

Baseline and lifetime alcohol consumption and risk of skin cancer in the European Prospective Investigation into Cancer and nutrition cohort (EPIC)

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Supplementary Table S1: Hazard ratios (HRs) and 95% confidence intervals (CIs) for intake of alcohol at different ages and risk of skin cancer, by sex, EPIC cohort

	Men				Women			
	Skin cancer	Melanoma	BCC	SCC	Skin cancer	Melanoma	BCC	SCC
	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹	HR (95% CI) ¹
Alcohol consumption at age 20 years (g/d)²								
Non-drinkers	0.94 (0.84-1.05)	1.08 (0.79-1.49)	0.92 (0.81-1.05)	0.97 (0.72-1.30)	0.92 (0.86-0.97)	0.83 (0.71-0.97)	0.94 (0.88-1.01)	0.88 (0.74-1.05)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.07 (0.99-1.16)	1.01 (0.80-1.27)	1.08 (0.99-1.18)	1.15 (0.92-1.44)	1.01 (0.94-1.09)	1.02 (0.85-1.22)	1.05 (0.97-1.14)	0.89 (0.72-1.11)
>15	1.05 (0.97-1.14)	0.99 (0.78-1.26)	1.08 (0.98-1.19)	0.99 (0.77-1.27)	1.06 (0.96-1.18)	1.35 (1.07-1.70)	1.02 (0.90-1.16)	1.03 (0.71-1.50)
P-trend	0.02	0.67	0.007	0.74	0.0002	<.0001	0.01	0.48
Alcohol consumption at age 30 years (g/d)²								
Non-drinkers	0.94 (0.82-1.07)	0.89 (0.58-1.35)	0.93 (0.79-1.09)	1.00 (0.71-1.42)	0.92 (0.86-0.99)	0.89 (0.74-1.06)	0.94 (0.86-1.01)	0.90 (0.71-1.11)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.04 (0.95-1.14)	0.98 (0.75-1.28)	1.03 (0.92-1.14)	1.10 (0.86-1.43)	1.02 (0.96-1.08)	1.07 (0.90-1.26)	1.03 (0.95-1.11)	1.03 (0.83-1.28)
>15	1.09 (0.99-1.19)	1.03 (0.79-1.34)	1.08 (0.97-1.20)	1.09 (0.84-1.41)	1.00 (0.92-1.09)	1.01 (0.81-1.25)	1.03 (0.93-1.14)	0.88 (0.64-1.21)
P-trend	0.007	0.48	0.03	0.49	0.008	0.08	0.02	0.56
Alcohol consumption at age 40 years (g/d)²								
Non-drinkers	1.02 (0.83-1.26)	1.10 (0.62-1.93)	0.97 (0.76-1.23)	1.71 (0.84-3.45)	0.95 (0.87-1.02)	0.95 (0.79-1.16)	0.95 (0.86-1.05)	0.88 (0.68-1.15)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.14 (1.00-1.30)	0.98 (0.67-1.42)	1.12 (0.96-1.30)	1.72 (1.02-2.91)	1.01 (0.94-1.08)	0.95 (0.80-1.15)	1.02 (0.94-1.11)	1.07 (0.86-1.34)
>15	1.22 (1.08-1.38)	1.17 (0.83-1.65)	1.16 (1.01-1.34)	2.04 (1.23-3.36)	1.05 (0.96-1.14)	0.96 (0.77-1.19)	1.10 (1.00-1.22)	0.95 (0.71-1.26)
P-trend	0.0006	0.25	0.01	0.02	0.03	0.9	0.008	0.43
Alcohol consumption at age 50 years (g/d)²								
Non-drinkers	1.14 (0.89-1.47)	0.76 (0.48-1.19)	0.95 (0.71-1.28)	1.35 (0.50-3.59)	0.87 (0.76-1.00)	0.76 (0.48-1.19)	0.89 (0.76-1.04)	0.82 (0.46-1.44)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.18 (1.01-1.38)	0.93 (0.66-1.30)	1.10 (0.93-1.31)	1.67 (0.90-3.11)	1.06 (0.96-1.18)	0.93 (0.66-1.30)	1.08 (0.96-1.20)	1.09 (0.72-1.65)
>15	1.26 (1.09-1.46)	0.96 (0.66-1.40)	1.16 (0.99-1.37)	1.83 (1.01-3.33)	1.09 (0.98-1.22)	0.96 (0.66-1.40)	1.14 (1.01-1.28)	0.85 (0.52-1.40)
P-trend	0.006	0.51	0.02	0.07	0.001	0.51	0.0008	0.90

