Supplementary Methods

Phenotypic and Behavioral Risk Factors for Melanoma

The cohort lacked information on sun sensitivity and sunscreen use, which are important risk factors for melanoma. Therefore, to explore the impact of potential confounding by these unmeasured risk factors, we assessed the cross-sectional associations of coffee intake with phenotypic (sun sensitivity, natural hair color and number of moles ≥ ¼ inch in diameter) and behavioral (sunburn in past year, sunscreen use and shade use) melanoma risk factors using data from the 2003-2004 and 2005-2006 US National Health and Nutrition Examination Survey (NHANES). In NHANES, daily coffee intake was assessed using a FFQ that was similar to the one used in NIH-AARP. We restricted our analyses to non-Hispanic white adults, aged 20 to 59 years, with non-missing data for coffee intake, who completed the dermatology questionnaire (n=2,043). Hair color and number of moles at least ¼ in diameter were asked in the more comprehensive 2003-2004 NHANES dermatology questionnaire only. Associations between coffee intake and the following melanoma risk factors were tested in bivariate analyses: number of moles at least ¼ in diameter, natural hair color at age 18, skin reaction to 30 minutes of sun without sun protection after several months of non-exposure, sunscreen use, shade use on sunny days, and history of sunburn in the past year. These analyses used FFQ sample weights and accounted for the complex sampling design of NHANES.

Coffee Calibration Sub-study using 24-hour Dietary Recalls

The analytic cohort included n=1,664 participants who completed two 24-hour dietary recalls on non-consecutive days. Coffee intake from beverages was estimated in grams and values were averaged for the two days of recall. A multivariable linear regression model predicting two-day mean coffee intake in this sub-cohort was fit using dummy variables for nine of the ten original categories of consumption listed on the food frequency questionnaire, with ‘none’ as the reference group (‘less than 1 cup per month’, ‘1-3 cups per month’, ‘1-2 cups per week’, ‘2-4 cups per week’, ‘5-6 cups per week’, ‘1 cup per

day', '2-3 cups per day', '4-5 cups per day' and '6+ cups per day'), as well as the *a priori* selected potential confounders (age, sex, smoking history (detailed), pipe/cigar smoking, education, alcohol drinking, physical activity, BMI and July erythemal UVR). The intercept and beta coefficients from the linear regression model were subsequently used to predict the mean two-day coffee intake for each participant in the analytic cohort (n=447,357). Predicted mean two-day coffee intake was scaled from gram to cups by dividing the gram value by a factor of 236.6. The scaled predicted value was then used in in the multivariable (fully)-adjusted Cox proportional hazards regression model to estimate the beta coefficient and standard error separately for a one cup increase in coffee intake with malignant melanoma and melanoma *in situ* with age as the underlying time metric. Next for each of the four coffee intake categories used in the present study (none, ≤1 cup per day, 2-3 cups per day and ≥4 cups per day) the mean coffee intake value (cups per day) for the analytic cohort (n=447,357) was calculated (Table 4S). Using 'none' as the reference category, the differences between the mean value for each of the three higher coffee intake categories and the reference category were calculated and hazard ratios were estimated by exponentiating the product of this difference and the appropriate beta coefficient from either the malignant melanoma or the melanoma *in situ* multivariable-adjusted Cox proportional hazards regression model (e.g. EXP((predicted mean coffee intake$_{\geq 4cups/day}$ − predicted mean coffee intake$_{none}$)*$\beta_{malignant\ melanoma}$)). In addition, 95% CIs were calculated using the standard error (SE) of a given beta coefficient (e.g. EXP((predicted mean coffee intake$_{\geq 4cups/day}$ − predicted mean coffee intake$_{none}$)*($\beta_{malignant\ melanoma}$±1.96*SE$_{malignant\ melanoma}$))). Finally, tests for linear trend, comparable to that in our main analysis, were conducted by assigning each of the four coffee intake categories its mean predicted coffee intake value and entering this single variable into separate models for malignant melanoma and melanoma *in situ*.

