	868.3	998.4	581.0	5949.7
Observations		5940									
P		<0.001									

Table 21. Smoking & Drinking Survey: AMED use by free school meals eligibility (weighted column percentages and unweighted numbers)

AMED by Free School Meals		No free school meals	Free School Meals	Total
Drinks EDs, never Alcohol	Weighted %	38.3	45.3	39.3
	Unweighted N	1914.0	406.0	2320.0
Drinks EDs and Alcohol but not together	Weighted %	24.5	20.4	23.9
	Unweighted N	1208.0	188.0	1396.0
Sometimes drinks EDs and Alcohol together	Weighted %	6.0	7.9	6.3
	Unweighted N	292.0	67.0	359.0
Don't drink EDs	Weighted %	31.1	26.5	30.5
	Unweighted N	1544.0	217.0	1761.0
Total	%	100.0	100.0	100.0
	Unweighted N	4958.0	878.0	5836.0
	Weighted N	4976.3	868.3	5844.6
Observations		5836		
P		<0.001		

Table 22. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Tried Smoking by Age, All respondents (weighted column percentages and unweighted numbers)

		Never Smoked	Tried smoking	Total
Never	Weighted %	35.9	5.0	30.6
	Unweighted N	1727.0	51.0	1778.0
Not in past week	Weighted %	39.9	32.3	38.6
	Unweighted N	1911.0	304.0	2215.0
Less than a can	Weighted %	7.1	8.9	7.4
	Unweighted N	344.0	93.0	437.0
One can or more	Weighted %	17.0	53.9	23.4
	Unweighted N	871.0	560.0	1431.0
Total	%	100.0	100.0	100.0
	Unweighted N	4853.0	1008.0	5861.0
	Weighted N	4861.9	1010.0	5871.9
Observations		5861		
P		<0.001		

Table 23. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Smoked Cigarettes, Girls (weighted column percentages and unweighted numbers)

GIRLS Ever consumed energy drinks/Age first tried a cigarette		Never tried cigarettes	Tried first cigarettes at 5-9 yrs	Tried first cigarettes at 10-11 yrs	Tried first cigarettes at 12-13 yrs	Tried first cigarettes at 13-14 yrs	Tried first cigarettes at 15+ yrs	Total
Never tried an energy drink	Weighted %	43.4	10.2	12.0	5.0	3.1	11.2	36.8
	Unweighted N	1018.0	2.0	8.0	12.0	4.0	7.0	1051.0
Have tried an energy drink	Weighted %	56.6	89.8	88.0	95.0	96.9	88.8	63.2
	Unweighted N	1372.0	22.0	60.0	235.0	119.0	56.0	1864.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	2390	24	68	247	123	63	2915
	Weighted N	2408.5	24.0	66.6	237.8	129.5	70.6	2936.9
Observations		2915						
P		<0.001						

Table 24. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Smoked Cigarettes, Boys (weighted column percentages and unweighted numbers)

BOYS Ever consumed energy drinks/Age first tried a cigarette		Never tried cigarettes	Tried first cigarettes at 5-9 yrs	Tried first cigarettes at 10-11 yrs	Tried first cigarettes at 12-13 yrs	Tried first cigarettes at 13-14 yrs	Tried first cigarettes at 15+ yrs	Total
Never tried an energy drink	Weighted %	28.2	2.2	4.3	3.7	2.6	1.4	24.1
	Unweighted N	709.0	1.0	4.0	10.0	2.0	1.0	727.0
Have tried an energy drink	Weighted %	71.8	97.8	95.7	96.3	97.4	98.6	75.9
	Unweighted N	1781.0	36.0	91.0	205.0	84.0	56.0	2253.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	2490	37	95	215	86	57	2980
	Weighted N	2480.4	38.8	91.5	213.9	86.4	58.3	2969.3
Observations		2980						
P		<0.001						

Table 25. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks by Age at First Smoked Cigarettes, All Year 11 (weighted column percentages and unweighted numbers)

YEAR 11 Ever consumed energy drinks/Age first tried a cigarette		Never tried cigarettes	Tried first cigarettes at 5-9 yrs	Tried first cigarettes at 10-11 yrs	Tried first cigarettes at 12-13 yrs	Tried first cigarettes at 13-14 yrs	Tried first cigarettes at 15+ yrs	Total
Never tried an energy drink	Weighted %	20.8	0.0	0.0	9.0	2.1	7.2	15.5
	Unweighted N	141.0	0.0	0.0	10.0	3.0	8.0	162.0
Have tried an energy drink	Weighted %	79.2	100.0	100.0	91.0	97.9	92.8	84.5
	Unweighted N	578.0	18.0	35.0	103.0	110.0	105.0	949.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	719	18	35	113	113	113	1111
	Weighted N	794.0	19.8	39.9	117.1	116.1	120.5	1207.3
Observations		1111						
P		<0.001						

