COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

Burden of Cancer Attributable to Alcohol Consumption – Further details

1. In November 2014, paper CC/2014/18 outlining key areas of burden estimation and providing previous examples of approaches used for the UK was presented to the Committee.

2. The Committee concluded that it would not undertake a calculation of burden of alcohol on cancer. Instead the published papers would be further reviewed by the Committee and a table prepared based on the aspects discussed for the literature presented.

3. The requested table, attached at Annex A, outlines the following for each paper: the hypothesis, cancer sites assessed, whether the evaluation is at population or individual level, how the alcohol exposure assessment was carried out, what adjustments were made for underreporting, how a never-drinker was defined, what the reference group was, how the attributable fraction was calculated, any latency period used, sensitivity analyses, uncertainties in the data, and, where relevant, a presentation of the alcohol attributable fractions.

4. For reference the previous paper is attached at Annex B

Questions for the Committee

i. What are Members' opinions of the approaches used to estimate burden?

ii. Do Members have any specific opinions on the estimated alcohol attributable burden estimates for the UK available in the literature?

iii. What conclusions on burden of alcohol on cancer would the Committee like to include in its statement?

Secretariat
April 2015

References

Jones L., Bellis M. A., Dedman D., Sumnall H., Tocque K. Alcohol-attributable fractions for England. Alcohol-attributable mortality and hospital admissions. Liverpool: North West Public Health Observatory; 2008

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Schütze M, Boeing H, Pischon T, Rehm J, Kehoe T, Gmel G, Olsen A, Tjønneland AM, Dahm CC, Overvad K, Clavel-Chapelon F, Boutron-Ruault MC, Trichopoulou A, Benetou V, Zylis D, Kaaks R, Rohrmann S, Palli D, Berrino F, Tumino R, Vineis P, Rodríguez L, Agudo A, Sánchez MJ, Dorronsoro M, Chirlaque MD, Barricarte A, Peeters PH, van Gils CH, Khaw KT, Wareham N, Allen NE, Key TJ, Boffetta P, Slimani N, Jenab M, Romaguera D, Wark PA, Riboli E, Bergmann MM. (2011). Alcohol attributable burden of incidence of cancer in eight European countries based on results from prospective cohort study. BMJ; 342: d1584.

COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

Burden of Cancer Attributable to Alcohol Consumption – Further details

Table outlining key aspects for consideration and the approaches used in each paper making estimates of burden of alcohol on cancer.

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Reference	Jones et al, 2008		
A priori hypothesis	To provide an indication of the public health effects of alcohol by calculating the alcohol attributable fractions for England based on the most recent population based estimates of alcohol consumption data and the risk estimates extracted from the published literature.		
Cancer sites assessed	Study chosen for analysis	Exposure categories *	Dose-response relationship
Oral cavity and pharynx	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.86 (1.76 – 1.96) 3.11 (2.85 – 3.39) 6.45 (5.76 – 7.24)
Larynx	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.43 (1.38 – 1.48) 2.02 (1.89 – 2.16) 3.86 (3.42 – 4.35)
Oesophagus	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.39 (1.36 – 1.42) 1.93 (1.85 – 2.00) 3.59 (3.34 – 3.87)
Colon	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.05 (1.01 – 1.09) 1.10 (1.03 – 1.18) 1.21 (1.05 – 1.39)
Rectum	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.09 (1.08 – 1.12) 1.19 (1.14 – 1.24) 1.42 (1.30 – 1.55)
Liver	Corrao et al. 2004	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	 1.19 (1.12 – 1.27) 1.40 (1.25 – 1.56) 1.81 (1.50 – 2.19)
Breast	Hamajima et al 2002	Abstention 1-19 g/day 20-39 g/day 40-74 g/day >75 g/day	Linear 1.07 1.21 1.32 1.46 (1.33 –1.61)
Population or individual basis	Population - England		
Alcohol exposure assessment methodology	For the age group 19-75 years, data on the proportion of non-drinkers and the average alcohol consumption was obtained from the General Household Survey in England		
Adjustment for under-reporting	Adjusted GHS data to correct for the increase in number of units in wine glasses and strong beers		
Definition of never-drinker			
Reference category	Abstention from alcohol consumption		
Methodology for calculation of attributable fraction	Levin's equation $AAF = \frac{\sum_{i=1}^{4} p_i(RR_i - 1)}{\sum_{i=1}^{4} p_i(RR_i - 1) + 1}$, where RR_i = relative risk of mortality in exposed groups compared with unexposed groups; p_i = proportion of the population exposed in each group; i = 0 to k, where i=0 represent nondrinkers.		
Latency period chosen	Chose the most recent alcohol consumption data in their calculations and mortality determined according to deaths for the same year.		
Sensitivity analyses			
Uncertainty in the data	Acknowledge limitations in the data due to the reliance on the accuracy of population estimates of alcohol consumption and the availability and quality of the relative risk estimates in the literature. Not developed methodology for calculating confidence intervals for each AAF.		