Abbreviations: BCC: basal-cell carcinoma, CI: confidence intervals, EPIC: European Prospective Investigation into Cancer and Nutrition, HR: hazard ratio: SCC: squamous-cell carcinoma

¹Stratified by age at recruitment, sex, and study center, and adjusted for educational level (none, primary school, technical/professional school, secondary school, university or higher degree), body mass index (BMI; <25, 25–29, or ≥30 kg/m²), smoking (never, former, and current), physical activity level (metabolic equivalent of task [MET] hour/week), and total energy intake (continuous)

²Analysis was based on 363,310 EPIC participants after exclusion of participants from Norway, Sweden, Naples, and Bilthoven – for whom data on lifetime alcohol was missing.

Supplementary Table S2: Hazard ratios (HRs) and 95% confidence intervals (CIs) for intake of baseline and lifetime alcohol and risk of skin cancer (per 12 g per day among drinkers) according to sex, and country, EPIC cohort

		Men		Women	
		Baseline alcohol Intake	Average lifetime intake of alcohol	Baseline alcohol Intake	Average lifetime intake of alcohol
		HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)
Denmark	<i>Skin cancer</i>	0.98 (0.97-1.00)	1.13 (0.71-1.79)	1.04 (1.00-1.07)	2.56 (1.51-4.34)
	<i>Melanoma</i>	0.97 (0.91-1.03)	0.55 (0.12-2.47)	0.97 (0.87-1.07)	0.47 (0.07-3.26)
	<i>BCC</i>	0.99 (0.96-1.01)	1.23 (0.74-2.07)	1.04 (1.00-1.07)	3.14 (1.77-5.58)
	<i>SCC</i>	1.00 (0.94-1.07)	1.19 (0.24-5.80)	1.01 (0.89-1.14)	2.14 (0.21-21.45)
United Kingdom	<i>Skin cancer</i>	0.99 (0.96-1.03)	1.80 (0.99-3.28)	1.04 (0.99-1.09)	1.42 (0.66-3.05)
	<i>Melanoma</i>	0.97 (0.87-1.10)	2.25 (0.36-14.25)	0.99 (0.87-1.14)	2.07 (0.44-9.68)
	<i>BCC</i>	0.98 (0.93-1.02)	1.45 (0.70-2.99)	1.05 (0.98-1.11)	1.42 (0.66-3.05)
	<i>SCC</i>	1.05 (0.97-1.14)	4.32 (1.10-17.04)	1.06 (0.92-1.21)	1.37 (0.26-7.33)
