

TABLE 0-2. (continued)

Interaction Summaries of Adjusted Exposure Index Analyses for Renal Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Contrast	Adj. Relative Risk (95% C.I.)	p-Value
				Low	Medium	High			
Blood Urea Nitrogen	Exposure Index-by- Race (Officer)	Nonblack	n	125	127	121	M vs. L	(b)	0.877
			Adj. Mean(c)	14.65	14.71	14.55	H vs. L	(b)	0.814
			95% C.I. (c)	(13.91,15.41)	(13.96,15.49)	(13.84,1.27)			
		Black	n	2	2	3	M vs. L	(b)	0.035
			Adj. Mean	16.93	10.65	19.51	H vs. L	(b)	0.494
			95% C.I.	(12.24,22.38)	(7.62,14.19)	(14.45,25.33)			

*Unadjusted estimate of relative risk and confidence interval, or p-value, based on stratified tables.

**Unadjusted estimate of relative risk and confidence interval calculated after adding 0.5 to each cell.

—Zero counts in cells do not allow for calculation of percent, relative risk, confidence interval, or p-value.

(a) Results presented for urinary white blood cell count are based on stratification into the six categories shown. Unadjusted results are presented for all strata except Ranch Hands in normal diabetic class, born before 1942. These results have been adjusted for race.

(b) No relative risk given for variables analyzed continuously.

(c) Transformed from square root scale.

Note: Small sample sizes may affect validity of overall p-value.

Note: Results without (*) or (**) are adjusted for all other main effects in model (age, race, and diabetic class), unless otherwise noted.

TABLE 0-3.

**Unadjusted Analyses for Renal Variables by Group
(Original Comparisons Only)**

Variable	Statistic	Group				Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison			
		Number	Percent	Number	Percent		
Kidney Disease	n	1,014		954			
	Yes	94	9.3	94	9.9	0.93 (0.69,1.26)	0.701
	No	920	90.7	859	90.1		
Urinary Protein	n	1,016		954			
	Abnormal	37	3.6	28	2.9	1.25 (0.76,2.06)	0.449
	Normal	979	96.4	926	97.1		
Urinary Occult Blood	n	1,015		954			
	Abnormal	182	17.9	155	16.2	1.13 (0.89,1.43)	0.338
	Normal	833	82.1	799	83.8		
Urinary White Blood Cell Count	n	1,016		954			
	Abnormal	102	10.0	83	8.7	1.17 (0.86,1.59)	0.316
	Normal	914	90.0	871	91.3		
Blood Urea Nitrogen	n	1,016		955			
	Mean*	14.21		14.37		--	0.318
	95% C.I.*	(13.99,14.43)		(14.15,14.59)			
Urine Specific Gravity	n	1,016		954			
	Mean	1.0157		1.0154		--	0.365
	95% C.I.	(1.0153,1.0162)		(1.0150,1.0159)			

*Converted from square root scale.

--No relative risk given for variables analyzed continuously.

TABLE 0-4.

Adjusted Analyses for Renal Variables by Group
(Original Comparisons Only)

Variable	Stratification	Statistic	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
			Ranch Hand	Original Comparison			
Kidney Disease		n	1,014	950	0.95 (0.70,1.28)	0.726	AGE (p=0.001)
Urinary Protein		n	1,016	942	****	****	OCC (p=0.007) AGE*DIAB (p=0.037) GRP*DIAB (p=0.003)
Urinary Occult Blood							GRP*OCC*RACE (p=0.020)
	Nonblack	n	955	887	1.14 (0.89,1.46)	0.299	AGE (p=0.003) OCC (p<0.001)
	Black Enlisted	n	53	51	1.43 (0.54,3.76)	0.465	GRP*OCC (p=0.051) AGE*DIAB (p=0.027)

TABLE 0-4. (continued)

Adjusted Analyses for Renal Variables by Group
(Original Comparisons Only)

