

Supplementary Table 1. Association of bile acids (BAs) with colorectal cancer (n=495 cases [n=233 women and n=262 men]; n=495 matched controls<sup>b</sup>) in the PLCO Study by sex

BA	Sex		BA Quartile				Trend Test		Continuous log <sub>2</sub> [BA]	Interaction Test for Sex P-value <sup>c</sup>
			1 (Ref)	2	3	4	P-value	Q-value		
Primary unconjugated BAs										
CDCA (ng/mL)			<8.08	8.08 to <26.30	26.30 to <81.30	≥81.30				0.01
	Women	N cases (%)	57 (24.5)	63 (27.0)	53 (22.8)	60 (25.8)				
		OR (95% CI) <sup>a</sup>	1.00	1.50 (0.87-2.58)	1.73 (0.94-3.15)	1.61 (0.87-2.96)	0.11	0.21	1.10 (1.01-1.20)	
	Men	N cases (%)	65 (24.8)	58 (22.1)	67 (25.6)	72 (27.5)				
		OR (95% CI) <sup>a</sup>	1.00	0.66 (0.37-1.19)	0.50 (0.28-0.88)	0.63 (0.35-1.14)	0.10	0.19	0.94 (0.87-1.02)	
CA (ng/mL)			<3.53	3.53 to <9.39	9.39 to <30.70	≥30.70				0.006
	Women	N cases (%)	65 (27.9)	55 (23.6)	62 (26.6)	51 (21.9)				
		OR (95% CI) <sup>a</sup>	1.00	1.05 (0.62-1.78)	1.21 (0.69-2.14)	1.39 (0.76-2.53)	0.25	0.38	1.09 (1.01-1.17)	
	Men	N cases (%)	69 (26.3)	66 (25.2)	64 (24.4)	63 (24.1)				
		OR (95% CI) <sup>a</sup>	1.00	0.75 (0.42-1.36)	0.70 (0.38-1.29)	0.55 (0.31-0.97)	0.04	0.11	0.95 (0.88-1.01)	
Primary conjugated BAs										
GCDCA (ng/mL)			<97.40	97.40 to <203.00	203.00 to <429.00	≥429.00				0.03
	Women	N cases (%)	55 (23.6)	53 (22.8)	64 (27.5)	61 (26.2)				
		OR (95% CI) <sup>a</sup>	1.00	1.07 (0.59-1.94)	1.56 (0.85-2.89)	2.04 (1.07-3.90)	0.02	0.06	1.25 (1.08-1.46)	
	Men	N cases (%)	57 (21.8)	57 (21.8)	71 (27.1)	77 (29.4)				
		OR (95% CI) <sup>a</sup>	1.00	0.80 (0.44-1.44)	1.00 (0.57-1.76)	0.90 (0.51-1.58)	0.90	0.95	1.02 (0.90-1.16)	
TCDC (ng/mL)			<9.63	9.63 to <25.30	25.30 to <60.30	≥60.30				0.16
	Women	N cases (%)	38 (16.3)	60 (25.8)	57 (24.5)	78 (33.5)				
		OR (95% CI) <sup>a</sup>	1.00	2.08 (1.03-4.17)	1.90 (0.94-3.83)	2.98 (1.42-6.24)	0.01	0.047	1.17 (1.03-1.34)	
	Men	N cases (%)	64 (24.4)	60 (22.9)	71 (27.1)	67 (25.6)				
		OR (95% CI) <sup>a</sup>	1.00	0.99 (0.57-1.73)	0.99 (0.56-1.73)	0.99 (0.56-1.76)	0.98	0.98	1.03 (0.94-1.14)	
GCA (ng/mL)			<27.50	27.50 to <58.20	58.20 to <132.00	≥132.00				0.16
	Women	N cases (%)	57 (24.5)	40 (17.2)	65 (27.9)	71 (30.5)				
		OR (95% CI) <sup>a</sup>	1.00	0.96 (0.52-1.75)	1.95 (1.05-3.60)	2.26 (1.21-4.22)	0.003	0.022	1.17 (1.03-1.34)	
	Men	N cases (%)	59 (22.5)	58 (22.1)	73 (27.9)	72 (27.5)				
		OR (95% CI) <sup>a</sup>	1.00	0.69 (0.39-1.23)	0.87 (0.50-1.50)	0.94 (0.53-1.68)	0.92	0.95	1.04 (0.93-1.17)	
TCA (ng/mL)			<1.85	1.85 to <6.39	6.39 to <17.40	≥17.40				0.54
	Women	N cases (%)	38 (16.3)	58 (24.9)	45 (19.3)	92 (39.5)				
		OR (95% CI) <sup>a</sup>	1.00	1.30 (0.66-2.57)	1.37 (0.69-2.72)	2.20 (1.14-4.26)	0.01	0.053	1.08 (0.99-1.18)	
	Men	N cases (%)	59 (22.5)	77 (29.4)	56 (21.4)	70 (26.7)				
		OR (95% CI) <sup>a</sup>	1.00	1.43 (0.85-2.40)	0.91 (0.51-1.63)	1.51 (0.84-2.70)	0.41	0.54	1.04 (0.97-1.12)	
Secondary unconjugated BAs										
DCA (ng/mL)			<31.80	31.80 to <71.40	71.40 to <162.00	≥162.00				0.78
	Women	N cases (%)	39 (16.7)	47 (20.2)	73 (31.3)	74 (31.8)				
		OR (95% CI) <sup>a</sup>	1.00	1.24 (0.67-2.28)	1.93 (1.07-3.48)	2.85 (1.45-5.60)	0.001	0.011	1.08 (1.00-1.18)	
	Men	N cases (%)	57 (21.8)	50 (19.1)	80 (30.5)	75 (28.6)				
		OR (95% CI) <sup>a</sup>	1.00	1.06 (0.58-1.94)	1.49 (0.83-2.66)	1.20 (0.68-2.10)	0.36	0.50	1.04 (0.97-1.12)	
LCA (ng/mL)	Women		<0.63	0.63 to <2.52	2.52 to <5.78	≥5.78				0.89
	Women	N cases (%)	47 (20.2)	49 (21.0)	71 (30.5)	66 (28.3)				
		OR (95% CI) <sup>a</sup>	1.00	1.02 (0.58-1.77)	2.09 (1.14-3.83)	1.73 (0.93-3.21)	0.04	0.11	1.03 (0.98-1.09)	
	Men	N cases (%)	47 (17.9)	64 (24.4)	60 (22.9)	91 (34.7)				
		OR (95% CI) <sup>a</sup>	1.00	1.28 (0.72-2.26)	1.21 (0.65-2.23)	1.81 (1.02-3.21)	0.05	0.13	1.04 (0.98-1.09)	
Secondary conjugated BAs										
GDCA (ng/mL)	Women		<34.30	34.30 to <80.90	80.90 to <193.00	≥193.00				0.21
		N cases (%)	42 (18.0)	47 (20.2)	57 (24.5)	87 (37.3)				
		OR (95% CI) <sup>a</sup>	1.00	1.48 (0.78-2.78)	1.68 (0.86-3.28)	3.45 (1.79-6.64)	0.0002	0.006	1.16 (1.04-1.29)	
	Men	N cases (%)	51 (19.5)	73 (27.9)	68 (26.0)	70 (26.7)				
		OR (95% CI) <sup>a</sup>	1.00	1.03 (0.58-1.82)	1.09 (0.62-1.92)	1.02 (0.57-1.83)	0.91	0.95	1.06 (0.97-1.14)	
TDCA (ng/mL)			<2.88	2.88 to <10.10	10.10 to <27.90	≥27.90				0.92
	Women	N cases (%)	38 (16.3)	40 (17.2)	58 (24.9)	97 (41.6)				
		OR (95% CI) <sup>a</sup>	1.00	1.06 (0.56-2.02)	1.92 (0.97-3.79)	2.36 (1.22-4.55)	0.004	0.023	1.08 (1.00-1.15)	
	Men	N cases (%)	56 (21.4)	74 (28.2)	67 (25.6)	65 (24.8)				
		OR (95% CI) <sup>a</sup>	1.00	1.17 (0.69-1.97)	0.97 (0.54-1.74)	1.46 (0.81-2.62)	0.30	0.43	1.06 (1.00-1.13)	
GLCA (ng/mL)			<0.67	0.67 to <2.94	2.94 to <9.61	≥9.61				0.70
	Women	N cases (%)	41 (17.6)	54 (23.2)	67 (28.8)	71 (30.5)				
		OR (95% CI) <sup>a</sup>	1.00	1.28 (0.69-2.38)	2.02 (1.11-3.67)	2.71 (1.41-5.22)	0.002	0.015	1.08 (1.02-1.15)	
	Men	N cases (%)	43 (16.4)	72 (27.5)	71 (27.1)	76 (29.0)				
		OR (95% CI) <sup>a</sup>	1.00	1.40 (0.77-2.56)	1.43 (0.81-2.53)	1.45 (0.83-2.53)	0.23	0.36	1.05 (0.99-1.11)	
TLCA			Not quantifiable	Quantifiable						0.60
	Women	N cases (%)	86 (36.9)	147 (63.1)					1.07 (1.02-1.12)	