The Netherlands	<i>Skin cancer</i>	1.06 (0.97-1.17)		0.98 (0.90-1.07)	0.49 (0.13-1.82)
	<i>Melanoma</i>	1.00 (0.85-1.18)		0.99 (0.87-1.13)	0.76 (0.01-7.25)
	<i>BCC</i>	–		0.93 (0.65-1.33)	1.15 (0.01-156.90)
	<i>SCC</i>	1.10 (0.96-1.25)		0.99 (0.88-1.12)	0.44 (0.07-2.68)
Germany	<i>Skin cancer</i>	1.01 (0.97-1.05)	1.75 (0.64-4.82)	1.02 (0.95-1.10)	1.00 (0.25-3.94)
	<i>Melanoma</i>	1.04 (0.96-1.13)	1.64 (0.19-14.10)	0.91 (0.75-1.11)	0.41 (0.02-7.72)
	<i>BCC</i>	1.00 (0.95-1.05)	2.32 (0.67-8.07)	1.06 (0.97-1.15)	1.35 (0.27-6.72)
	<i>SCC</i>	1.02 (0.87-1.18)	0.25 (0.01-7.76)	0.70 (0.33-1.48)	–
France	<i>Skin cancer</i>	–		0.99 (0.95-1.03)	0.81 (0.47-1.40)
	<i>Melanoma</i>	–		1.00 (0.92-1.09)	1.03 (0.31-3.46)
	<i>BCC</i>	–		0.97 (0.91-1.02)	0.75 (0.34-1.64)
	<i>SCC</i>	–		1.05 (0.92-1.19)	0.44 (0.10-3.39)
Spain	<i>Skin cancer</i>	0.99 (0.95-1.03)	1.28 (0.48-3.40)	0.89 (0.74-1.07)	0.49 (0.15-1.61)
	<i>Melanoma</i>	1.02 (0.92-1.13)	0.62 (0.05-8.08)	0.88 (0.58-1.34)	0.18 (0.01-3.13)
	<i>BCC</i>	0.97 (0.92-1.03)	1.13 (0.35-3.68)	0.86 (0.68-1.09)	0.40 (0.1-1.66)
	<i>SCC</i>	0.98 (0.89-1.09)	4.02 (0.29-56.24)	1.15 (0.70-1.90)	–
Italy	<i>Skin cancer</i>	1.00 (0.95-1.06)	0.85 (0.31-2.36)	1.00 (0.93-1.08)	1.04 (0.39-2.78)
	<i>Melanoma</i>	1.00 (0.88-1.14)	1.33 (0.11-16.13)	1.09 (0.93-1.28)	3.58 (0.32-39.56)
	<i>BCC</i>	0.98 (0.92-1.04)	0.53 (0.16-1.72)	0.98 (0.90-1.08)	0.85 (0.27-2.72)
	<i>SCC</i>	1.14 (0.92-1.41)	3.33 (0.04-15.25)	0.76 (0.47-1.23)	1.26 (0.01-189.81)
Sweden	<i>Skin cancer</i>	–	–	0.99 (0.92-1.07)	–
	<i>Melanoma</i>	–	–	0.96 (0.86-1.09)	–
	<i>BCC</i>	–	–	0.14 (0.01-1.66)	–
	<i>SCC</i>	–	–	1.02 (0.92-1.13)	–
Norway	<i>Skin cancer</i>	–	–	1.51 (1.06-2.15)	–
	<i>Melanoma</i>	–	–	1.31 (0.84-2.03)	–
	<i>BCC</i>	–	–	–	–
	<i>SCC</i>	–	–	1.64 (0.81-3.31)	–