Variable	Stratification	Statistic	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
			Ranch Hand	Original Comparison			
Urinary White Blood Cell Count	Nonblack	n	956	893	****	****	GRP*AGE*RACE (p=0.048) GRP*OCC*RACE (p=0.022) OCC (p=0.010) GRP*DIAB (p=0.054) GRP*AGE (p=0.053)
	Black Enlisted	n	53	51	****	****	GRP*OCC (p=0.015) DIAB (p=0.017) GRP*AGE (p=0.010)
Blood Urea Nitrogen		n	1,016	952		****	AGE (p<0.001)
		Adj. Mean	****	****	--		OCC (p=0.025)
		95% C.I.	****	****			RACE*DIAB (p=0.049) GRP*RACE (p=0.077)
Urine Specific Gravity		n	1,016	951			DIAB (p=0.011)
		Adj. Mean	****	****	--	****	OCC (p<0.001)
		95% C.I.	****	****			GRP*RACE (p=0.037)

*Abbreviations:

OCC: occupation

GRP: group

DIAB: diabetic class

****Group-by-covariate interaction--adjusted relative risk/group means, p-value, and confidence interval are not presented.

--No relative risk given for variables analyzed continuously.

TABLE 0-5.

**Summary of Group-by-Covariate Interactions for Renal Variables
(Original Comparisons Only)**

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
Urinary Protein	Group-by-Diabetic Class	Diabetic	n	78		76		0.57 (0.20,1.60)	0.286
			Number/%						
			Abnormal	7	9.0%	11	14.4%		
			Normal	71	91.0%	65	85.5%		
		Impaired	n	106		136		0.58 (0.19,1.75)	0.332
			Number/%						
			Abnormal	5	4.7%	11	8.1%		
			Normal	101	95.3%	125	91.9%		
		Normal	n	832		739		3.82 (1.56,9.37)	0.004
			Number/%						
			Abnormal	25	3.0%	6	0.8%		
			Normal	807	97.0%	733	99.2%		
Urinary Occult Blood	Group-by-Occupation (Black)	Officer	n	7		7		--	--
			Number/%						
			Abnormal	0	0.0%	3	42.9%		
			Normal	7	100.0%	4	57.1%		
		Enlisted Flyer	n	10		12		--	--
			Number/%						
			Abnormal	3	30.0%	1	8.3%		
			Normal	7	70.0%	11	91.7%		
		Enlisted Groundcrew	n	43		39		--	--
			Number/%						
			Abnormal	13	30.2%	9	23.1%		
			Normal	30	69.8%	30	76.9%		

TABLE 0-5. (continued)

Summary of Group-by-Covariate Interactions for Renal Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group		Original Comparison	Adj. Relative Risk (95% C.I.)	p-Value
				Ranch	Band			
Urinary White Blood Cell Count	Nonblack: Group-by-Age Group-by-Diabetic Class	Born $\geq$ 1942	n	14		12		
		Diabetic	Abnormal	1	7.1%	2	16.7%	0.90 (0.38,2.10)
			Normal	13	92.9%	10	83.3%	0.799
		Born $\leq$ 1942	n	22		33		
		Impaired	Abnormal	2	9.1%	4	12.1%	4.12 (2.06,8.24)
			Normal	20	90.9%	29	87.9%	<0.001
		Born $\geq$ 1942	n	344		298		
		Normal	Abnormal	38	11.0%	13	4.4%	2.08 (1.16,3.71)
			Normal	306	89.0%	285	95.6%	0.014
		Born $\leq$ 1942	n	57		57		
		Diabetic	Abnormal	6	10.5%	12	21.1%	0.38 (0.14,1.04)
			Normal	51	89.5%	45	78.9%	0.059
		Born $\leq$ 1942	n	80		89		
		Impaired	Abnormal	14	17.5%	6	6.7%	1.77 (0.75,4.17)
			Normal	66	82.5%	83	93.3%	0.191
		Born $\leq$ 1942	n	439		404		
		Normal	Abnormal	31	7.1%	37	9.2%	0.89 (0.55,1.44)
			Normal	408	92.9%	367	90.8%	0.639

TABLE 0-5. (continued)