Reference	Jones et al, 2008 (cont)	
Comments	* Exposure categories chosen as they corresponded with the risk estimates in Corrao et al 2004 Risk estimates may not be equivalent for men and women. Corrao et al did not report separate data for men and women. Consideration of the use of risk estimates drawn from international literature as the drinking patterns between populations may change the effect of alcohol consumption on risk of disease.	
Alcohol attributable fraction	Men	Women
Oral cavity and pharynx	0.44–0.57	0.20–0.35
Larynx	0.14–0.2	0.05–0.10
Oesophagus	0.26–0.38	0.10–0.20
Colon	0.06–0.09	0.02–0.04
Rectum	0.04–0.06	0.01–0.03
Liver	0.07–0.11	0.03–0.05
Breast		0.11–0.21

Reference	Rehm et al, 2010		
A priori hypothesis	Three objectives: 1) To model the volume of alcohol exposure using US National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) with different distributions 2) to shift the alcohol use distribution to the level of adult per capita consumption 3) to show the impact of shifting the alcohol use distribution on alcohol attributable fractions using liver cirrhosis as an example		
Cancer sites assessed	Study chosen for analysis	Exposure categories	Dose-response relationship
None – used liver cirrhosis data		>0 - 30 g/day >30 - 60 g/day >60 - 90 g/day >90 g/day	
Population or individual basis	Population - US		
Alcohol exposure assessment methodology	US National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) was used to obtain data on alcohol consumption from a representative sample of civilian non-institutionalised adults in the US in 2001-2002. US per capita alcohol consumption data from 2001-2002		
Adjustment for under-reporting	Up-shifted the data to account for under-reporting in survey data. They used a method for triangulation of survey and per capita data for deriving population exposure based on the gamma distribution for drinkers.		
Definition of never-drinker	Not given but did discuss the abstainer category in the analysis. Referred to current abstainers as those who were lifetime abstainers plus ex-drinkers.		
Reference category			
Methodology for calculation of attributable fraction	AAFs based on continuous distributions were obtained using the following: $AAF = \frac{P_{abs} + P_{form} RR_{form} + \int_0^\infty P(x) RR(x) dx - 1}{P_{abs} + P_{form} RR_{form} + \int_0^\infty P(x) RR(x) dx}$ while the categorical value of the AAFs were obtained using: $AAF = \frac{P_{abs} + P_{form} RR_{form} + \sum_{i=0}^{k} P(i) RR(i) - 1}{P_{abs} + P_{form} RR_{form} + \sum_{i=0}^{k} P(i) RR(i)}$ where P_{abs} represents the proportion of lifetime abstainers, P_{form} the proportion of former drinkers, and P(x) the probability distribution function of drinkers. RR_{form} represents the relative risk for former drinkers, and RR(x) the relative risk function for a given alcohol consumption in grams per day. The subscript i denotes the groups as characterized by different categories for volume of drinking.		
Latency period chosen			
Sensitivity analyses	Sensitivity analysis with consumption capped at 150 grams of pure alcohol per day.		
Uncertainty in the data	Assumption made in the triangulation method was a constant factor of under-reporting for all sub-populations as defined by sex, age and ethnicity.		
Comments			
Alcohol attributable fraction	Data presented on the AAF for liver cirrhosis and not cancer related data.		