Table 26. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Truancy or Exclusion, All respondents (weighted column percentages and unweighted numbers)

ALL: Ever consumed energy drinks/Truant		No self-reported truancy/ exclusion	Self-reported truancy/ exclusion	Total
Never tried an energy drink	Weighted %	34.2	9.1	30.1
	Unweighted N	1695.0	82.0	1777.0
Have tried an energy drink	Weighted %	65.8	90.9	69.9
	Unweighted N	3302.0	865.0	4167.0
Total	%	100.0	100.0	100.0
	Unweighted N	4997.0	947.0	5944.0
	Weighted N	4991.0	961.8	5952.7
Observations		5944		
P		<0.001		

Table 27. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Truancy or Exclusion, Girls (weighted column percentages and unweighted numbers)

GIRLS: Ever consumed energy drinks/Truant		No self-reported truancy/ exclusion	Self-reported truancy/ exclusion	Total
Never tried an energy drink	Weighted %	40.6	7.9	36.5
	Unweighted N	1022.0	29.0	1051.0
Have tried an energy drink	Weighted %	59.4	92.1	63.5
	Unweighted N	1545.0	345.0	1890.0
Total	%	100.0	100.0	100.0
	Unweighted N	2567	374	2941
	Weighted N	2595.3	368.5	2963.8
Observations		2941		
P		<0.001		

Table 28. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Truancy or Exclusion, Boys (weighted column percentages and unweighted numbers)

BOYS: Ever consumed energy drinks/Truant		No self-reported truancy/ exclusion	Self-reported truancy/ exclusion	Total
Never tried an energy drink	Weighted %	27.3	9.8	23.8
	Unweighted N	673.0	53.0	726.0
Have tried an energy drink	Weighted %	72.7	90.2	76.2
	Unweighted N	1757.0	520.0	2277.0
Total	%	100.0	100.0	100.0
	Unweighted N	2430	573	3003
	Weighted N	2395.7	593.3	2989.0
Observations		3003		
P		<0.001		

Table 29. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Low Wellbeing, All respondents (weighted column percentages and unweighted numbers)

ALL: Ever consumed energy drinks/ Wellbeing		Low wellbeing	Not low wellbeing	Don't know/ missing	Total
Never tried an energy drink	Weighted %	16.8	31.8	34.6	30.3
	Unweighted N	111.0	1452.0	162.0	1725.0
Have tried an energy drink	Weighted %	83.2	68.2	65.4	69.7
	Unweighted N	557.0	3151.0	318.0	4026.0
Total	%	100.0	100.0		100.0
	Unweighted N	668	4603	480	5751
	Weighted N	684.6	4606.8	469.0	5760.4
Observations		5751			
P		<0.001			

Table 30. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Low Wellbeing, Girls (weighted column percentages and unweighted numbers)

ALL: Ever consumed energy drinks/ Wellbeing		Low wellbeing	Not low wellbeing	Don't know/ missing	Total
Never tried an energy drink	Weighted %	18.2	39.5	41.0	36.4
	Unweighted N	75.0	841.0	101.0	1017.0
Have tried an energy drink	Weighted %	81.8	60.5	59.0	63.6
	Unweighted N	348.0	1341.0	150.0	1839.0
Total	%	100.0	100.0		100.0
	Unweighted N	423	2182	251	2856
	Weighted N	432.4	2198.8	247.5	2878.7
Observations		2856			
P		<0.001			

Table 31. Smoking & Drinking Survey: Ever consumed Caffeinated Energy Drinks and Low Wellbeing, Boys (weighted column percentages and unweighted numbers)

BOYS: Ever consumed energy drinks/ Wellbeing		Low wellbeing	Not low wellbeing	Don't know/ missing	Total
Never tried an energy drink	Weighted %	14.3	24.9	27.5	24.1
	Unweighted N	36.0	611.0	61.0	708.0
Have tried an energy drink	Weighted %	85.7	75.1	72.5	75.9
	Unweighted N	209.0	1810.0	168.0	2187.0
Total	%	100.0	100.0		100.0
	Unweighted N	245	2421	229	2895
	Weighted N	252.2	2408.0	221.5	2881.7
Observations		2856			
P		<0.001			