		OR (95% CI) <sup>a</sup>	1.00	1.84 (1.16-2.93)				0.01	0.047		
	Men	N cases (%)	124 (47.3)	138 (52.7)						1.03 (0.99-1.07)	
		OR (95% CI) <sup>a</sup>	1.00	1.40 (0.91-2.15)				0.13	0.23		
Tertiary unconjugated BAs											
UDCA (ng/mL)			<2.00	2.00 to <6.21	6.21 to <19.40	≥19.40					0.01
	Women	N cases (%)	47 (20.2)	56 (24.0)	68 (29.2)	62 (26.6)					
		OR (95% CI) <sup>a</sup>	1.00	1.41 (0.77-2.61)	2.08 (1.21-3.87)	1.63 (0.90-2.97)	0.08	0.19	1.07 (1.01-1.12)		
	Men	N cases (%)	63 (24.1)	58 (22.1)	76 (29.0)	65 (24.8)					
		OR (95% CI) <sup>a</sup>	1.00	0.70 (0.39-1.25)	0.83 (0.47-1.47)	0.72 (0.40-1.30)	0.45	0.56	0.94 (0.90-1.00)		
Tertiary conjugated BAs											
GUDCA (ng/mL)			<9.35	9.35 to <21.80	21.80 to <57.40	≥57.40					0.03
	Women	N cases (%)	56 (24.0)	50 (21.5)	68 (29.2)	59 (25.3)					
		OR (95% CI) <sup>a</sup>	1.00	1.14 (0.66-1.97)	1.51 (0.86-2.64)	1.35 (0.75-2.44)	0.19	0.32	1.11 (1.00-1.23)		
	Men	N cases (%)	70 (26.7)	65 (24.8)	69 (26.3)	58 (22.1)					
		OR (95% CI) <sup>a</sup>	1.00	0.62 (0.36-1.07)	0.68 (0.39-1.20)	0.56 (0.31-1.01)	0.09	0.19	0.96 (0.87-1.07)		
TUDCA (ng/mL)			Not quantifiable	Quantifiable							0.50
	Women	N cases (%)	84 (36.1)	149 (63.9)			0.85	0.95	1.01 (0.97-1.06)		
		OR (95% CI) <sup>a</sup>	1.00	1.05 (0.66-1.66)							
	Men	N cases (%)	128 (48.9)	134 (51.2)			0.70	0.84	1.02 (0.98-1.06)		
		OR (95% CI) <sup>a</sup>	1.00	1.08 (0.73-1.60)							

<sup>a</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking status (never, former, current), family history of CRC (no, yes), diabetes diagnosis (no, yes), alcohol drinker (no, yes), alcoholic intake (average number of drinks/day), hours spent in vigorous physical activity (none, <1 hour/wk, 1 hour/wk, 2 hours/wk, 3 hours/wk, ≥4 hours/wk), not processed red meat (g/day/1000 kcal), processed meat (g/day/1000 kcal), MPED equivalents of whole grains (oz/day/1000 kcal), total energy (kcal/day), education (high school graduate or less, some college or post high school training, college graduate or postgraduate), hormone replacement therapy status (women only; never, current, former)

<sup>b</sup> Controls were alive and cancer-free at case diagnosis date and were incidence-density sampled and matched on age at randomization (+/- 5 years), sex, race, year of randomization, and season of blood draw

<sup>c</sup> P-interaction between log<sub>2</sub>-transformed bile acid measure and sex estimated in unconditional logistic regression model including sex as a covariate in the model

Supplementary Table 2. Association of summary short chain fatty acid (SCFA) and bile acid (BA) measures with colorectal cancer in the PLCO Study (n=495 cases [n=233 women and n=262 men]; n=495 matched controls) and ATBC Study (n=598 cases; n=598 matched controls)