Reference	Parkin, 2011		
A priori hypothesis	To quantify the cancers attributable to alcohol consumption in the UK in 2010		
Cancer sites assessed	Study chosen for analysis	Exposure categories	Dose-response relationship
Oral Cavity and Pharynx	Corrao et al. 2004	0 g/d 25 g/d 50 g/d 100 g/d	 1.86 (1.76–1.96) 3.11 (2.85–3.39) 6.45 (5.76–7.24)
Larynx	Corrao et al. 2004	0 g/d 25 g/d 50 g/d 100 g/d	 1.43 (1.38–1.48) 2.02 (1.89–2.16) 3.86 (3.42–4.35)
Oesophagus	Corrao et al. 2004	0 g/d 25 g/d 50 g/d 100 g/d	 1.39 (1.36–1.42) 1.93 (1.85–2.00) 3.59 (3.34–3.87)
Colorectal	Cho et al (2004) Moskal et al (2007) Ferrari et al (2007) WCRF (2007)		
Breast	Hamajima et al 2002		
Liver	Corrao et al. 2004	0 g/d 25 g/d 50 g/d 100 g/d	 1.19 (1.12–1.27) 1.40 (1.25–1.56) 1.81 (1.50–2.19)
Population or individual basis	Population - UK		
Alcohol exposure assessment methodology	National diet and Nutrition survey (representative sample of adults in the age group of 19-64 years living in private households in Great Britain, surveyed between July 2000 and June 2001. For the age group >65 years, data on the proportion of non-drinkers and the average alcohol consumption was obtained from the General Household Survey (GHS)		
Adjustment for under-reporting	None However, commentary is provided in paper on the issue of under-reporting in questionnaire. They state that as the GHS and the Governments alcohol strategy (HMG) 2007 believe people underestimate their alcohol intake and as estimates of risk are generally based on questionnaire responses, they are likely to overestimate the risk in relation to actual alcohol consumption		
Definition of never-drinker	Information not provided in paper		
Reference category	0 g/d		
Methodology for calculation of attributable fraction	$\mathrm{PAF} = \frac{\Sigma(p_x \times \mathrm{ERR}_x)}{1 + \Sigma(p_x \times \mathrm{ERR}_x)}$ where p_x is the proportion of the population in consumption level x (x=1–12) and ERR_x the excess relative risk (RRx−1) in consumption level x (x=1–12)		
Latency period chosen	Paper states that the latent period between exposure to alcohol and the appropriate increase in cancer risk is unknown. Chose to assume it would be 10 years, using cancer data from 2010 and alcohol consumption data from 2000		
Sensitivity analyses			
Uncertainty in the data			
Comments			

Reference	Parkin, 2011 (cont)		
Population attributable fraction	Age at outcome	Men	Women
Oral Cavity and Pharynx	25-34	0.36	0.23
	35-44	0.39	0.18
	45-59	0.40	0.18
	60-74	0.38	0.17
	≥75	0.32	0.16
Larynx	25-34	0.26	0.17
	35-44	0.29	0.13
	45-59	0.30	0.13
	60-74	0.28	0.12
	≥75	0.24	0.11
Oesophagus	25-34	0.25	0.16
	35-44	0.28	0.12
	45-59	0.28	0.12
	60-74	0.26	0.12
	≥75	0.22	0.11
Colorectal	25-34	0.16	0.10
	35-44	0.17	0.07
	45-59	0.18	0.08
	60-74	0.16	0.07
	≥75	0.14	0.06
Breast	25-34		0.08
	35-44		0.07
	45-59		0.07
	60-74		0.06
	≥75		0.06
Liver	25-34	0.12	0.07
	35-44	0.13	0.05
	45-59	0.13	0.06
	60-74	0.12	0.05
	≥75	0.10	0.05