Table 32. HBSC Wales 2013: Frequency of caffeinated energy drink consumption by age

Frequency of energy drink consumption by age	Weighted %	Year 7	Year 8	Year 9	Year 10	Year 11	Total
Never	Weighted %	58.7	50.8	45.9	48.1	46.3	49.8
	Unweighted N	1130.0	992.0	907.0	876.0	752.0	4657.0
Less than once a week	Weighted %	17.3	21.4	21.7	23.3	24.4	21.7
	Unweighted N	323.0	404.0	448.0	404.0	394.0	1973.0
Once a week	Weighted %	8.8	10.3	12.4	10.7	9.8	10.4
	Unweighted N	160.0	180.0	193.0	194.0	155.0	882.0
2-6 days a week	Weighted %	10.6	11.4	13.7	13.0	13.8	12.6
	Unweighted N	198.0	194.0	233.0	217.0	212.0	1054.0
Daily and multiple times	Weighted %	4.5	6.1	6.3	4.8	5.7	5.5
	Unweighted N	71.0	105.0	111.0	83.0	92.0	462.0
Once a week or more	Weighted %	24	27.8	32.4	28.6	29.3	28.5
	Unweighted N	429	479	537	494	459	2398
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1882.0	1875.0	1892.0	1774.0	1605.0	9028.0
	Weighted N	1718.4	1760.5	1791.4	1867.1	1886.7	9024.2
Observations		9028					
P		<0.001					

Table 33. HBSC Wales 2013: Frequency of caffeinated energy drink consumption by gender (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by gender		Girls	Boys	Total
Never	Weighted %	42.7	57	49.9
	Unweighted N	2018	2628	4646
Less than once a week	Weighted %	22.2	21.3	21.7
	Unweighted N	1028	939	1967
Once a week	Weighted %	12.5	8.3	10.4
	Unweighted N	539	338	877
2-6 days a week	Weighted %	15.6	9.5	12.5
	Unweighted N	674	373	1047
Daily and multiple times	Weighted %	7	3.9	5.5
	Unweighted N	289	170	459
Once a week or more	Weighted %	35.1	21.7	28.4
	Unweighted N	1502	881	2383
Total	%	100.0	100.0	100.0
	Unweighted N	4548	4448	8996
	Weighted N	4488.9	4510.5	8999.5
Observations		8996		
P		<0.001		

Table 34. HBSC Wales: Frequency of caffeinated energy drink use by age, Boys (weighted column percentages and unweighted numbers)

BOYS: Frequency of energy drink consumption by age		Year 7	Year 8	Year 9	Year 10	Year 11	Total
Never	Weighted %	49.4	44.2	40.0	43.3	37.6	42.7
	Unweighted N	479.0	446.0	409.0	376.0	308.0	2018.0
Less than once a week	Weighted %	18.7	21.8	22.0	22.9	25.1	22.2
	Unweighted N	173.0	212.0	230.0	201.0	212.0	1028.0
Once a week	Weighted %	11.4	12.4	13.9	12.9	11.8	12.5
	Unweighted N	97.0	110.0	123.0	114.0	95.0	539.0
2-6 days a week	Weighted %	14.5	14.1	17.0	14.6	17.6	15.6
	Unweighted N	136.0	114.0	152.0	132.0	140.0	674.0
Daily and multiple times	Weighted %	5.9	7.5	7.2	6.3	7.9	7.0
	Unweighted N	47.0	67.0	66.0	51.0	58.0	289.0
Once a week or more	Weighted %	31.9	34	38	33.8	37.3	35.1
	Unweighted N	280	291	341	297	293	1502
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	932	949	980	874	813	4548
	Weighted N	828.2	865.2	924.5	935.6	935.4	4488.9
Observations		4548					
P		0.180					

Table 35. HBSC Wales: Frequency of caffeinated energy drink use by age, Girls (weighted column percentages and unweighted numbers)