Abbreviations: BCC: basal-cell carcinoma, CI: confidence intervals, EPIC: European Prospective Investigation into Cancer and Nutrition, HR: hazard ratio; SCC: squamous-cell carcinoma

¹Stratified by age at recruitment, sex, and study center, and adjusted for educational level (none, primary school, technical/professional school, secondary school, university or higher degree), body mass index (BMI; <25, 25–29, or ≥30)

kg/m²), smoking (never, former, and current), physical activity level (metabolic equivalent of task [MET] hour/week), and total energy intake (continuous)

Supplementary Table S3: Hazard ratios (HRs) and 95% confidence intervals (CIs) for baseline and lifetime intake of alcohol and risk of skin cancer according to sex and tumor site, EPIC cohort

	Skin cancer		Melanoma		BCC		SCC	
	Head, neck and extremities	Trunk	Head, neck and extremities	Trunk	Head, neck and extremities	Trunk	Head, neck and extremities	Trunk
	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)
Men								
Baseline total alcohol intake (g/d)								
Non-drinkers	0.95(0.80-1.12)	1.19 (0.87-1.64)	0.95 (0.60-1.51)	1.05 (0.60-1.83)	0.97 (0.78-1.20)	1.22 (0.79-1.90)	1.05 (0.75-1.48)	1.40 (0.52-3.79)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.11 (1.01-1.24)	1.29 (1.07-1.57)	0.99 (0.75-1.31)	1.05 (0.60-1.83)	1.12 (0.98-1.28)	1.27 (0.98-1.64)	1.35 (1.08-1.70)	1.36 (0.69-2.69)
>15	1.15 (1.04-1.28)	1.30 (1.08-1.57)	0.99 (0.75-1.32)	1.47 (1.07-2.03)	1.14 (1.00-1.30)	1.14 (0.89-1.47)	1.40 (1.11-1.76)	1.67 (0.85-3.28)
P-trend	0.001	0.04	0.93	0.02	0.03	0.77	0.004	0.23
Average lifetime alcohol intake (g/d)²								
Non-drinkers	0.98 (0.70-1.38)	0.96 (0.47-1.98)	1.40 (0.49-3.98)	0.93 (0.22-3.96)	1.01 (0.68-1.51)	0.94 (0.38-2.36)	0.73 (0.29-1.82)	–
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.13 (1.01-1.27)	1.19 (0.96-1.48)	1.03 (0.70-1.51)	1.04 (0.68-1.59)	1.16 (1.00-1.33)	1.30 (0.99-1.70)	1.12 (0.85-1.48)	0.91 (0.39-2.12)
>15	1.15 (1.02-1.30)	1.17 (0.95-1.45)	0.97 (0.66-1.43)	1.15 (0.77-1.74)	1.15 (1.00-1.33)	1.21 (0.92-1.58)	1.27 (0.96-1.69)	0.98 (0.42-2.30)
P-trend	0.03	0.23	0.64	0.39	0.10	0.35	0.05	0.81
Women								
Baseline total alcohol intake (g/d)								
Non-drinkers	1.08 (0.99-1.18)	0.82 (0.67-1.01)	1.13 (0.95-1.36)	0.87 (0.63-1.22)	1.08 (0.95-1.22)	0.86 (0.65-1.14)	1.02 (0.84-1.24)	0.57 (0.27-1.19)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.09 (1.02-1.17)	0.98 (0.86-1.12)	1.02 (0.89-1.18)	0.87 (0.67-1.12)	1.12 (1.03-1.23)	0.99 (0.83-1.18)	1.09 (0.93-1.29)	1.13 (0.71-1.81)
>15	1.03 (0.95-1.12)	0.93 (0.79-1.09)	0.95 (0.79-1.13)	0.78 (0.56-1.08)	1.05 (0.95-1.16)	0.94 (0.77-1.14)	1.05 (0.86-1.29)	1.31 (0.75-2.28)
P-trend	0.75	0.72	0.20	0.30	0.44	0.95	0.50	0.05
Average lifetime alcohol intake (g/d)²								
Non-drinkers	1.12 (1.00-1.26)	0.89 (0.67-1.17)	1.21 (0.94-1.57)	0.99 (0.58-1.71)	1.12 (0.97-1.29)	0.87 (0.62-1.24)	0.93 (0.69-1.26)	0.78 (0.23-2.67)
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-14.9	1.02 (0.96-1.09)	1.08 (0.94-1.24)	1.03 (0.88-1.21)	1.04 (0.77-1.40)	1.03 (0.95-1.12)	1.05 (0.89-1.24)	1.01 (0.84-1.20)	1.30 (0.74-2.27)
>15	1.03 (0.93-1.13)	1.09 (0.91-1.31)	1.08 (0.87-1.34)	1.28 (0.88-1.86)	1.05 (0.93-1.17)	0.99 (0.79-1.25)	0.90 (0.69-1.19)	1.46 (0.70-3.02)
P-trend	0.72	0.13	0.93	0.28	0.97	0.60	0.83	0.20

Abbreviations: BCC: basal-cell carcinoma, CI: confidence intervals, EPIC: European Prospective Investigation into Cancer and Nutrition, HR: hazard ratio: SCC: squamous-cell carcinoma

¹Stratified by age at recruitment, sex, and study center, and adjusted for educational level (none, primary school, technical/professional school, secondary school, university or higher degree), body mass index (BMI; <25, 25–29, or ≥30 kg/m²), smoking (never, former, and current), physical activity level (metabolic equivalent of task [MET] hour/week), and total energy intake (continuous)

²Analysis of lifetime alcohol intake was based on 363,310 EPIC participants after exclusion of participants from Norway, Sweden, Naples, and Bilthoven – for whom data on lifetime alcohol was missing.