Reference	Schutze et al. 2011 - EPIC study 109,118 men and 254,870 women; Aged 35-70 years		
A priori hypothesis	To calculate cancer burden attributable to current and former alcohol consumption in 8 European countries (France, Italy, Spain, UK, the Netherlands, Greece, Germany and Denmark) based on relative risk estimates from the EPIC cohort study		
Cancer sites assessed	Exposure categories	Hazard Risk Ratio ** Continuous 12 g/d	Hazard Risk Ratio ** Former drinker
All cancer sites	Men Women	1.03 (1.02 - 1.04) 1.03 (1.01 - 1.05)	1.54 (1.20 - 1.98) 1.10 (1.01 - 1.20)
Alcohol-related cancers combined *	Men Women	1.10 (1.07 - 1.12) 1.05 (1.03 - 1.07)	3.72 (1.81 - 7.65) 1.04 (0.92 - 1.19)
Upper aero-digestive tract	Men Women	1.17 (1.12 - 1.23) 1.25 (1.10 - 1.42)	1.54 (1.20 - 1.98) 0.65 (0.27 - 1.56)
Colorectal	Men Women	1.05 (1.02 - 1.09) 1.04 (0.99 - 1.09)	2.19 (0.99 - 4.83) 1.05 (0.79 - 1.40)
Liver	Men Women	1.13 (1.04 - 1.22) 1.09 (0.89 - 1.33)	1.54 (1.20 - 1.98) 2.28 (0.89 - 5.85)
Breast (female)	Women	1.05 (1.02 - 1.07)	1.03 (0.88 - 1.20)
Population or individual basis	Individual - for European countries including UK		
Alcohol exposure assessment methodology	Alcohol consumption data from the general population from the WHO		
Adjustment for under-reporting	Used the Rehm et al (2007) methodology to account for the underestimation from data from surveys based on the trianglulation of per capita consumption estimates with population estimates from national surveys to produce upshifted estimates		
Definition of never-drinker	Never drinker was defined as a participant with no consumption in the past and no consumption at recruitment. Former drinkers were defined as those who consumed alcohol in the past but not at recruitment. Lifetime drinkers were those who consumed alcohol in the past and at recruitment		
Reference category	Never drinkers		
Methodology for calculation of attributable fraction	**Equation A** $$AAF = \frac{P_{NC} \cdot 1 + P_{FC} \cdot HRR_{FC} + \int_{0.0001\ g/day}^{250\ g/day} P_{LC}(x) \cdot HRR(x)dx - 1}{P_{NC} \cdot 1 + P_{FC} \cdot HRR_{FC} + \int_{0.0001\ g/day}^{250\ g/day} P_{LC}(x) \cdot HRR(x)dx}$$ in former compared with never consumers. **Equation B** $$AAF_{Men\ >24\ g/day} = \frac{\int_{24\ g/day}^{250\ g/day} P_{LC}(x) \cdot HRR(x)dx - P_{LC>24\ g/day}}{P_{NC} \cdot 1 + P_{FC} \cdot HRR_{FC} + \int_{0.0001\ g/day}^{250\ g/day} P_{LC}(x) \cdot HRR(x)dx}$$ population.		Where P_{NC}, P_{FC} and P_{LC} = prevalence of never (%), former (%), or lifetime consumers (% and gamma distribution), respectively; $HRR_{(x)}$ = risk of cancer per consumed gram of alcohol a day for lifetime consumers; and HRR_{FC} = risk of cancer incidence Where $P_{LC>24\ g/day}$ = proportion of lifetime consumers with consumption larger than recommended upper limit. Counterfactual scenario for total and partial alcohol attributable fraction was complete elimination of alcohol consumption in
Latency period chosen			
Sensitivity analyses	Simulated the distribution of alcohol exposure among cases by using the alcohol exposure information in cancer cases from EPIC and shifting the curve towards the alcohol exposure information of the general population. The estimated mean alcohol consumption among cancer cases was higher than among the general population		
Uncertainty in the data			
Comments	* Alcohol-related cancers combined = Upper aero-digestive tract, Colorectal, liver and female breast cancer ** Linearity of association between alcohol consumption and risk of cancer in lifetime consumers was observed for all sites except for liver cancer in men as assessed using restricted cubic spline regressions		

Reference	Schutze et al. 2011 - EPIC study 109,118 men and 254,870 women; Aged 35-70 years	
Alcohol attributable fraction (%) - UK data only	Men	Women
All cancer sites	8 (5 - 11)	3 (1 - 5)
Alcohol-related cancers combined *	27 (21 - 34)	6 (3 - 9)
Upper aero-digestive tract	45 (32 - 58)	30 (9 - 51)
Colorectal	14 (5 - 23)	5 (-2 - 11)
Liver	33 (10 - 57)	13 (-13 - 39)
Breast (female)		5 (2 - 8)

Reference	Jones and Bellis, 2013		
A priori hypothesis	Update the specific alcohol attributable fractions for England last review in 2008 to provide an indication of the public health effects of alcohol.		
Cancer sites assessed	Study chosen for analysis	Exposure categories	Dose-response relationship
Lip, Oral Cavity and Pharynx	Tramacere et al 2010	 10g/d 25g/d 50g/d 75g/d 100 g/d 125g/d	Non linear 1.29 (1.25-1.32) 1.85 (1.74-1.96) 3.24 (2.89 -3.64) 5.42 (4.58 – 6.40) 8.61 (6.91 – 10.73) 13.02 (9.87 – 17.18)
Larynx	Islami et al 2010	12.5 g/d >12.5 - <50 g/d >50 g/d	0.88 (0.70 – 1.12) 1.50 (1.23 – 1.56) 2.46 (1.88 – 3.22)
Oesophagus	Islami et al 2011	 <12.5 g/d >12.5 - <50 g/d >50 g/d	Not reported 1.38 (1.14 – 1.67) 2.62 (2.07 – 3.31) 5.52 (3.92 – 7.28)
Colorectal	Fedirko et al 2011		
Breast	Hamajima et al 2002	 <25/g 25-34 g/d 35-44 g/d >45 g/d	Linear 1.07 1.21 1.32 1.46 (1.33 –1.61)
Liver	Corrao et al 2004	 25 g/d 50 g/d 100g/d	Linear 1.19 (1.12-1.27) 1.40 (1.25 – 1.56) 1.81 (1.50 – 2.19)
Population or individual basis	Population - England		
Alcohol exposure assessment methodology	Age specific distribution of alcohol consumption for adults > 16 years in England who participated in the Good Lifestyle study (GLF) in 2010		
Adjustment for under-reporting	Used the Rehm et al (2010) methodology to account for the underestimation from data from the GLF surveys based on the triangulation of per capita consumption estimates with population estimates from national surveys to produce upshifted estimates*		
Definition of never-drinker	Responders were categorised into current drinkers, former drinkers and abstainers. Former drinkers were those respondents who either reported 1) very occasionally drinking but provided no weekly estimates of drinking or those who use to drink. Abstainers were those respondents who were “always non drinkers”		
Reference category	Abstainers		
Methodology for calculation of attributable fraction	$PAF = \frac{\sum p_{1i} RR_i - 1}{\sum p_{1i} RR_i}$ Update AAF calculations on previous Jones and Bellis 2008 Used an adapted methodology of Kelly et al (2009)		
Latency period chosen	Chose alcohol consumption data from 2010 and mortality data from 2010		
Sensitivity analyses			
Uncertainty in the data	Authors attempted to incorporate a measure of uncertainty around the estimates using stimulation techniques. A technique used to construct confidence intervals. Was not feasible due to the limited information provided in the published papers on the RR estimates and their variance		
Comments	* This upshifting methodology was also adopted in the Global Burden of disease 2010 comparative risk assessment. Used continuous rather than categorical approach where possible		