GIRLS: Frequency of energy drink consumption by age		Year 7	Year 8	Year 9	Year 10	Year 11	Total
Never	Weighted %	67.4	57.5	52.3	53.0	54.9	57.0
	Unweighted N	649.0	544.0	495.0	497.0	443.0	2628.0
Less than once a week	Weighted %	16.1	21.0	21.6	23.8	23.8	21.3
	Unweighted N	150.0	189.0	216.0	202.0	182.0	939.0
Once a week	Weighted %	6.3	8.2	10.9	8.5	7.7	8.3
	Unweighted N	62.0	68.0	70.0	80.0	58.0	338.0
2-6 days a week	Weighted %	7.1	8.6	10.1	11.3	10.1	9.5
	Unweighted N	61.0	77.0	79.0	84.0	72.0	373.0
Daily and multiple times	Weighted %	3.1	4.7	5.2	3.3	3.4	3.9
	Unweighted N	24.0	38.0	43.0	32.0	33.0	170.0
Once a week or more	Weighted %	16.5	21.5	26.1	23.2	21.3	21.7
	Unweighted N	147	183	192	196	163	881
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	946	916	903	895	788	4448
	Weighted N	887.5	886.7	860.0	927.7	948.6	4510.5
Observations		4448					
P		0.024					

Table 36. HBSC Wales: Frequency of caffeinated energy drink use by ethnicity

Frequency of energy drink consumption by ethnic group		White	Mixed Race	Asian or Asian British	Black or Black British	Chinese	Other	Total
Never	Weighted %	50.1	42.0	54.5	46.7	31.4	44.3	49.8
	Unweighted N	4333.0	109.0	100.0	36.0	11.0	43.0	4632.0
Less than once a week	Weighted %	21.6	21.9	22.5	26.1	36.5	18.0	21.7
	Unweighted N	1827.0	54.0	35.0	23.0	9.0	15.0	1963.0
Once a week	Weighted %	10.3	11.7	11.1	8.6	18.4	16.1	10.4
	Unweighted N	806.0	27.0	20.0	8.0	5.0	12.0	878.0
2-6 days a week	Weighted %	12.6	15.0	9.1	9.9	7.6	14.1	12.6
	Unweighted N	970.0	39.0	16.0	8.0	3.0	14.0	1050.0
Daily and multiple times	Weighted %	5.4	9.3	2.7	8.8	6.2	7.5	5.5
	Unweighted N	419.0	20.0	5.0	8.0	2.0	4.0	458.0
Once a week or more	Weighted %	28.3	36.1	23	27.2	32.1	37.7	28.5
	Unweighted N	2195	86	41	24	10	30	2386
Total	%	100	100	100	100	100	100	100
	Unweighted N	8355	249	176	83	30	88	8981
	Weighted N	8288.8	249.9	218.3	101.8	32.6	93.9	8985.4
Observations		8981						
P		0.425						

Table 37. HBSC Wales: Frequency of caffeinated energy drink use by health region

Frequency of energy drink consumption by ethnic group		Abertawe Bro Morgannwg	Aneurin Bevan	Betsi Cadwaladr	Cardiff & Vale	Cwm Taf	Hwyel Dda	Powys Teaching	Total
Never	Weighted %	54.9	46.1	51.0	44.9	41.0	58.5	56.3	49.8
	Unweighted N	524.0	485.0	1237.0	578.0	447.0	873.0	513.0	4657.0
Less than once a week	Weighted %	20.5	21.3	21.7	24.4	21.4	19.9	24.4	21.7
	Unweighted N	186.0	208.0	512.0	295.0	229.0	316.0	227.0	1973.0
Once a week	Weighted %	9.1	12.8	9.3	11.5	10.5	9.4	8.6	10.4
	Unweighted N	82.0	110.0	219.0	138.0	113.0	136.0	84.0	882.0
2-6 days a week	Weighted %	10.9	13.6	12.6	13.3	18.5	8.8	8.0	12.6
	Unweighted N	96.0	115.0	268.0	171.0	193.0	131.0	80.0	1054.0
Daily and multiple times	Weighted %	4.7	6.1	5.5	5.9	8.6	3.4	2.8	5.5
	Unweighted N	41.0	57.0	114.0	79.0	91.0	53.0	27.0	462.0
Once a week or more	Weighted %	24.6	32.6	27.3	30.7	37.6	21.6	19.3	28.5
	Unweighted N	219	282	601	388	397	320	191	2398
Total	%	100		100	100	100	100	100	100
	Unweighted N	929	975	2350	1261	1073	1509	931	9028
	Weighted N	1430.0	1808.5	1949.4	1429.2	896.9	1121.5	388.8	9024.2
Observations		8981							
P		<0.001							