Study	Sex		Colorectal Cancer						P-trend	log <sub>2</sub> [BA]	P-interaction <sup>d</sup>
			Quartile 1 (ref)	Quartile 2	Quartile 3	Quartile 4					
Total BA											
PLCO	Women	Definition	<350.73	350.73 to <680.59	680.59 to 1353.49	≥1353.49				0.05	
		N cases (%)	47 (20.2)	46 (19.7)	75 (32.2)	65 (27.9)	--	233 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.07 (0.62-1.82)	1.85 (1.12-3.06)	1.78 (1.02-3.08)	0.009	1.25 (1.09-1.44)	--		
	Men	OR (95% CI) <sup>b</sup>	1.00	1.06 (0.57-1.95)	1.80 (1.03-3.12)	1.95 (1.04-3.66)	0.01	1.31 (1.11-1.53)	--		
		N cases (%)	48 (18.3)	77 (29.4)	63 (24.1)	74 (28.2)	--	262 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.57 (0.93-2.65)	1.13 (0.68-1.88)	1.37 (0.78-2.40)	0.64	1.05 (0.92-1.19)	--		
ATBC	Men	OR (95% CI) <sup>b</sup>	1.00	1.34 (0.76-2.38)	0.92 (0.52-1.63)	1.26 (0.68-2.34)	0.87	1.05 (0.91-1.21)	--		
		Definition	<279.92	279.92 to <507.14	507.14 to <896.69	≥896.69				--	
		N cases (%)	123 (20.6)	154 (25.8)	137 (22.8)	184 (30.8)	--	598 (100)	--		
PLCO	Women	OR (95% CI) <sup>a</sup>	1.00	1.27 (0.91-1.76)	1.14 (0.82-1.59)	1.48 (1.08-2.03)	0.03	1.11 (1.01-1.21)	--		
		OR (95% CI) <sup>b</sup>	1.00	1.29 (0.92-1.81)	1.13 (0.80-1.60)	1.44 (1.04-2.00)	0.06	1.10 (1.00-1.20)	--		
		Definition	<181.70	181.70 to <400.99	400.99 to <836.01	≥836.01				0.05	
	Men	N cases (%)	46 (19.7)	61 (26.2)	60 (25.8)	66 (28.3)	--	233 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.35 (0.81-2.27)	1.81 (1.04-3.17)	2.20 (1.25-3.85)	0.004	1.19 (1.05-1.35)	--		
		OR (95% CI) <sup>b</sup>	1.00	1.33 (0.73-2.42)	1.66 (0.88-3.14)	2.56 (1.37-4.79)	0.003	1.22 (1.06-1.41)	--		
ATBC	Men	N cases (%)	48 (18.3)	74 (28.2)	63 (24.1)	77 (29.4)	--	262 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.59 (0.94-2.70)	0.97 (0.57-1.64)	1.18 (0.70-1.99)	0.93	1.00 (0.89-1.12)	--		
		OR (95% CI) <sup>b</sup>	1.00	1.45 (0.81-2.59)	0.87 (0.49-1.58)	1.23 (0.68-2.22)	0.86	1.01 (0.89-1.15)	--		
Total primary BA											
PLCO	Women	Definition	<159.47	159.47 to <315.88	315.88 to <622.97	≥622.97				--	
		N cases (%)	133 (22.2)	147 (24.6)	130 (21.7)	188 (31.4)	--	598 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.12 (0.81-1.56)	0.98 (0.71-1.37)	1.42 (1.04-1.96)	0.06	1.08 (1.00-1.17)	--		
	Men	OR (95% CI) <sup>b</sup>	1.00	1.12 (0.79-1.57)	0.96 (0.68-1.35)	1.37 (0.99-1.90)	0.12	1.07 (0.99-1.16)	--		
		N cases (%)	42 (18.0)	47 (20.2)	64 (27.5)	80 (34.3)	--	233 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.15 (0.63-2.07)	1.42 (0.82-2.44)	2.07 (1.18-3.61)	0.006	1.10 (1.00-1.21)	--		
ATBC	Men	OR (95% CI) <sup>b</sup>	1.00	1.35 (0.70-2.61)	1.73 (0.95-3.18)	2.60 (1.35-4.99)	0.003	1.14 (1.02-1.27)	--		
		N cases (%)	49 (18.7)	65 (24.8)	75 (28.6)	73 (27.9)	--	262 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.38 (0.82-2.34)	1.65 (1.00-2.71)	1.48 (0.86-2.53)	0.11	1.08 (0.99-1.18)	--		
Total secondary BA											
PLCO	Women	Definition	<59.76	59.76 to <125.06	125.06 to <218.11	≥218.11				--	
		N cases (%)	125 (20.9)	145 (24.3)	141 (23.6)	187 (31.3)	--	598 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.17 (0.83-1.64)	1.15 (0.82-1.62)	1.50 (1.09-2.08)	0.02	1.10 (1.02-1.20)	--		
	Men	OR (95% CI) <sup>b</sup>	1.00	1.11 (0.78-1.58)	1.15 (0.81-1.63)	1.47 (1.04-2.07)	0.03	1.09 (1.00-1.19)	--		
		N cases (%)	42 (18.0)	47 (20.2)	64 (27.5)	80 (34.3)	--	233 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.15 (0.63-2.07)	1.42 (0.82-2.44)	2.07 (1.18-3.61)	0.006	1.10 (1.00-1.21)	--		
ATBC	Men	OR (95% CI) <sup>b</sup>	1.00	1.35 (0.70-2.61)	1.73 (0.95-3.18)	2.60 (1.35-4.99)	0.003	1.14 (1.02-1.27)	--		
		N cases (%)	49 (18.7)	65 (24.8)	75 (28.6)	73 (27.9)	--	262 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	1.38 (0.82-2.34)	1.65 (1.00-2.71)	1.48 (0.86-2.53)	0.11	1.08 (0.99-1.18)	--		
Total SCFA											
PLCO	Women	Definition	<1023.4	1023.4 to <1513.5	1513.5 to <2319.4	≥2319.4				0.03	
		N cases (%)	70 (20.0)	59 (25.3)	52 (22.3)	52 (22.3)	--	233 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	0.91 (0.55-1.51)	0.72 (0.44-1.19)	0.67 (0.40-1.11)	0.09	0.84 (0.68-1.04)	--		
	Men	OR (95% CI) <sup>b</sup>	1.00	0.78 (0.44-1.38)	0.61 (0.34-1.07)	0.55 (0.31-0.98)	0.03	0.77 (0.61-0.98)	--		
		N cases (%)	62 (23.7)	54 (20.6)	77 (29.4)	69 (26.3)	--	262 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	0.84 (0.52-1.36)	1.32 (0.81-2.16)	1.25 (0.76-2.06)	0.19	1.12 (0.93-1.35)	--		
ATBC	Men	OR (95% CI) <sup>b</sup>	1.00	0.69 (0.40-1.20)	1.22 (0.70-2.11)	1.32 (0.75-2.33)	0.15	1.20 (0.97-1.48)	--		
		N cases (%)	166 (27.8)	146 (24.4)	135 (22.6)	151 (25.3)	--	598 (100)	--		
		OR (95% CI) <sup>a</sup>	1.00	0.88 (0.64-1.20)	0.82 (0.60-1.13)	0.91 (0.67-1.24)	0.47	0.98 (0.88-1.09)	--		
ATBC	Men	OR (95% CI) <sup>b</sup>	1.00	0.94 (0.68-1.30)	0.85 (0.61-1.18)	0.92 (0.65-1.28)	0.48	0.98 (0.87-1.09)	--		

<sup>a</sup> Unadjusted models, conditioned on matching factors only

<sup>b</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking status (never, former, current), family history of CRC (no, yes), diabetes diagnosis (no, yes), alcohol drinker (no, yes), alcoholic intake (average number of drinks/day), hours spent in vigorous physical activity (none, <1 hour/wk, 1 hour/wk, 2 hours/wk, 3 hours/wk, ≥4 hours/wk), not processed red meat (g/day/1000 kcal), processed meat (g/day/1000 kcal), MPED equivalents of whole grains (oz/day/1000 kcal), total energy (kcal/day), education (high school graduate or less, some college or post high school training, college graduate or postgraduate), hormone replacement therapy status (women only; never, current, former)