Alcohol attributable fraction	Men Un-shifted	Men Up-shifted	Women Un-shifted	Women Up-shifted
Lip, Oral Cavity and Pharynx	0.29-0.47	0.29-0.53	0.18-0.31	0.24-0.43
Larynx	0.19-0.31	0.28-0.41	0.13-0.20	0.17-0.29
Oesophagus	0.44-0.56	0.52-0.63	0.33-0.45	0.38-0.53
Colorectal	0.10-0.14	0.13-0.19	0.08-0.10	0.11-0.14
Breast			0.09-0.11	0.11-0.15
Liver	0.09-0.13	0.12-0.18	0.07-0.09	0.10-0.13

Reference	Meier et al, 2013		
A priori hypothesis	To develop a new approach for adjusting survey data to account for under-coverage of alcohol consumption and to test the impact of such adjustments on UK Alcohol attributable fraction (AAF) estimates.		
Cancer sites assessed	Study chosen for analysis	Exposure categories	Dose-response relationship
Oral and pharyngeal cancers	Tramacere et al. 2010	 10g/d 25g/d 50g/d 75g/d 100 g/d 125g/d	Non linear 1.29 (1.25-1.32) 1.85 (1.74-1.96) 3.24 (2.89 -3.64) 5.42 (4.58 – 6.40) 8.61 (6.91 – 10.73) 13.02 (9.87 – 17.18)
Population or individual basis	Population - England		
Alcohol exposure assessment methodology	Survey data from the General Household Survey (GHS) and UK alcohol clearance data from the Her Majesty's Revenue and Customs (HMRC)		
Adjustment for under-reporting	Yes Sales and survey data were adjusted to account for potential biases (e.g. self-pouring, under-sampled populations) using evidence from external data sources. then, survey and sales data were aligned using different implementations of Rehm et al.(2010)		
Definition of never-drinker	No details provided		
Reference category	No details provided		
Methodology for calculation of attributable fraction	Adapted equation taken from Jones and Bellis (2008) $\mathrm{AAF} = \frac{\sum_{i=1}^{n} p_i(\mathrm{RR}_i - 1)}{1 + \sum_{i=1}^{n} p_i(\mathrm{RR}_i - 1)},$ where i and n represent surveyed individuals and the total number of individuals, RR_i is the relative risk of exposure to alcohol for individual i given their consumption level, p_i is the proportion of the survey weight for individual i as a percentage of the total population weight.		
Latency period chosen	No details provided		
Sensitivity analyses	Due to the limited data availability and the scale and complexity of their study, the authors were not able to carry out a comprehensive sensitivity analysis to address the uncertainty of the revised consumption estimates		
Uncertainty in the data	Limitations discussed in paper with regard to alcohol under-reporting Uncertainty exists for certain adjustments such as drinking by tourists and wastage estimates for the on-trade sector.		
Comments	British sales data under-estimate per capita consumption by 8%; Adjustments to survey data increase per capita consumption by 35% Revised AAFs for oral and pharyngeal cancers were substantially larger with their preferred method for aligning the sales with survey AAF increases from original dataset: 0.47-0.60 for men and 0.28-0.35 for women		