Table 38. HBSC Wales: Frequency of caffeinated energy drink use by ever tried alcohol (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption		Never tried alcohol	Tried alcohol	Total
Never	Weighted %	59.4	39.5	50.0
	Unweighted N	2929.0	1673.0	4602.0
Less than once a week	Weighted %	19.5	24.1	21.6
	Unweighted N	924.0	1016.0	1940.0
Once a week	Weighted %	8.9	12.2	10.5
	Unweighted N	396.0	477.0	873.0
2-6 days a week	Weighted %	8.7	16.8	12.5
	Unweighted N	381.0	650.0	1031.0
Daily and multiple times	Weighted %	3.5	7.4	5.4
	Unweighted N	167.0	280.0	447.0
Once a week or more	Weighted %	21.1	36.4	28.4
	Unweighted N	944	1407	2351
Total	%	100.0	100.0	100.0
	Unweighted N	4797	4096	8893
	Weighted N	4715.3	4183.0	8898.3
Observations		8993		
P		<0.001		

Table 39. HBSC Wales: Frequency of caffeinated energy drink use by consumption of sweets (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by consumption of sweets	Weighted %	Never eat sweets	Less than once a week	Once a week	2-6 days a week	Eat sweets Daily and multiple times	Total
Never	Weighted %	61.2	61.2	60.7	48.9	40.8	49.9
	Unweighted N	95.0	461.0	858.0	2350.0	893.0	4657.0
Less than once a week	Weighted %	15.5	22.1	20.4	23.4	19.3	21.7
	Unweighted N	24.0	166.0	287.0	1081.0	415.0	1973.0
Once a week	Weighted %	5.1	9.0	8.5	11.7	9.6	10.4
	Unweighted N	6.0	54.0	111.0	514.0	197.0	882.0
2-6 days a week	Weighted %	9.0	5.3	7.8	12.8	17.6	12.6
	Unweighted N	10.0	37.0	106.0	558.0	343.0	1054.0
Daily and multiple times	Weighted %	9.2	2.4	2.6	3.2	12.7	5.5
	Unweighted N	14.0	16.0	38.0	136.0	257.0	461.0
Once a week or more	Weighted %	23.3	16.7	18.9	27.7	39.9	28.4
	Unweighted N	30	107	255	1208	797	2397
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	149	734	1400	4639	2105	9027
	Weighted N	147.4	714.3	1352.8	4629.2	2179.6	9023.3
Observations		9027					
P		<0.001					

Table 40. HBSC Wales: Frequency of caffeinated energy drink use by dislike of school (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by school dislike	Weighted %	Like a lot	Like a bit	Not very much	Not at all	Total
Never	Weighted %	63.1	49.8	40.4	34.9	50.0
	Unweighted N	1433.0	2275.0	648.0	258.0	4614.0
Less than once a week	Weighted %	18.9	23.5	21.4	21.0	21.8
	Unweighted N	393.0	1029.0	359.0	169.0	1950.0
Once a week	Weighted %	7.1	10.4	14.8	10.4	10.4
	Unweighted N	144.0	435.0	208.0	81.0	868.0
2-6 days a week	Weighted %	7.4	12.5	15.3	20.2	12.4
	Unweighted N	144.0	515.0	240.0	138.0	1037.0
Daily and multiple times	Weighted %	3.5	3.8	8.2	13.5	5.3
	Unweighted N	61.0	161.0	121.0	102.0	445.0
Once a week or more	Weighted %	18	26.7	38.2	44.1	28.2
	Unweighted N	349	1111	569	321	2350
Total	%	100.0	100.0	100.0	100.0	100.0
	Unweighted N	2175	4415	1576	748	8914
	Weighted N	2135.3	4408.1	1612.2	755.1	8910.8
Observations		8914				
P		<0.001				

Table 41. HBSC Survey: Caffeinated energy drink consumption and headaches (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by headaches	Weighted %	Experience Headaches About every day	More once/week	About every week	About every month	Rarely or never experience headaches	Total
Never	Weighted %	39.3	47.3	44.1	49.9	53.7	49.9
	Unweighted N	205.0	525.0	540.0	1109.0	2222.0	4601.0
Less than once a week	Weighted %	21.5	20.6	24.0	23.1	20.7	21.7
	Unweighted N	104.0	234.0	279.0	508.0	825.0	1950.0
Once a week	Weighted %	10.6	10.2	10.9	11.6	9.6	10.4
	Unweighted N	47.0	112.0	121.0	233.0	353.0	866.0
2-6 days a week	Weighted %	16.6	14.8	15.3	10.6	11.7	12.6
	Unweighted N	69.0	159.0	160.0	222.0	430.0	1040.0
Daily and multiple times	Weighted %	12.0	7.2	5.8	4.8	4.3	5.4
	Unweighted N	53.0	79.0	64.0	100.0	155.0	451.0
Once a week or more	Weighted %	39.2	32.1	31.9	27	25.6	28.4
	Unweighted N	169	350	345	555	938	2357
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	478	1109	1164	2172	3985	8908
	Weighted N	499.6	1129.4	1149.0	2146.9	3988.8	8913.7
Observations		8908					
P		<0.001					