Supplementary Table 1. Associations of NIH-AARP Diet and Health Study Characteristics with Malignant Melanoma Adjusted for Age and Sex (n=447,357)

Characteristic	HR (95% CI)	*P*-value§
Age at entry (years)*	1.03 (1.03-1.04)	<0.001
BMI (kg/m2)	1.00 (1.00-1.01)	0.31
Sex†		
Male	Ref.	<0.001
Female	0.52 (0.48-0.57)b	
Cigarette smoking		
Never smoker	Ref.	<0.001
Former smoker	0.87 (0.80-0.94)	
Current smoker	0.63 (0.54-0.73)	
Pipe/Cigar smoking		
Never smoker	Ref.	0.01
Ever smoker	0.89 (0.81-0.97)	
Education		
≤11 years	Ref.	
High school graduate	1.42 (1.16-1.74)	<0.001
Some college	1.62 (1.31-1.99)	
College graduate	1.82 (1.50-2.23)	
Physical activity		
Never/rarely	Ref.	
1-3/month	1.12 (0.97-1.30)	<0.001
1-2/week	1.23 (1.08-1.40)	
3-4/week	1.34 (1.19-1.51)	
5+/week	1.31 (1.16-1.49)	
Alcohol (drinks/day)		
None	Ref.	
≤1	1.12 (1.02-1.23)	0.01
>1 and ≤3	1.24 (1.10-1.39)	
>3	1.11 (0.95-1.29)	
July erythemal UVR (J/m^2)‡		
≤186.3	Ref.	
>186.3-236.8	0.99 (0.89-1.11)	<0.001
>236.8-253.7	1.13 (1.02-1.25)	
>253.7	1.19 (1.07-1.31)	
Family history of cancer		
No	Ref.	0.06
Yes	1.07 (1.00-1.15)	

*Adjusted for sex

†Adjusted for age

‡ July erythemal UVR exposure was calculated as the averaged exposure across all available measured days in the month of July between 1978-1993 and 1996-2005 and categorized as quartiles

§Test for significance is the Wald Chi-Square Test

Supplementary Table 2. Characteristics, Weighted % (Unweighted n), by Level of Coffee Intake and Age Group among US Adults, NHANES 2003 to 2004

Age group	Characteristic	Coffee Intake				
		None	≤1 cup/day	2-3 cup/day	≥4 cups/day	*P*-value*
	Overall	**29.9 (316)**	**35.0 (372)**	**25.6 (261)**	**9.5 (99)**	—
Aged 20-59 years (n=1,048)	Natural hair color at age 18					
	Red/blonde	28.7 (66)	37.5 (85)	23.3 (54)	10.6 (26)	0.94
	Light/medium brown	30.9 (158)	34.3 (178)	26.4 (134)	8.4 (40)	
	Dark brown/black	29.0 (92)	34.4 (109)	25.9 (73)	10.7 (33)	
	Number of mole ≥ ¼ inch in diameter					
	None	31.5 (225)	35.8 (249)	22.8 (161)	9.9 (69)	0.18
	1 or 2	26.1 (63)	37.5 (85)	27.7 (62)	8.7 (20)	
	≥3	27.4 (28)	27.0 (38)	36.9 (38)	8.7 (10)	
	Family history of melanoma					
	No	30.0 (249)	33.9 (288)	26.6 (220)	9.4 (82)	0.58
	Yes	29.4 (67)	39.4 (84)	21.6 (41)	9.6 (17)	
	Overall	19.2 (51)	31.1 (82)	38.4 (96)	11.3 (31)	—
Aged 50-59 years (n=260)	Natural hair color at age 18					
	Red/blonde	19.0 (7)	26.3 (14)	41.6 (17)	13.1 (8)	0.46
	Light/medium brown	21.2 (24)	34.8 (44)	35.3 (50)	8.7 (10)	
	Dark brown/black	16.2 (20)	28.1 (24)	41.3 (29)	14.4 (13)	
	Number of mole ≥ ¼ inch in diameter					
	None	22.2 (36)	33.8 (52)	32.3 (52)	11.7 (19)	0.16
	1 or 2	15.9 (9)	31.9 (17)	41.8 (24)	10.4 (7)	
	≥3	13.4 (6)	22.1 (13)	53.3 (20)	11.2 (5)	
	Family history of melanoma					
	No	19.8 (44)	28.4 (67)	40.4 (87)	11.5 (27)	0.19
	Yes	15.2 (7)	48.4 (15)	26.0 (9)	10.4 (4)	