Reference	Meier et al, 2013 (cont)								
Alcohol attributable fraction	Original			Revised					
	Age	Male	Female	Age	Male	Female			
GHS	16–17	0.35	0.31	16–17	0.42	0.33			
	18–24	0.51	0.33	18–24	0.60	0.39			
	25–34	0.48	0.30	25–34	0.55	0.36			
	35–44	0.48	0.30	35–44	0.54	0.36			
	45–54	0.50	0.31	45–54	0.58	0.37			
	55–64	0.51	0.28	55–64	0.60	0.34			
	65–74	0.42	0.20	65–74	0.52	0.26			
	75+	0.30	0.13	75+	0.39	0.18			
	Total	0.47	0.28	Total	0.55	0.34			
	Revised GHS aligned to 70% of HMRC			Revised GHS aligned to 80% of HMRC			Revised GHS aligned to 90% of HMRC		
	Age	Male	Female	Age	Male	Female	Age	Male	Female
Method 1	16–17	0.45	0.27	16–17	0.49	0.30	16–17	0.52	0.33
	18–24	0.60	0.32	18–24	0.63	0.36	18–24	0.66	0.40
	25–34	0.56	0.29	25–34	0.60	0.33	25–34	0.63	0.37
	35–44	0.54	0.29	35–44	0.58	0.33	35–44	0.61	0.36
	45–54	0.58	0.31	45–54	0.62	0.34	45–54	0.65	0.38
	55–64	0.58	0.26	55–64	0.63	0.30	55–64	0.66	0.33
	65–74	0.49	0.19	65–74	0.53	0.22	65–74	0.57	0.24
	75+	0.32	0.13	75+	0.36	0.15	75+	0.39	0.16
	Total	0.55	0.27	Total	0.59	0.30	Total	0.62	0.34
Method 2	16–17	0.41	0.28	16–17	0.44	0.31	16–17	0.47	0.34
	18–24	0.58	0.34	18–24	0.62	0.37	18–24	0.64	0.40
	25–34	0.55	0.31	25–34	0.58	0.35	25–34	0.61	0.38
	35–44	0.53	0.31	35–44	0.57	0.34	35–44	0.60	0.37
	45–54	0.57	0.31	45–54	0.60	0.35	45–54	0.62	0.38
	55–64	0.58	0.28	55–64	0.61	0.31	55–64	0.63	0.34
	65–74	0.49	0.21	65–74	0.52	0.23	65–74	0.55	0.26
	75+	0.34	0.14	75+	0.38	0.16	75+	0.41	0.18
	Total	0.54	0.28	Total	0.57	0.32	Total	0.60	0.35

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Burden of Cancer Attributable to Alcohol Consumption – Further details

Paper CC/2014/18 - Calculation of Burden of Cancer Attributable to Alcohol Consumption.

Secretariat
April 2015

CC/2014/18

COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

Calculation of Burden of Cancer Attributable to Alcohol Consumption.

Covering Paper

Members are asked to consider this introductory paper with the aim of deciding how the COC will take forward their calculation of cancer burden attributable to alcohol consumption in 2015.

The Secretariat has identified key areas within exposure assessment, latency and risk exposure period (REP) in the burden estimation, criteria for study selection and determination of the quantitative cancer risk of alcohol consumption, where limitations and/or difficulties exist in the methodology for the estimation of cancer burden attributable to alcohol. Specific questions are posed within each of these sections where input from Members is required.

In addition, the following general questions are posed for Members at the end of the paper:

1) What are Member's views on the issues outlined here and how will the Committee undertake the calculation of burden of cancer?

2) Would it be more appropriate to put together a Burden sub-group of the Committee to facilitate this work?

3) Does the Committee have any further suggestions?

PHE Toxicology Unit/COC Secretariat
October 2014

COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

Calculation of Burden of Cancer Attributable to Alcohol Consumption.

Introduction

1) Since November 2013, the COC has been considering the association between alcohol consumption and cancer risk. To date, Members have reviewed alcohol consumption and trends in the UK, pancreatic cancer risk and effect of alcohol cessation on its risk, liver cancer risk and effect of alcohol cessation on its risk, kidney cancer, Hodgkin's lymphoma and non-Hodgkin's lymphoma, and at this meeting female breast cancer and colorectal cancer will also be considered. The Secretariat intends on bringing the remaining sites (oral cavity and the pharynx, larynx, oesophagus) causally associated with alcohol consumption before the Committee in April 2015. At the beginning of these deliberations, it was suggested by Members that following a review of the recently published epidemiological data, calculation of the burden of cancer attributable to alcohol consumption should be undertaken. This introductory paper highlights previous work in the area of cancer burden and alcohol consumption and identifies areas where methodological issues exist in burden estimation with the overall aim of deciding how the COC will take forward their calculation of cancer burden attributable to alcohol consumption in 2015.