<sup>c</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking intensity (cigarettes/day), diabetes diagnosis (no, yes), average number of alcoholic drinks per day, frequency of physical activity in leisure time (none, <1/wk, 1-2/wk, ≥3/wk), total red meat (g/day/1000 kcal), total processed meat (g/day/1000 kcal), whole grains (oz/day/100kcal), total energy (kcal/day), education (less than elementary school, some junior high school, completed junior high school, some senior high school, senior high school graduate)

<sup>d</sup> P-interaction between log<sub>2</sub>-transformed bile acid measure and sex estimated in unconditional logistic regression model including sex as a covariate in the model

Supplementary Table 3. Association of bile acids (BAs) with colorectal cancer (n=598 cases; n=598 matched controls<sup>b</sup>) in the ATBC Study

		BA Quartile				Trend Test		Continuous
		1 (Ref)	2	3	4	P-value	Q-value	log <sub>2</sub> [BA]
Primary unconjugated BAs								
CDCA (ng/mL)		<17.0	17.0 to <42.8	42.8 to <131.0	≥131.0			
	N cases (%)	170 (28.4)	127 (21.2)	146 (24.4)	155 (25.9)			
	OR (95% CI) <sup>a</sup>	1.00	0.79 (0.57-1.09)	0.88 (0.63-1.23)	0.92 (0.66-1.28)	0.74	0.93	1.00 (0.94-1.05)
CA (ng/mL)		<10.2	10.2 to <25.1	25.1 to <96.9	≥96.9			
	N cases (%)	152 (25.4)	156 (26.1)	139 (23.2)	151 (25.3)			
	OR (95% CI) <sup>a</sup>	1.00	1.03 (0.75-1.43)	0.93 (0.67-1.30)	0.99 (0.72-1.38)	0.83	0.96	1.00 (0.95-1.06)
Primary conjugated BAs								
GCDCA (ng/mL)		<62.4	62.4 to <126.0	126.0 to <251.0	≥251.0			
	N cases (%)	120 (20.1)	140 (23.4)	168 (28.1)	170 (28.4)			
	OR (95% CI) <sup>a</sup>	1.00	1.11 (0.79-1.57)	1.38 (0.98-1.92)	1.33 (0.94-1.87)	0.05	0.27	1.10 (1.02-1.20)
TCDCA (ng/mL)		<7.9	7.9 to <14.6	14.6 to <31.4	≥31.4			
	N cases (%)	128 (21.4)	136 (22.7)	164 (27.4)	170 (28.4)			
	OR (95% CI) <sup>a</sup>	1.00	1.03 (0.73-1.46)	1.21 (0.86-1.72)	1.24 (0.89-1.74)	0.14	0.45	1.06 (0.98-1.15)
GCA (ng/mL)		<14.1	14.1 to <29.7	29.7 to <53.5	≥53.5			
	N cases (%)	113 (18.9)	171 (28.6)	113 (18.9)	201 (33.6)			
	OR (95% CI) <sup>a</sup>	1.00	1.62 (1.14-2.31)	0.98 (0.68-1.41)	1.82 (1.27-2.60)	0.02	0.15	1.11 (1.02-1.21)
TCA (ng/mL)		≤1.25	>1.25 to <4.3	4.3 to <8.8	≥8.8			
	N cases (%)	161 (26.9)	125 (20.9)	134 (22.4)	178 (29.8)			
	OR (95% CI) <sup>a</sup>	1.00	1.10 (0.78-1.56)	0.92 (0.66-1.29)	1.18 (0.85-1.62)	0.50	0.75	1.06 (0.98-1.14)
Secondary unconjugated BAs								
DCA (ng/mL)		<31.5	31.5 to <70.5	70.5 to <138.0	≥138.0			
	N cases (%)	141 (23.6)	134 (22.4)	151 (25.3)	172 (28.8)			
	OR (95% CI) <sup>a</sup>	1.00	0.88 (0.61-1.25)	1.06 (0.75-1.50)	1.18 (0.84-1.65)	0.20	0.45	1.04 (0.97-1.11)
LCA		Not quantifiable	Quantifiable					
	N cases (%)	333 (55.7)	265 (44.3)					
	OR (95% CI) <sup>a</sup>	1.00	1.00 (0.78-1.28)			0.99	0.99	1.05 (0.93-1.17)
Secondary conjugated BAs								
GDCA (ng/mL)		<13.4	13.4 to <28.0	28.0 to <65.5	≥65.5			
	N cases (%)	111 (18.6)	124 (20.7)	196 (32.8)	167 (27.9)			
	OR (95% CI) <sup>a</sup>	1.00	1.10 (0.78-1.58)	1.79 (1.26-2.55)	1.54 (1.07-2.21)	0.004	0.060	1.10 (1.02-1.18)
TDCA (ng/mL)		Not quantifiable	Quantifiable					
	N cases (%)	297 (49.7)	301 (50.3)					
	OR (95% CI) <sup>a</sup>	1.00	1.13 (0.89-1.43)			0.33	0.55	1.08 (0.99-1.17)
GLCA		Not quantifiable	Quantifiable					
	N cases (%)	312 (52.2)	286 (47.8)					
	OR (95% CI) <sup>a</sup>	1.00	1.19 (0.94-1.50)			0.16	0.45	1.06 (0.97-1.16)
TLCA		Not quantifiable	Quantifiable					
	N cases (%)	559 (93.5)	39 (6.5)					
	OR (95% CI) <sup>a</sup>	1.00	1.39 (0.83-2.32)			0.21	0.45	1.16 (0.86-1.58)
Tertiary unconjugated BAs								
UDCA (ng/mL)		≤2.52	>2.52 to 9.4	9.4 to 24.4	≥24.4			
	N cases (%)	230 (38.5)	93 (15.6)	121 (20.2)	154 (25.8)			
	OR (95% CI) <sup>a</sup>	1.00	0.91 (0.63-1.30)	0.74 (0.54-1.02)	0.91 (0.67-1.24)	0.28	0.53	0.98 (0.91-1.04)
Tertiary conjugated BAs								
GUDCA (ng/mL)		<8.5	8.5 to <19.9	19.9 to <49.3	≥49.3			
	N cases (%)	129 (21.6)	164 (27.4)	174 (29.1)	131 (21.9)			
	OR (95% CI) <sup>a</sup>	1.00	1.32 (0.95-1.85)	1.28 (0.92-1.79)	1.01 (0.72-1.42)	0.97	0.99	1.02 (0.95-1.10)
TUDCA		Not quantifiable	Quantifiable					
	N cases (%)	525 (87.8)	73 (12.2)					
	OR (95% CI) <sup>a</sup>	1	0.92 (0.65-1.31)			0.65	0.89	0.96 (0.80-1.15)

<sup>a</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking intensity (cigarettes/day), diabetes diagnosis (no, yes), average number of alcoholic drinks per day, frequency of physical activity in leisure time (none, <1/wk, 1-2/wk, ≥3/wk), total red meat (g/day/1000 kcal), total processed meat (g/day/1000 kcal), whole grains (oz/day/100kcal), total energy (kcal/day), education (less than elementary school, some junior high school, completed junior high school, some senior high school, senior high school graduate)