Table 42. HBSC Survey: Caffeinated energy drink consumption and sleep difficulties (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by sleep difficulties	Weighted %	Experience Sleep Difficulties About every day	More once/week	About every week	About every month	Rarely or never experience Sleep Difficulties	Total
Never	Weighted %	44.3	45.3	45.3	51.3	53.3	49.9
	Unweighted N	538.0	489.0	502.0	765.0	2288.0	4582.0
Less than once a week	Weighted %	18.1	21.7	26.7	23.6	20.8	21.7
	Unweighted N	223.0	238.0	252.0	346.0	880.0	1939.0
Once a week	Weighted %	10.2	13.0	10.9	9.5	10.0	10.4
	Unweighted N	104.0	113.0	107.0	133.0	405.0	862.0
2-6 days a week	Weighted %	17.1	13.9	12.9	11.6	11.2	12.6
	Unweighted N	183.0	141.0	128.0	156.0	431.0	1039.0
Daily and multiple times	Weighted %	10.4	6.0	4.1	4.0	4.6	5.4
	Unweighted N	116.0	61.0	44.0	57.0	172.0	450.0
Once a week or more	Weighted %	37.6	33	28	25.1	25.9	28.4
	Unweighted N	403	315	279	346	1008	2351
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	1164	1042	1033	1457	4176	8872
	Weighted N	1198.9	1073.4	1030.4	1467.5	4112.0	8882.1
Observations		8872					
P		<0.001					

Table 43. HBSC Survey: Caffeinated energy drink consumption and dizziness (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by dizziness	Weighted %	Experience dizziness About every day	More once/week	About every week	About every month	Rarely or never experience dizziness	Total
Never	Weighted %	42.5	39.0	43.5	46.6	53.4	49.9
	Unweighted N	171.0	262.0	323.0	674.0	3151.0	4581.0
Less than once a week	Weighted %	16.1	21.5	24.5	23.7	21.2	21.7
	Unweighted N	70.0	136.0	173.0	328.0	1228.0	1935.0
Once a week	Weighted %	11.1	10.7	10.8	12.8	9.7	10.4
	Unweighted N	42.0	53.0	78.0	172.0	516.0	861.0
2-6 days a week	Weighted %	17.7	19.3	14.6	12.0	11.4	12.6
	Unweighted N	61.0	111.0	112.0	168.0	587.0	1039.0
Daily and multiple times	Weighted %	12.7	9.5	6.7	4.9	4.4	5.4
	Unweighted N	49.0	59.0	50.0	67.0	225.0	450.0
Once a week or more	Weighted %	41.4	39.5	32	29.7	25.4	28.4
	Unweighted N	152	223	240	407	1328	2350
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	393	621	736	1409	5707	8866
	Weighted N	398.7	648.7	780.9	1427.5	5622.9	8878.8
Observations		8866					
P		<0.001					

Table 44. HBSC Survey: Caffeinated energy drink consumption and feeling nervous (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by nervousness	Weighted %	Experience nervousness About every day	More once/week	About every week	About every month	Rarely or never experience nervousness	Total
Never	Weighted %	45.3	49.4	47.7	51.5	50.5	49.9
	Unweighted N	274.0	481.0	661.0	1277.0	1891.0	4584.0
Less than once a week	Weighted %	20.1	18.8	24.5	24.2	20.1	21.7
	Unweighted N	133.0	182.0	309.0	579.0	734.0	1937.0
Once a week	Weighted %	8.2	10.4	11.3	9.6	11.1	10.4
	Unweighted N	47.0	88.0	142.0	214.0	373.0	864.0
2-6 days a week	Weighted %	15.8	13.7	12.6	11.0	12.8	12.6
	Unweighted N	77.0	124.0	158.0	248.0	429.0	1036.0
Daily and multiple times	Weighted %	10.6	7.7	3.9	3.8	5.6	5.4
	Unweighted N	59.0	70.0	49.0	86.0	187.0	451.0
Once a week or more	Weighted %	34.6	31.8	27.8	24.3	29.4	28.4
	Unweighted N	183	282	349	548	989	2351
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	590	945	1319	2404	3614	8872
	Weighted N	620.0	958.6	1340.8	2416.3	3546.0	8881.8
Observations		8872					
P		<0.001					