Supplementary Table S4: Hazard ratios (HRs) and 95% confidence intervals (CIs) for intake of **baseline and lifetime alcohol** and risk of melanoma according to histologic type, and sex, EPIC cohort

Histologic type of melanoma	Lentigo maligna	Superficial spreading	Acro lentiginous	Nodular	Other ²	<i>P</i> _{heterogeneity}
	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	HR ¹ (95% CI)	
Men						
Baseline total alcohol intake (g/d)						
<i>Cases</i>	62	327	9	79	335	
Non-drinkers	1.17 (0.43-3.17)	0.62 (0.29-1.33)	1.65 (0.13-20.76)	1.00 (0.39-2.59)	1.34 (0.84-2.14)	
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
5-14.9	1.17 (0.56-2.45)	1.36 (0.95-1.96)	1.40 (0.23-8.70)	0.66 (0.35-1.26)	0.99 (0.73-1.35)	
>15	1.37 (0.66-2.86)	1.47 (1.04-2.07)	0.80 (0.12-5.43)	0.64 (0.35-1.17)	1.09 (0.80-1.50)	0.05
P-trend	0.50	0.004	0.63	0.13	0.82	
Average lifetime alcohol intake (g/d)³						
<i>Cases</i>	51	263	7	56	178	
Non-drinkers	2.51 (0.50-12.70)	0.50 (0.07-3.71)	–	2.51 (0.50-12.70)	2.91 (1.09-7.79)	
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
5-14.9	1.45 (0.59-3.53)	1.14 (0.75-1.74)	0.57 (0.03-10.23)	1.45 (0.59-3.53)	0.78 (0.48-1.27)	
>15	1.29 (0.50-3.31)	1.16 (0.77-1.75)	1.89 (0.17-20.76)	1.29 (0.50-3.31)	1.07 (0.68-1.68)	0.47
P-trend	0.97	0.40	0.37	0.97	0.95	
Women						
Baseline total alcohol intake (g/d)						
<i>Cases</i>	139	865	24	116	490	
Non-drinkers	1.16 (0.72-1.87)	1.22 (0.99-1.51)	1.44 (0.47-4.38)	1.33 (0.79-2.23)	0.76 (0.55-1.04)	
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
5-14.9	0.84 (0.54-1.30)	1.08 (0.91-1.27)	0.65 (0.21-1.98)	1.03 (0.64-1.64)	0.88 (0.70-1.10)	
>15	0.74 (0.44-1.25)	0.88 (0.72-1.08)	0.69 (0.20-2.42)	0.68 (0.33-1.40)	1.18 (0.90-1.54)	0.63
P-trend	0.10	0.07	0.22	0.16	0.10	
Average lifetime alcohol intake (g/d)³						
<i>Cases</i>	122	21	661	61	293	
Non-drinkers	1.53 (0.88-2.64)	1.29 (0.97-1.73)	1.86 (0.46-7.53)	0.36 (0.10-1.30)	0.93 (0.54-1.62)	
>0-4.9	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
5-14.9	0.84 (0.53-1.31)	0.94 (0.78-1.12)	1.92 (0.70-5.29)	0.85 (0.46-1.57)	1.32 (1.00-1.72)	
>15	1.13 (0.62-2.06)	0.97 (0.76-1.23)	1.10 (0.22-5.58)	1.23 (0.56-2.68)	1.50 (1.06-2.12)	0.51
P-trend	0.31	0.17	0.86	0.31	0.01	

Abbreviations: BCC: basal-cell carcinoma, CI: confidence intervals, EPIC: European Prospective Investigation into Cancer and Nutrition, HR: hazard ratio: SCC: squamous-cell carcinoma

¹Stratified by age at recruitment, sex, and study center, and adjusted for educational level (none, primary school, technical/professional school, secondary school, university or higher degree), body mass index (BMI; <25, 25–29, or ≥30 kg/m²), smoking (never, former, and current), physical activity level (metabolic equivalent of task [MET] hour/week), and total energy intake (continuous). N=7 melanoma cases with missing histologic type were excluded for the analyses of skin cancer types.

²Others include melanoma that is not specified

³Analysis of lifetime alcohol intake was based on 363,310 EPIC participants after exclusion of participants from Norway, Sweden, Naples, and Bilthoven – for whom data on lifetime alcohol was missing.