<sup>b</sup> Controls were alive and cancer-free at case diagnosis date and were incidence-density sampled and matched on age at randomization (+/- 5 years), baseline serum draw date (+/- 30 days), fasting status (<8 vs. ≥8 hours)

Supplementary Table 4. Association of summary short chain fatty acid (SCFA) and bile acid (BA) measures with colorectal cancer (n=430 cases [n=198 women and n=232 men]; n=430 matched controls<sup>b</sup>) excluding cases occurring within 5 years of blood draw and their matched controls in the PLCO Study

Summary BA measures		Definition	Colorectal Cancer						
			Quartile 1 (ref)	Quartile 2	Quartile 3	Quartile 4	P-trend	log <sub>2</sub> [BA]	P-interaction <sup>b</sup>
Total SCFA			<1023.4	1023.4 to <1513.5	1513.5 to <2319.4	≥2319.4			0.10
	Women	N cases (%)	55 (27.8)	53 (26.8)	45 (22.7)	45 (22.7)	--	198 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	0.86 (0.47-1.59)	0.69 (0.37-1.27)	0.57 (0.30-1.27)	0.07	0.80 (0.62-1.04)	--
	Men	N cases (%)	56 (24.1)	51 (22.0)	67 (28.9)	58 (25.0)	--	232 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	0.70 (0.39-1.22)	1.06 (0.59-1.90)	1.20 (0.65-2.21)	0.36	1.15 (0.92-1.43)	--
Total BA			<350.73	350.73 to <680.59	680.59 to 1353.49	≥1353.49			0.01
	Women	N cases (%)	37 (18.7)	40 (20.2)	64 (32.3)	57 (28.8)	--	198 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.09 (0.56-2.14)	1.92 (1.05-3.52)	2.31 (1.16-4.60)	0.005	1.38 (1.15-1.66)	--
	Men	N cases (%)	46 (19.8)	70 (30.2)	55 (23.7)	61 (26.3)	--	263 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.33 (0.72-2.46)	0.76 (0.41-1.40)	0.98 (0.50-1.93)	0.45	0.99 (0.85-1.16)	--
Total primary BA			<181.70	181.70 to <400.99	400.99 to <836.01	≥836.01			0.01
	Women	N cases (%)	37 (18.7)	50 (25.3)	54 (27.3)	57 (28.8)	--	198 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.19 (0.62-2.28)	1.91 (0.95-3.83)	2.94 (1.47-5.87)	0.001	1.28 (1.09-1.50)	--
	Men	N cases (%)	46 (19.8)	67 (28.9)	56 (24.1)	63 (27.2)	--	232 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.38 (0.74-2.56)	0.76 (0.40-1.46)	0.99 (0.52-1.86)	0.64	0.95 (0.83-1.10)	--
Total secondary BA			<93.11	93.11 to <195.43	195.43 to 418.45	≥418.45			0.45
	Women	N cases (%)	34 (17.2)	38 (19.2)	58 (29.3)	68 (34.3)	--	198 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.22 (0.58-2.56)	2.05 (1.05-3.99)	2.92 (1.41-6.06)	0.001	1.15 (1.03-1.30)	--
	Men	N cases (%)	43 (18.5)	62 (26.7)	67 (28.9)	60 (25.9)	--	232 (100)	--
		OR (95% CI) <sup>a</sup>	1.00	1.60 (0.86-2.95)	1.35 (0.75-2.45)	1.20 (0.63-2.29)	0.74	1.07 (0.96-1.19)	--

<sup>a</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking status (never, former, current), family history of CRC (no, yes), diabetes diagnosis (no, yes), alcohol drinker (no, yes), alcoholic intake (average number of drinks/day), hours spent in vigorous physical activity (none, <1 hour/wk, 1 hour/wk, 2 hours/wk, 3 hours/wk, ≥4 hours/wk), not processed red meat (g/day/1000 kcal), processed meat (g/day/1000 kcal), MPED equivalents of whole grains (oz/day/1000 kcal), total energy (kcal/day), education (high school graduate or less, some college or post high school training, college graduate or postgraduate), hormone replacement therapy status (women only; never, current, former)

<sup>b</sup> P-interaction between log<sub>2</sub>-transformed bile acid measure and sex estimated in unconditional logistic regression model including sex as a covariate in the model

Supplementary Table 5. Association of summary short chain fatty acid (SCFA) and bile acid (BA) measures with colorectal cancer (n=550 cases; n=550 matched controls<sup>b</sup>) excluding cases occurring within 5 years of blood draw and their match controls in the ATBC Study

Summary BA measures		Quartile 1 (ref)	Quartile 2	Quartile 3	Quartile 4	P-trend	log <sub>2</sub> [BA]
Total SCFA	Definition	<1412.8	1412.8 to <2073.4	2073.4 to <3078.2	≥3078.2		
	N cases (%)	150 (27.3)	131 (23.8)	129 (23.5)	140 (25.5)		550 (100)
	OR (95% CI)	1.00	0.94 (0.67-1.32)	0.94 (0.67-1.32)	0.97 (0.68-1.38)	0.87	1.01 (0.89-1.13)
Total BA	Definition	<279.92	279.92 to <507.14	507.14 to <896.69	≥896.69		
	N cases (%)	116 (21.1)	140 (25.5)	125 (22.7)	169 (30.7)	--	550 (100)
	OR (95% CI)	1.00	1.29 (0.90-1.84)	1.13 (0.79-1.61)	1.46 (1.04-2.05)	0.06	1.09 (0.99-1.20)
Total primary BA	Definition	<159.47	159.47 to <315.88	315.88 to <622.97	≥622.97		
	N cases (%)	125 (22.7)	135 (24.6)	119 (21.6)	171 (31.1)	--	550 (100)
	OR (95% CI)	1.00	1.16 (0.82-1.67)	0.97 (0.68-1.38)	1.38 (0.98-1.94)	0.13	1.07 (0.99-1.17)
Total secondary BA	Definition	<59.76	59.76 to <125.06	125.06 to <218.11	≥218.11		
	N cases (%)	116 (21.1)	134 (24.4)	131 (23.8)	169 (30.7)	--	550 (100)
	OR (95% CI)	1.00	1.08 (0.75-1.55)	1.14 (0.79-1.64)	1.50 (1.05-2.14)	0.02	1.08 (1.00-1.20)

<sup>a</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking intensity (cigarettes/day), diabetes diagnosis (no, yes), average number of alcoholic drinks per day, frequency of physical activity in leisure time (none, <1/wk, 1-2/wk, ≥3/wk), total red meat (g/day/1000 kcal), total processed meat (g/day/1000 kcal), whole grains (oz/day/100kcal), total energy (kcal/day), education (less than elementary school, some junior high school, completed junior high school, some senior high school, senior high school graduate)

<sup>b</sup> Controls were alive and cancer-free at case diagnosis date and were incidence-density sampled and matched on age at randomization (+/- 5 years), baseline serum draw date (+/- 30 days), fasting status (<8 vs. ≥8 hours)