2) In the most recent findings for the UK in the Global Burden of Disease (GBD) study (Murray et al., 2013, attached as Annex A), alcohol was the 5th leading risk factor in 2010. The burden of cancer attributable to alcohol consumption has also been previously considered for the UK and European populations (Parkin, 2011; Jones and Bellis, 2013, Schütze et al., 2011, attached as Annex B, C, and D). In 2004, the COC specifically addressed alcohol and breast cancer and concluded that approximately 6% (between 3.2% and 8.8%) of breast cancers reported in the UK each year could be prevented if drinking was reduced to a very low level (i.e. less than 1 unit/week).

How to estimate the burden of disease and calculate the Population Attributable Fraction (PAF)

3) The Population Attributable Risk (PAR) is the proportion of cases that would not have occurred in the absence of a specific risk factor; this attributable fraction (AF) can then be used to estimate attributable numbers of deaths, or newly occurring cancers. There are several methods for estimating the AF but all depend on knowledge of the risk of the disease due to the exposure of interest and the proportion of the target population exposed (Steenland and Armstrong, 2006). The proportion of cancer caused by alcohol consumption is determined in three stages 1) estimation of the exposure distribution to alcohol and 2) establishment of the

appropriate relative risk (RR) associated with each exposure level (dose-response relationship) and 3) calculation of the PAF (Rehm et al., 2010, attached as Annex E).

The most common method of estimating the PAF is to use Levin's equation

$$PAR = P_e (RR_e-1) \ / \ [1 + P_e (RR_e-1)],$$

where P_e is the proportion exposed proportion who drink alcohol and RR_e is the relative risk of disease due to that exposure. This method is appropriate if relative risks are taken from epidemiological studies, with the estimate of the proportion of the population exposed from an independent data source. Jones et al. (2008, attached as Annex F) provide a worked example of how to calculate the attributable fraction.

Key areas and issues identified for calculation of the burden of disease

Exposure assessment

Appropriate data selection of alcohol consumption in the UK

4) The General Lifestyle Survey (GLF or sometimes referred to as the GLS), formerly known as the General Household Survey (GHS), ran from 1971-2012. The GLF survey was a national survey; covering adults aged 16 and over living in private households in the UK and information on the consumption of alcoholic beverages by the UK population was obtained regularly as part of the GLF. The Opinions and Lifestyle Survey (OPN) replaced the GLF in 2012 and is an inter-departmental multi-purpose survey carried out by the Office for National Statistics collecting information on a range of topics from people living in private households in Great Britain. Their first release of data on drinking habits in the UK was in December 2013, and the data are available here: http://www.energy.publicdata.eu/it/dataset/opinions_and_lifestyle_survey/resource/229c6074-f4ce-4b68-a7ec-8cc9c73f5d0c. Data on alcohol consumption in the UK can also be obtained from sources where recorded consumption was calculated (i.e. alcoholic beverages consumed that are recorded in official statistics of production, trade, sales or taxes).

5) Methodology for determining alcohol consumption in populations has a number of limitations. It is generally accepted that surveys underestimate alcohol consumption in interviewees. Members have previously discussed the issue of exposure assessment. Difficulties arise when relying on self-reporting as a source of information on exposure. It is understood that under-reporting is approximately 70% when comparing UK revenue sales from alcohol and self-reporting of alcohol consumption by the public. The Health Survey for England (HSfE) (2011) report similar figures and commented that "*Comparisons of survey measures with HM Revenue and Customs data on alcohol taxed for sale suggest that survey estimates of consumption represent between 55% and 60% of the true figure. However, survey data provide a reliable means of comparing drinking between different groups and of measuring trends in drinking over time".* It is also noted that per capita consumption does not provide data on gender-specific or age-specific consumption estimates.

6) Previous UK studies of Parkin (2011) and Jones and Bellis (2008) have used data from surveys in their calculations of burden of cancer/disease from alcohol consumption. Jones and Bellis (2008) choose data from the GHS as it was the only current source of population estimates that allowed calculation of units of alcohol consumed per week. Parkin (2011) used alcohol consumption data from both the National Diet and Nutrition survey and the GHS. In an attempt to overcome the limitations of both survey and per capita consumption data, Rehm et al. (2007, attached as Annex G) and Rehm et al. (2010, Annex E) has developed methodology to triangulate both average alcohol consumption from surveys and per capita consumption. The methodology involves taking alcohol volume data by sex and age from surveys and overall exposure from per capita consumption data. Meier et al. (2013, attached as Annex H) also addressed this issue of discrepancy between surveys and per capita sales data in a study of oral cancers in Great Britain.