Table 45. HBSC Survey: Caffeinated energy drink consumption and low mood (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by low mood	Weighted %	Experience low mood about every day	More once/week	About every week	About every month	Rarely or never experience low mood	Total
Never	Weighted %	40.5	45.8	46.8	48.7	52.9	49.9
	Unweighted N	240.0	379.0	446.0	873.0	2647.0	4585.0
Less than once a week	Weighted %	20.8	21.5	24.1	23.0	21.0	21.7
	Unweighted N	121.0	191.0	221.0	391.0	1015.0	1939.0
Once a week	Weighted %	10.2	10.5	10.7	11.1	10.1	10.4
	Unweighted N	56.0	79.0	91.0	182.0	453.0	861.0
2-6 days a week	Weighted %	16.2	15.0	13.3	13.3	11.2	12.6
	Unweighted N	85.0	111.0	115.0	225.0	499.0	1035.0
Daily and multiple times	Weighted %	12.2	7.1	5.1	4.0	4.9	5.4
	Unweighted N	61.0	58.0	46.0	72.0	213.0	450.0
Once a week or more	Weighted %	38.7	32.7	29.1	28.3	26.1	28.4
	Unweighted N	202	248	252	479	1165	2346
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	563	818	919	1743	4827	8870
	Weighted N	586.2	871.1	898.9	1768.0	4753.3	8877.4
Observations		8870					
P		<0.001					

Table 46. HBSC Survey: Caffeinated energy drink consumption and feeling irritable (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by feeling irritable	Weighted %	Feel irritable about every day	More once/week	About every week	About every month	Rarely or never feel irritable	Total
Never	Weighted %	33.8	43.1	45.1	51.2	56.5	49.9
	Unweighted N	254.0	509.0	614.0	1098.0	2118.0	4593.0
Less than once a week	Weighted %	19.3	20.8	24.9	23.5	20.2	21.6
	Unweighted N	146.0	243.0	313.0	491.0	746.0	1939.0
Once a week	Weighted %	12.9	10.4	10.7	10.2	9.8	10.4
	Unweighted N	89.0	116.0	128.0	192.0	338.0	863.0
2-6 days a week	Weighted %	20.3	18.8	13.8	11.1	9.4	12.6
	Unweighted N	133.0	189.0	175.0	218.0	324.0	1039.0
Daily and multiple times	Weighted %	13.6	6.9	5.5	4.0	4.0	5.4
	Unweighted N	104.0	73.0	72.0	72.0	131.0	452.0
Once a week or more	Weighted %	46.9	36.1	30	25.3	23.3	28.5
	Unweighted N	326	378	375	482	793	2354
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	726	1130	1302	2071	3657	8886
	Weighted N	774.2	1147.3	1287.1	2066.1	3615.8	8890.5
Observations		8886					
P		<0.001					

Table 47. HBSC Survey: Caffeinated energy drink consumption and stomach ache (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by experience of stomach ache	Weighted %	Have stomach ache about every day	More once/week	About every week	About every month	Rarely or never have stomach ache	Total
Never	Weighted %	42.9	39.4	48.3	49.3	52.7	50.0
	Unweighted N	108.0	268.0	396.0	1483.0	2339.0	4594.0
Less than once a week	Weighted %	21.1	20.6	19.1	24.1	20.7	21.7
	Unweighted N	49.0	136.0	159.0	683.0	913.0	1940.0
Once a week	Weighted %	10.7	12.0	11.1	10.5	9.8	10.4
	Unweighted N	23.0	72.0	77.0	294.0	397.0	863.0
2-6 days a week	Weighted %	11.2	15.6	15.1	12.1	12.0	12.6
	Unweighted N	26.0	105.0	113.0	319.0	475.0	1038.0
Daily and multiple times	Weighted %	14.1	12.3	6.4	4.0	4.7	5.4
	Unweighted N	33.0	73.0	48.0	114.0	183.0	451.0
Once a week or more	Weighted %	36	40	32.6	26.6	26.6	28.3
	Unweighted N	82	250	238	727	1055	2352
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	239	654	793	2893	4307	8886
	Weighted N	232.4	650.9	809.6	2880.9	4319.4	8893.3
Observations		8886					
P		<0.001					