*Test for categorical variables is the Rao-Scott F adjusted Chi-Square

— Not applicable

Supplementary Table 3. Characteristics, Weighted % (Unweighted n), by Level of Coffee Intake among US Adults and Age Group, NHANES 2003 to 2006

Age group	Characteristic	Coffee Intake				
		None	≤1 cup/day	2-3 cup/day	≥4 cups/day	*P*-value*
	Overall	**29.8 (622)**	**34.6 (728)**	**26.1 (495)**	**9.5 (198)**	**—**
Aged 20-59 years (n=2,043)	Sunburn in past year					
	Yes	29.8 (354)	35.4 (430)	26.3 (269)	8.5 (102)	
	No	29.9 (268)	33.5 (298)	25.8 (226)	10.8 (96)	0.50
	Sunscreen use†					
	Always/most of the time	28.6 (204)	39.0 (267)	26.0 (155)	6.3 (38)	
	Sometimes	27.8 (144)	36.9 (184)	26.2 (128)	9.1 (46)	
	Rarely or never	31.5 (267)	29.7 (273)	26.5 (212)	12.3 (113)	0.01
	Stay in shade on sunny days					
	Always/most of the time or never in sun	35.3 (191)	33.6 (178)	21.4 (111)	9.8 (48)	
	Sometimes	26.5 (240)	36.2 (339)	28.1 (220)	9.3 (85)	
	Rarely or never	30.2 (191)	33.1 (191)	27.1 (164)	9.6 (65)	0.08
	Skin reaction to 30 minutes of sun exposure after prolonged non-exposure					
	Severe sunburn with blistering or peeling	34.4 (139)	34.4 (133)	20.0 (68)	11.2 (39)	
	Mild sunburn with some tanning	28.0 (237)	35.0 (297)	29.1 (221)	7.9 (68)	
	Tanning without sunburn or nothing	29.7 (246)	34.2 (298)	25.7 (206)	10.4 (91)	0.11
	Overall	21.2 (113)	29.9 (157)	34.2 (173)	14.7 (78)	—
Aged 50-59 years (n=521)	Sunburn in past year					
	Yes	19.3 (42)	30.0 (64)	39.4 (69)	11.3 (25)	
	No	22.4 (71)	29.9 (93)	30.9 (104)	16.8 (53)	0.08
	Sunscreen use†					
	Always/most of the time	25.9 (42)	29.7 (44)	32.2 (50)	12.1 (17)	
	Sometimes	22.3 (23)	35.0 (36)	34.3 (35)	8.4 (12)	
	Rarely or never	17.0 (45)	27.1 (74)	36.4 (88)	19.6 (49)	0.08
	Stay in shade on sunny days					
	Always/most of the time or never in sun	24.9 (44)	33.1 (60)	26.6 (49)	15.4 (24)	
	Sometimes	16.4 (37)	25.5 (55)	43.4 (81)	14.7 (32)	
	Rarely or never	23.7 (32)	32.6 (42)	29.8 (43)	13.9 (22)	0.08
	Skin reaction to 30 minutes of sun exposure after prolonged non-exposure					
	Severe sunburn with blistering or peeling	18.5 (20)	28.9 (26)	33.8 (29)	18.8 (14)	0.34
	Mild sunburn with some tanning	22.3 (48)	30.3 (64)	38.0 (75)	9.5 (24)	
	Tanning without sunburn or nothing	21.0 (45)	30.0 (67)	30.2 (69)	18.8 (40)	

*Test for categorical variables is Rao-Scott F adjusted Chi-Square

†n=2,031 and n=515 due to individuals who do not go out in the sun, respectively

— Not applicable

Supplementary Table 4. Calibration Analysis of the Association of Daily Coffee Consumption with Malignant Melanoma and Melanoma *In Situ* Using a Subset of Participants (n=1,664) with Two 24-hour Dietary Recalls to Predict Mean Daily Consumption for the NIH-AARP Diet and Health Study Analytic Cohort (N=447,357)