Supplementary Table 6. Association of short chain acids (SCFAs) with colorectal cancer in the PLCO Study (n=495 cases [n=233 women and n=262 men]; n=495 matched controls)<sup>a</sup> by sex and the in the ATBC Study (n=598 cases; n=598 matched controls)<sup>b</sup>

Study	Sex		SCFA Quartile				Trend Test		Continuous	Interaction Test for Sex
			1 (Ref)	2	3	4	P-value	Q-value	log <sub>2</sub> [SCFA]	P-value <sup>c</sup>
Acetic Acid (ng/mL)										
PLCO		Definition	<782.0	782.0 to <1290.0	1290.0 to <2040.0	≥2040.0				0.02
	Women	N cases (%)	71 (30.5)	66 (28.3)	43 (18.5)	53 (22.8)				
		OR (95% CI) <sup>d</sup>	1.00	1.07 (0.61-1.90)	0.58 (0.33-1.04)	0.57 (0.32-1.03)	0.02	0.20	0.78 (0.63-0.96)	
	Men	N cases (%)	57 (21.8)	72 (27.5)	63 (24.1)	70 (26.7)				
		OR (95% CI) <sup>d</sup>	1.00	0.90 (0.52-1.55)	0.81 (0.46-1.44)	1.33 (0.75-2.37)	0.35	0.70	1.16 (0.96-1.40)	
ATBC		Definition	<1060.0	1060.0 to <1690.0	1690.0 to <2670.0	≥2670.0				
	Men	N cases (%)	167 (27.9)	140 (23.4)	138 (23.1)	153 (25.6)				
		OR (95% CI) <sup>e</sup>	1.00	0.87 (0.63-1.20)	0.85 (0.61-1.17)	0.90 (0.61-1.17)	0.52	0.93	0.98 (0.88-1.08)	
Butyric Acid (ng/mL)										
PLCO		Definition	<17.3	17.3 to <24.7	24.7 to <34.6	≥34.6				0.51
	Women	N cases (%)	50 (21.5)	54 (23.2)	48 (20.6)	81 (34.8)				
		OR (95% CI) <sup>d</sup>	1.00	1.39 (0.75-2.58)	1.09 (0.57-2.07)	1.74 (0.90-3.38)	0.17	0.60	1.37 (1.04-1.80)	
	Men	N cases (%)	69 (26.3)	68 (26.0)	48 (18.3)	77 (29.4)				
		OR (95% CI) <sup>d</sup>	1.00	0.68 (0.39-1.18)	0.53 (0.29-0.95)	1.00 (0.58-1.72)	0.91	0.91	1.13 (0.91-1.40)	
ATBC		Definition	<27.0	27.0 to <33.6	33.6 to <44.3	≥44.3				
	Men	N cases (%)	149 (24.9)	152 (25.4)	137 (22.9)	160 (26.8)				
		OR (95% CI) <sup>e</sup>	1.00	1.04 (0.75-1.43)	0.93 (0.67-1.30)	1.07 (0.77-1.50)	0.85	0.93	0.98 (0.79-1.21)	
Propionic acid (ng/mL)										
PLCO		Definition	<15.7	15.7 to <32.6	32.6 to <54.0	≥54.0				0.76
	Women	N cases (%)	57 (24.5)	52 (22.3)	51 (21.9)	73 (31.3)				
		OR (95% CI) <sup>d</sup>	1.00	0.92 (0.51-1.67)	0.82 (0.44-1.53)	1.60 (0.81-3.18)	0.23	0.60	1.01 (0.93-1.11)	
	Men	N cases (%)	69 (26.3)	63 (24.1)	46 (17.6)	84 (32.1)				
		OR (95% CI) <sup>d</sup>	1.00	0.70 (0.40-1.24)	0.70 (0.38-1.30)	1.11 (0.61-2.03)	0.55	0.73	1.04 (0.96-1.14)	
ATBC		Definition	<51.7	51.7 to <70.2	70.2 to <93.4	≥93.4				
	Men	N cases (%)	148 (24.8)	135 (22.6)	174 (29.1)	141 (22.6)				
		OR (95% CI) <sup>e</sup>	1.00	0.94 (0.64-1.39)	1.23 (0.84-1.80)	0.93 (0.62-1.38)	0.92	0.93	1.04 (0.88-1.23)	
Hexanoic acid (ng/mL)										
PLCO		Definition	<30.1	30.1 to <39.6	39.6 to <53.6	≥53.6				0.73
	Women	N cases (%)	51 (21.9)	55 (23.6)	68 (29.2)	59 (25.3)				
		OR (95% CI) <sup>a</sup>	1.00	0.67 (0.36-1.26)	0.82 (0.42-1.62)	0.59 (0.30-1.18)	0.25	0.60	0.92 (0.63-1.36)	
	Men	N cases (%)	75 (28.6)	65 (24.8)	57 (21.8)	65 (24.8)				
		OR (95% CI) <sup>a</sup>	1.00	1.10 (0.65-1.89)	0.85 (0.47-1.54)	1.29 (0.67-2.48)	0.69	0.75	1.10 (0.75-1.61)	
ATBC		Definition	<70.7	70.7 to <79.8	79.8 to <93.1	≥93.1				
	Men	N cases (%)	140 (23.4)	133 (22.2)	169 (28.3)	156 (26.1)				
		OR (95% CI) <sup>b</sup>	1.00	0.96 (0.69-1.35)	1.14 (0.83-1.58)	1.10 (0.78-1.54)	0.40	0.93	1.22 (0.86-1.75)	
Isobutyric acid (ng/mL)										
PLCO		Definition	<42.4	42.4 to <56.0	56.0 to <73.6	≥73.6				0.87
	Women	N cases (%)	67 (28.8)	61 (26.2)	46 (19.7)	59 (25.3)				
		OR (95% CI) <sup>d</sup>	1.00	0.73 (0.41-1.32)	0.53 (0.26-1.07)	0.81 (0.41-1.58)	0.55	0.73	1.07 (0.83-1.37)	
	Men	N cases (%)	71 (27.1)	52 (19.9)	62 (23.7)	77 (29.4)				
		OR (95% CI) <sup>d</sup>	1.00	0.68 (0.39-1.20)	0.79 (0.44-1.44)	0.87 (0.45-1.70)	0.69	0.75	1.00 (0.75-1.33)	
ATBC		Definition	<78.9	78.9 to <92.6	92.6 to <109.0	≥109.0				
	Men	N cases (%)	165 (27.6)	121 (20.2)	145 (24.3)	167 (27.9)				
		OR (95% CI) <sup>e</sup>	1.00	0.68 (0.47-0.98)	0.82 (0.56-1.20)	0.86 (0.59-1.26)	0.71	0.93	0.98 (0.87-1.10)	
Isovaleric acid (ng/mL)										
PLCO		Definition	<42.9	42.9 to <61.4	61.4 to <82.8	≥82.8				0.21
	Women	N cases (%)	84 (36.1)	76 (32.6)	37 (15.9)	36 (15.5)				
		OR (95% CI) <sup>d</sup>	1.00	1.09 (0.65-1.85)	0.56 (0.31-1.04)	0.75 (0.38-1.46)	0.14	0.60	0.74 (0.53-1.04)	
	Men	N cases (%)	47 (17.9)	62 (23.7)	75 (28.6)	78 (29.8)				
		OR (95% CI) <sup>d</sup>	1.00	0.82 (0.45-1.51)	1.04 (0.55-1.97)	0.73 (0.38-1.41)	0.46	0.73	1.06 (0.76-1.48)	
ATBC		Definition	<63.5	63.5 to <80.1	80.1 to <101.0	≥101.0				
	Men	N cases (%)	161 (26.9)	134 (22.4)	140 (23.4)	163 (27.3)				
		OR (95% CI) <sup>e</sup>	1.00	0.83 (0.59-1.16)	0.84 (0.59-1.16)	0.97 (0.68-1.37)	0.93	0.93	0.96 (0.76-1.22)	