Summary of Group-by-Covariate Interactions for Renal Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group		Original Comparison	Adj. Relative Risk (95% C.I.)	p-Value
				Ranch	Band			
Urinary White Blood Cell Count	Group-by- Occupation (Black)	Officer	n	7		7		
			Number/%					
			Abnormal	0	0.0%	2	28.6%	--
		Enlisted Flyer	Normal	7	100.0%	5	71.4%	--
			n	10		12		
			Number/%					
			Abnormal	3	30.0%	0	0.0%	--
		Enlisted Groundcrew	Normal	7	70.0%	12	100.0%	--
			n	43		39		
			Number/%					
			Abnormal	7	16.3%	7	17.9%	--
			Normal	36	83.7%	32	82.1%	--
Urinary White Blood Cell Count	Group-by- Age (Black Enlisted)	Born ≥1942	n	29		26		
			Number/%					
			Abnormal	4	13.8%	5	19.2%	0.65 (0.15, 2.78)
		Born <1942	Normal	25	86.2%	21	80.8%	
			n	24		25		
			Number/%					
			Abnormal	6	25.0%	2	8.0%	4.99 (0.79, 31.56)
			Normal	18	75.0%	23	92.0%	

TABLE 0-5. (continued)

Summary of Group-by-Covariate Interactions for Renal Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group		Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand	Original Comparison		
Blood Urea Nitrogen	Group-by-Race	Nonblack	n	956	894	--	0.726
			Adj. Mean*	14.16	14.22		
			95% C.I.*	(13.86, 14.47)	(13.92, 14.53)		
		Black	n	60	58	--	0.057
			Adj. Mean*	12.43	13.63		
			95% C.I.*	(11.41, 13.51)	(12.66, 14.64)		
Urine Specific Gravity	Group-by-Race	Nonblack	n	956	893	--	0.104
			Adj. Mean	1.0163	1.0158		
			95% C.I.	(1.0157, 1.0169)	(1.0151, 1.0164)		
		Black	n	60	58	--	0.081
			Adj. Mean	1.0154	1.0177		
			95% C.I.	(1.0135, 1.0173)	(1.0158, 1.0196)		

--No relative risk given for variables analyzed continuously. Also, no relative risk or p-value given for interactions involving occupation for urinary occult blood and urinary white blood cell count; tables presented only for illustrative purposes.

*Transformed from square root scale.

APPENDIX P

Endocrine Assessment

APPENDIX P: Endocrine Assessment

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TABLE P-1.

Summary of Group-by-Covariate Interactions for Endocrinological Variables

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Comparison	
Testosterone	Group-by- % Body Fat	<10%	n	6	4	0.012
			Mean	522.6	1044.8	
			Adj. Mean	654.4	1042.8	
			95% C.I.	(484.7,849.5)	(803.5,1313.2)	
		10-25%	n	815	1026	0.023
			Mean	627.8	605.7	
			Adj. Mean	603.3	582.4	
			95% C.I.	(583.4,623.5)	(563.9,601.3)	
		>25%	n	179	257	0.706
			Mean	470.5	470.3	
			Adj. Mean	463.0	456.7	
			95% C.I.	(435.0,491.9)	(432.9,481.2)	
Differential Cortisol	Group-by- Race-by- Age	Nonblack Born $\geq$ 1942	n	374	500	0.156
			Mean	2.07	2.44	
			Adj. Mean	1.58	1.97	
			95% C.I.	(0.64,2.51)	(1.06,2.88)	
		Nonblack Born <1942	n	572	697	0.708
			Mean	2.53	2.46	
			Adj. Mean	2.08	1.99	
			95% C.I.	(1.18,2.97)	(1.10,2.88)	
		Black Born $\geq$ 1942	n	32	47	0.003
			Mean	0.17	2.78	
			Adj. Mean	-0.46	2.33	
			95% C.I.	(-2.11,1.18)	(0.89,3.76)	
		Black Born <1942	n	26	36	0.312
			Mean	3.24	2.30	
			Adj. Mean	2.94	1.89	
			95% C.I.	(1.22,4.67)	(0.32,3.46)	

TABLE P-2.