Table 48. HBSC Wales 2017/18: Frequency of caffeinated energy drink use by age (weighted column percentages and unweighted numbers)

	Year 7	Year 9	Year 11	Total
Never	69.4	56.4	56.8	61.0
	3850.0	3322.0	2397.0	9569.0
Less than once a week	14.2	19.4	20.3	17.9
	792.0	1134.0	880.0	2806.0
Once a week	5.9	8.1	7.9	7.3
	328.0	471.0	351.0	1150.0
2-6 days a week	6.4	9.6	9.9	8.6
	354.0	557.0	430.0	1341.0
Daily and multiple times	4.0	6.5	5.1	5.2
	225.0	379.0	229.0	833.0
	100.0	100.0	100.0	100.0
Total	5549	5863	4287	15699
	5401.6	5208.3	5087.8	15697.6
Observations	9028			
P	0.000626			

Table 49. HBSC Survey: Caffeinated energy drink consumption and self-rated academic achievement (weighted column percentages and unweighted numbers)

Frequency of energy drink consumption by self-rated achievement	Weighted %	Very good	Good	Average	Below average	Total
Never	Weighted %	63.1	49.6	38.3	25.0	50.0
	Unweighted N	1523.0	2267.0	741.0	69.0	4600.0
Less than once a week	Weighted %	18.2	23.6	22.3	18.4	21.8
	Unweighted N	424.0	1036.0	439.0	50.0	1949.0
Once a week	Weighted %	6.9	10.9	13.1	12.0	10.4
	Unweighted N	157.0	452.0	229.0	29.0	867.0
2-6 days a week	Weighted %	8.1	11.7	18.0	25.8	12.5
	Unweighted N	171.0	484.0	328.0	56.0	1039.0
Daily and multiple times	Weighted %	3.7	4.2	8.3	18.7	5.4
	Unweighted N	74.0	173.0	149.0	48.0	444.0
Once a week or more	Weighted %	18.7	26.8	39.4	56.6	28.2
	Unweighted N	402	1109	706	133	2350
Total	%	100.0	100.0	100.0	100.0	100.0
	Unweighted N	2349	4412	1886	252	8899
	Weighted N	2368.4	4315.6	1972.2	251.7	8907.9
Observations		8891				
P		<0.001				

Table 50. Young People's Behaviour and Attitudes Survey 2016: Caffeinated energy drink consumption by year group

ED consumption by year group		Year 8*	Year 9	Year 10	Year 11	Year 12	Total
Once a day or more	Weighted %	4.8	7.0	6.4	7.2	6.7	6.4
	Unweighted N	36.0	52.0	50.0	53.0	43.0	234.0
Most days	Weighted %	3.3	4.8	5.1	8.9	7.0	5.8
	Unweighted N	24.0	35.0	42.0	61.0	45.0	207.0
Once or twice a week	Weighted %	8.5	13.4	11.3	13.4	11.7	11.7
	Unweighted N	63.0	93.0	83.0	90.0	77.0	406.0
Less than once a week or never	Weighted %	83.4	74.8	77.3	70.5	74.6	76.1
	Unweighted N	633.0	571.0	609.0	506.0	507.0	2826.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0
	Unweighted N	756	751	784	710	672	3673
	Weighted N	733.6	730.1	732.4	742.5	742.6	3681.2
Observations		3673					
P		<0.001					

*Note Year 8 is equivalent to Year 7 in England and Wales

Table 51. National Diet and Nutrition Survey 2014-2016: Caffeinated energy drinks over 4-day period

Energy drinks over 4-day period	under 11	11-12	13-14	15-16	17-18	Total
None	99.8	97.1	94.6	94.0	87.1	96.9
	763.0	114.0	125.0	132.0	135.0	1269.0
One drink	0.2	2.9	5.2	4.4	8.1	2.4
	1.0	4.0	4.0	4.0	9.0	22.0
Two or more drinks	0.0	0.0	0.2	1.6	4.8	0.7
	0.0	0.0	2.0	2.0	11.0	15.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
	764.0	118.0	131.0	138.0	155.0	1306.0
Observations	1306					
P	p<0.001					

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