<sup>a</sup> Controls were alive and cancer-free at case diagnosis date and were incidence-density sampled and matched on age at randomization (+/- 5 years), sex, race, year of randomization, and season of blood draw

<sup>b</sup> Controls were alive and cancer-free at case diagnosis date and were incidence-density sampled and matched on age at randomization (+/- 5 years), baseline serum draw date (+/- 30 days), fasting status (<8 vs. ≥8 hours)

<sup>c</sup> P-interaction between log<sub>2</sub>-transformed bile acid measure and sex estimated in unconditional logistic regression model including sex as a covariate in the model

<sup>d</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking status (never, former, current), family history of CRC (no, yes), diabetes diagnosis (no, yes), alcohol drinker (no, yes), alcoholic intake (average number of drinks/day), hours spent in vigorous physical activity (none, <1 hour/wk, 1 hour/wk, 2 hours/wk, 3 hours/wk, ≥4 hours/wk), not processed red meat (g/day/1000 kcal), processed meat (g/day/1000 kcal), MPED equivalents of whole grains (oz/day/1000 kcal), total energy (kcal/day), education (high school graduate or less, some college or post high school training, college graduate or postgraduate), hormone replacement therapy status (women only; never, current, former)

<sup>e</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking intensity (cigarettes/day), diabetes diagnosis (no, yes), average number of alcoholic drinks per day, frequency of physical activity in leisure time (none, <1/wk, 1-2/wk, ≥3/wk), total red meat (g/day/1000 kcal), total processed meat (g/day/1000 kcal), whole grains (oz/day/100kcal), total energy (kcal/day), education (less than elementary school, some junior high school, completed junior high school, some senior high school, senior high school graduate)

Supplementary Table 7. Independent associations of bile acids (BAs) and short chain acids (SCFAs) with colorectal cancer in the PLCO Study (n=495 cases [n=233 women and n=262 men]; n=495 matched controls) by sex and the in the ATBC Study (n=598 cases; n=598 matched controls) selected using a stepwise procedure

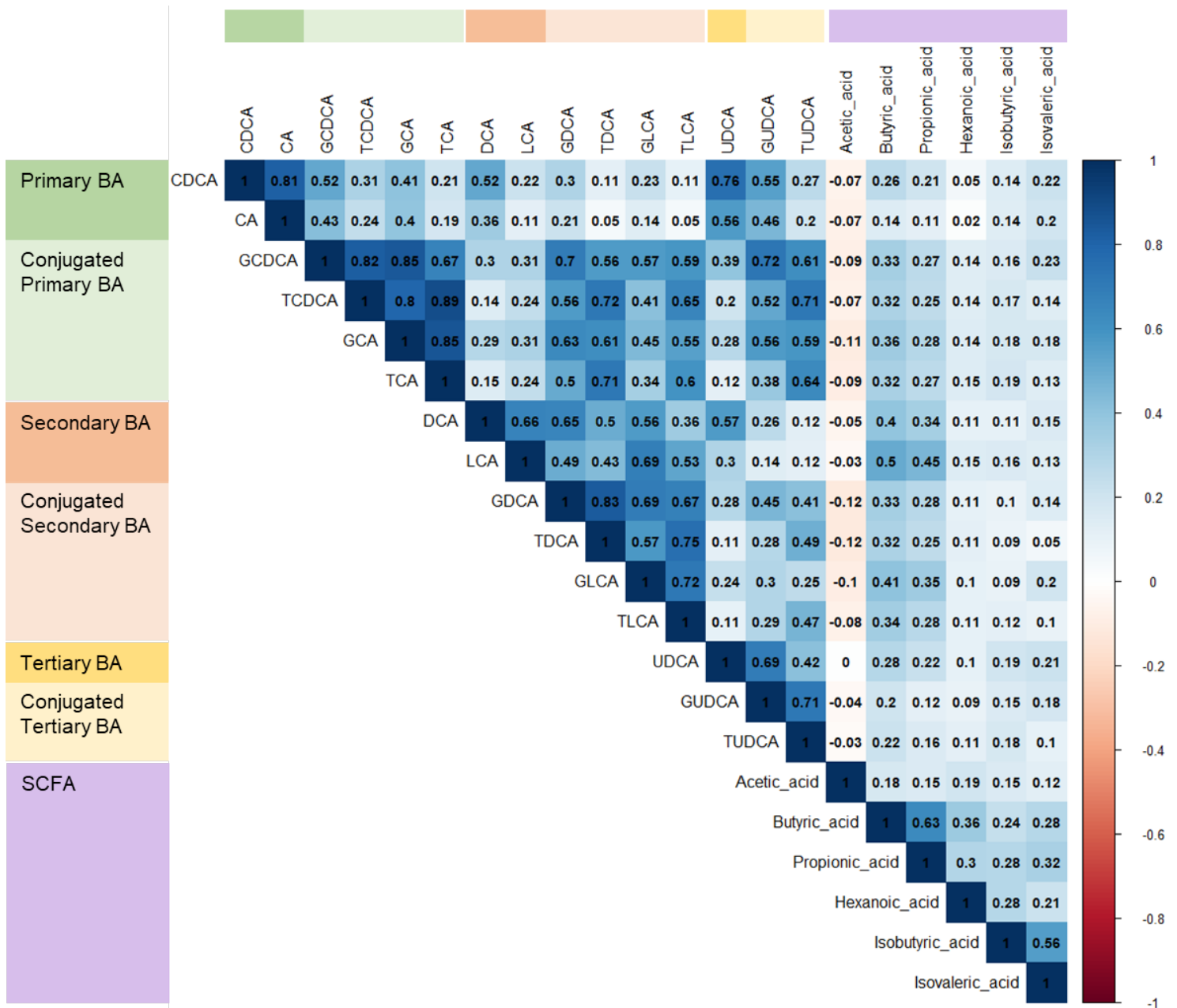
Study, Sex	Metabolite	Order entered	Model entry P <sup>a</sup>	Mutually adjusted OR (95% CI)	Mutually adjusted P <sup>a</sup>
PLCO, Women	Glycodeoxycholic acid	1	0.0015	1.29 (1.10-1.50) <sup>b</sup>	0.0029
	Isovaleric acid	2	0.0298	0.68 (0.48-0.96) <sup>b</sup>	0.0274
PLCO, Men	Ursodeoxycholic acid	1	0.0216	0.94 (0.89-0.99) <sup>b</sup>	0.0224
	Taurodeoxycholic acid	2	0.0464	1.06 (1.00-1.13) <sup>b</sup>	0.0439
ATBC, Men	Glycodeoxycholic acid	1	0.0136	1.10 (1.02-1.18) <sup>c</sup>	0.0131

<sup>a</sup> P-value for test obtained from conditional logistic regression model for a given metabolite (modeled on a continuous basis); all tests were two-sided. previously in model.