> *Questions for Members on appropriate data selection of alcohol consumption in the UK*
> a) What are Members' views on how best to deal with under-reporting of alcohol consumption for the purposes of our calculations? Sensitivity analysis could be incorporated into the evaluation to investigate the effect of such under-reporting.
> b) What are Members' views on the methodologies of Rehm et al. (2010) and Meier et al. (2013)?

Drinking status

7) Another issue with exposure assessment is addressing the definition of a non-drinker. Some studies defined a non-drinker as someone who currently doesn't drink but this definition does not provide information on whether the individual was a drinker in the past. Others define a non-drinker as an individual who currently doesn't drink and who hasn't consumed alcohol in the past 12 months. This differs from the definition of a never drinker. For the purposes of our analyses, it could be possible to distinguish between these two non-drinking statuses and to categorise individuals as either a) never drinker (currently does not consume alcohol and never consumed alcohol in the past) and b) a former drinker (currently does not consume alcohol but did consumed alcohol in the past) is currently doesn't drink but may have been a drinker in the past. This differs from a never drinker or abstainer.

> *Questions for Members on drinking status?*
> c) How best can the different definitions of a non-drinker be addressed in our calculations?
> d) What is the most appropriate reference category for our deliberations?

Categories of alcohol consumption for dose-response analysis

8) For calculations of burden, Members have previously suggested that a number of alcohol consumption categories should be considered in the analysis. It would be helpful at this point to select the appropriate alcohol categories and for Members to suggest the top dose that should be considered. The dose range may vary by sex depending on the available data.

Questions for Members

e) Would Members suggest an incremental increase of one unit (8g of alcohol) would be appropriate for the dose-response analysis?
f) Do Members have other suggestions?

Latency and Risk exposure period (REP) in the burden estimation

9) The latency period between alcohol consumption and an increased risk of a particular cancer is unknown. For their study on occupational carcinogens, Hutchings and Rushton (2012) defined a risk exposure period (REP), based on cancer latency, as the window of time during which exposure to an occupational carcinogen could result in a cancer being diagnosed or appearing in national mortality or cancer registration record in the estimation year.

Questions for Members

g) What lag-time would Members consider appropriate and would a specific time-period be considered for each of the cancer sites?
h) Considering latency, would alcohol consumption data at the start of this time period or would current intake offer the most appropriate exposure estimate?

Quantitative risk of alcohol

10) It was previously agreed that the ongoing literature review would only consider the cancer sites causally associated with alcohol consumption according to IARC. For the purposes of our calculations, RR estimates and subsequent cancer incidence and mortality data will be limited to these cancer sites. In previous studies investigating the burden of cancer attributable to alcohol, selection of the most appropriate relative risk (RR) was derived from previously published meta-analysis or pooled analysis (Jones and Bellis, 2008; Parkin, 2011). Guidance is needed on how best to select the most appropriate estimate.

Questions for Members

i) Taking into consideration the data from the IARC monographs of 2010 and 2012, the recently updated review papers on the seven cancer sites and the COC's own deliberations on breast cancer in 2004, how do Members wish to select the most appropriate RR'S? For example, should selection be based on the most recent meta-analysis, the meta-analysis with the largest number of studies, only UK relevant studies or studies (cohort or case-control) with Newcastle Ottawa scores > 8 and at least three dose levels?

Data source for cancers statistics

11) The latest available UK cancer statistics are available from the Office of National Statistics (ONS) and currently we have access to 2013 data. This data will offer the most recent cancer incidence data.

Overview Questions for Committee

What are Member's views on the issues outlined here and how will the committee undertake the calculation of burden of cancer?
Would it be more appropriate to put together a Burden sub-group committee to facilitate this work?
Does the Committee have any further suggestions?

PHE Toxicology Unit, Imperial College
October 2014

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Annex A to CC/14/18

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Annex B to CC/14/18

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Calculation of Burden of Cancer Attributable to Alcohol Consumption.

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Annex C to CC/14/18

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Calculation of Burden of Cancer Attributable to Alcohol Consumption.

Updating England specific alcohol-attributable fractions.

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Alcohol attributable burden of incidence of cancer in eight European countries based on results from prospective cohort study.

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Statistical modeling of volume of alcohol exposure for epidemiological studies of population health: the US example.

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Alcohol-attributable fractions for England. Alcohol-attributable mortality and hospital admissions.

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Annex G to CC/14/18

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Comparative quantification of alcohol exposure as risk factor for global burden of disease.

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Annex H to CC/14/18

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Calculation of Burden of Cancer Attributable to Alcohol Consumption.

Adjusting for unrecorded consumption in survey and per capita sales data: quantification of impact on gender- and age-specific alcohol-attributable fractions for oral and pharyngeal cancers in Great Britain.

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