FFQ coffee intake category	Predicted mean coffee intake (cups/day)*	Δ Predicted mean coffee intake (cups/day)	$\beta_{1\ cup}$ from multivariable Cox regression model†	SE_β	HR	95% CI	*P*-trend‡
Malignant Melanoma							
0 cups/day (Ref.)	0.045	0.000	-0.030	0.014	Ref	Ref	0.009
≤1 cup/day	0.995	0.950	-0.030	0.014	0.97	(0.95-1.00)	
2-3 cups/day	2.535	2.490	-0.030	0.014	0.93	(0.86-0.99)	
≥4 cups/day	4.633	4.589	-0.030	0.014	0.87	(0.76-0.99)	
Melanoma *In Situ*							
0 cups/day (Ref.)	0.045	0.000	0.008	0.018	Ref	Ref	0.35
≤1 cup/day	0.995	0.950	0.008	0.018	1.01	(0.97-1.04)	
2-3 cups/day	2.535	2.490	0.008	0.018	1.02	(0.94-1.11)	
≥4 cups/day	4.633	4.589	0.008	0.018	1.04	(0.88-1.22)	

*From multivariable linear regression model using mean coffee intake based on two days of 24-hour dietary recalls as the response variable and FFQ coffee intake categories as the main predictor (none (Ref.), <1 cup/ month, 1-3 cups/month', 1-2 cups/week, 2-4 cups/week, 5-6 cups/week, 1 cup/day, 2-3 cups/day, 4-5 cups/day and 6+ cups/day) and adjusted for age (continuous), sex, cigarette smoking (never, former (defined by time since quitting (1-4 years, 5-9 years, ≥10 years) and smoking intensity (1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day) or current/quit < 1 year ago (defined by smoking intensity 1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day)), cigar/pipe smoking (ever user or nonuser), BMI (<25 kg/m2, 25 to <30 kg/m2 or ≥30 kg/m2), education (less than high school, high school graduate, some college, or college graduate), average daily alcohol intake, physical activity (engaged in physical activity never or rarely, 1-3 times/month, 1-2 times per week, 3-4 times per week, or 5 or more times per week), family history of cancer (yes/no), and July erythemal UVR exposure (quartiles)

†From multivariable Cox regression model using predicted coffee intake as the main predictor (continuous) and adjusted for age (continuous), sex, cigarette smoking (never, former (defined by time since quitting (1-4 years, 5-9 years, ≥10 years) and smoking intensity (1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day) or current/quit < 1 year ago (defined by smoking intensity 1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day)), cigar/pipe smoking (ever user or nonuser), BMI (<25 kg/m2, 25 to <30 kg/m2 or ≥30 kg/m2), education (less than high

school, high school graduate, some college, or college graduate), average daily alcohol intake, physical activity (engaged in physical activity never or rarely, 1-3 times/month, 1-2 times per week, 3-4 times per week, or 5 or more times per week), family history of cancer (yes/no), and July erythemal UVR exposure (quartiles)

‡From multivariable Cox regression model using predicted mean coffee intake for each of the four FFQ intake categories as the main predictor (continuous) and adjusted for age (continuous), sex, cigarette smoking (never, former (defined by time since quitting (1-4 years, 5-9 years, ≥10 years) and smoking intensity (1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day) or current/quit < 1 year ago (defined by smoking intensity 1-10 cigarettes/day, 11-20 cigarettes/day, 21-30 cigarettes/day, 31-40 cigarettes/day, 41-60 cigarettes/day, and ≥61 cigarettes/day)), cigar/pipe smoking (ever user or nonuser), BMI (<25 kg/m2, 25 to <30 kg/m2 or ≥30 kg/m2), education (less than high school, high school graduate, some college, or college graduate), average daily alcohol intake, physical activity (engaged in physical activity never or rarely, 1-3 times/month, 1-2 times per week, 3-4 times per week, or 5 or more times per week), family history of cancer (yes/no), and July erythemal UVR exposure (quartiles)