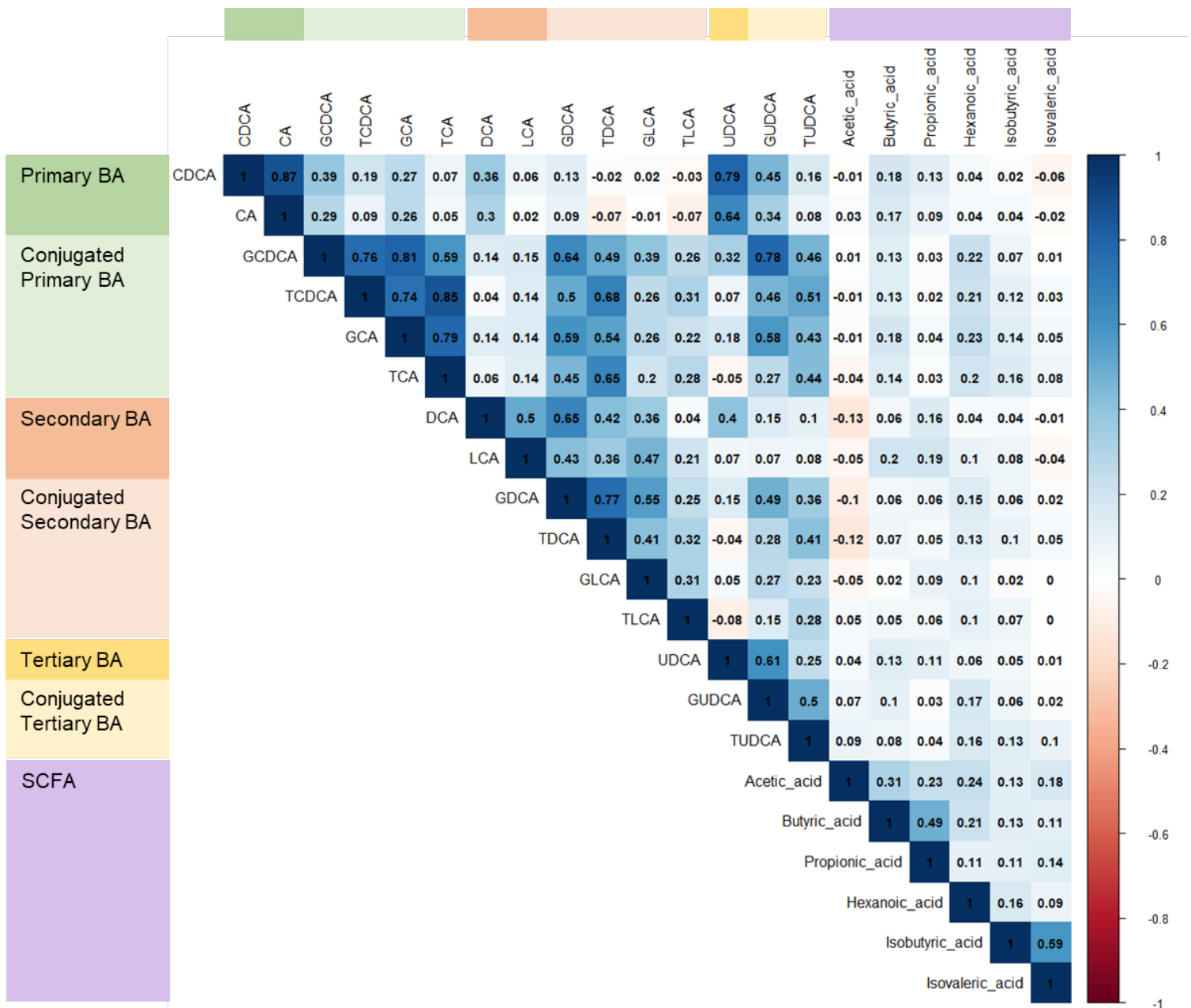
<sup>b</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking status (never, former, current), family history of CRC (no, yes), diabetes diagnosis (no, yes), alcohol drinker (no, yes), alcoholic intake (average number of drinks/day), hours spent in vigorous physical activity (none, <1 hour/wk, 1 hour/wk, 2 hours/wk, 3 hours/wk, ≥4 hours/wk), not processed red meat (g/day/1000 kcal), processed meat (g/day/1000 kcal), MPED equivalents of whole grains (oz/day/1000 kcal), total energy (kcal/day), education (high school graduate or less, some college or post high school training, college graduate or postgraduate), hormone replacement therapy status (women only; never, current, former), and all other metabolites

<sup>c</sup> Adjusted for age at baseline (years), BMI (kg/m<sup>2</sup>), smoking intensity (cigarettes/day), diabetes diagnosis (no, yes), average number of alcoholic drinks per day, frequency of physical activity in leisure time (none, <1/wk, 1-2/wk, ≥3/wk), total red meat (g/day/1000 kcal), total processed meat (g/day/1000 kcal), whole grains (oz/day/100kcal), total energy (kcal/day), education (less than elementary school, some junior high school, completed junior high school, some senior high school, senior high school graduate), and all other metabolites





**Supplementary Figure 1.** Spearman rank correlation plot for BAs and SCFAs among controls in the PLCO study (n=495); abbreviations: BA, bile acid; chenodeoxycholic acid, CDCA; CA, cholic acid; GCDCA, glycochenodeoxycholic acid; TCDC, taurochenodeoxycholic acid; GCA, glycocholic acid; TCA, taurocholic acid; DCA, deoxycholic acid; LCA, lithocholic acid; GDCA, glycodeoxycholic acid; TDCA, taurodeoxycholic acid; GLCA, glycolithocholic acid; TLCA, tauroolithocholic acid; UDCA, ursodeoxycholic acid; GUDCA, glyoursodeoxycholic acid; TUDCA, taoursodeoxycholic acid; SCFA, short-chain fatty acid



**Supplementary Figure 2.** Spearman rank correlation plot for BAs and SCFAs among controls in the ATBC study (n=598); abbreviations: BA, bile acid; chenodeoxycholic acid, CDCA; CA, cholic acid; GCDCA, glycochenodeoxycholic acid; TCDCa, taurochenodeoxycholic acid; GCA, glycocholic acid; TCA, taurocholic acid; DCA, deoxycholic acid; LCA, lithocholic acid; GDCA, glycodeoxycholic acid; TDCA, taurodeoxycholic acid; GLCA, glycolithocholic acid; TLCA, tauroolithocholic acid; UDCA, ursodeoxycholic acid; GUDCA, glyoursodeoxycholic acid; TUDCA, taoursodeoxycholic acid; SCFA, short-chain fatty acid