Unadjusted Exposure Index Analyses for Endocrinological Variables by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
T ₃ % Uptake	Officer	n	126	124	122	Overall	0.250
		Mean	28.01	28.35	27.96	M vs. L	0.177
		95% C.I.	(27.66,28.36)	(28.00,28.71)	(27.61,28.32)	H vs. L	0.857
	Enlisted Flyer	n	55	65	55	Overall	0.362
		Mean	27.31	27.59	27.83	M vs. L	0.411
		95% C.I.	(26.82,27.81)	(27.14,28.06)	(27.32,28.34)	H vs. L	0.155
	Enlisted Groundcrew	n	153	161	142	Overall	0.775
		Mean	27.68	27.65	27.53	M vs. L	0.865
		95% C.I.	(27.37,28.00)	(27.34,27.95)	(27.21,27.85)	H vs. L	0.493
TSH	Officer	n	126	124	122	Overall	0.283
		Mean	1.181	1.167	1.278	M vs. L	0.843
		95% C.I.	(1.089,1.286)	(1.076,1.271)	(1.173,1.397)	H vs. L	0.203
	Enlisted Flyer	n	55	65	55	Overall	0.181
		Mean	1.033	1.153	1.204	M vs. L	0.178
		95% C.I.	(0.924,1.162)	(1.035,1.292)	(1.068,1.367)	H vs. L	0.075
	Enlisted Groundcrew	n	153	161	142	Overall	0.738
		Mean	1.117	1.124	1.160	M vs. L	0.899
		95% C.I.	(1.043,1.199)	(1.051,1.204)	(1.079,1.250)	H vs. L	0.465

TABLE P-2. (continued)

Unadjusted Exposure Index Analyses for Endocrinological Variables by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Testosterone	Officer	n	125	128	118	Overall	0.099
		Mean	599.4	547.4	558.0	M vs. L	0.041
		95% C.I.	(563.8, 636.1)	(513.8, 582.1)	(522.7, 594.4)	H vs. L	0.112
	Enlisted Flyer	n	55	63	57	Overall	0.363
		Mean	588.7	637.4	584.9	M vs. L	0.244
		95% C.I.	(531.6, 648.6)	(581.8, 695.6)	(529.1, 643.6)	H vs. L	0.929
	Enlisted Groundcrew	n	162	153	139	Overall	0.276
		Mean	609.3	641.4	603.4	M vs. L	0.205
		95% C.I.	(574.7, 644.9)	(606.9, 676.9)	(567.3, 640.6)	H vs. L	0.820
Initial Cortisol	Officer	n	124	130	121	Overall	0.186
		Mean	11.97	11.43	12.28	M vs. L	0.239
		95% C.I.	(11.33, 12.65)	(10.83, 12.07)	(11.61, 12.99)	H vs. L	0.531
	Enlisted Flyer	n	55	65	57	Overall	0.276
		Mean	11.97	11.08	11.13	M vs. L	0.001
		95% C.I.	(11.09, 12.91)	(10.33, 11.88)	(10.33, 11.99)	H vs. L	0.092
	Enlisted Groundcrew	n	154	161	142	Overall	0.699
		Mean	11.69	11.33	11.50	M vs. L	0.397
		95% C.I.	(11.09, 12.32)	(10.76, 11.92)	(10.89, 12.15)	H vs. L	0.678

TABLE P-2. (continued)

Unadjusted Exposure Index Analyses for Endocrinological Variables by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
2-Hour Cortisol	Officer	n	124	130	121	Overall	0.416
		Mean	9.27	9.16	9.69	M vs. L	0.789
		95% C.I.	(8.72,9.86)	(8.63,9.73)	(9.10,10.32)	H vs. L	0.324
	Enlisted Flyer	n	55	65	57	Overall	0.200
		Mean	8.43	9.48	9.06	M vs. L	0.074
		95% C.I.	(7.67,9.26)	(8.69,10.34)	(8.25,9.94)	H vs. L	0.286
	Enlisted Groundcrew	n	154	161	142	Overall	0.453
		Mean	9.64	9.29	9.17	M vs. L	0.358
		95% C.I.	(9.11,10.19)	(8.79,9.81)	(8.65,9.72)	H vs. L	0.229
Differential Cortisol	Officer	n	124	130	121	Overall	0.709
		Mean	2.69	2.31	2.59	M vs. L	0.424
		95% C.I.	(2.02,3.36)	(1.66,2.96)	(1.91,3.26)	H vs. L	0.829
	Enlisted Flyer	n	55	65	57	Overall	0.003
		Mean	3.43	1.20	2.30	M vs. L	<0.001
		95% C.I.	(2.50,4.36)	(0.34,2.06)	(1.39,3.22)	H vs. L	0.092
	Enlisted Groundcrew	n	154	161	142	Overall	0.726
		Mean	1.96	2.12	2.37	M vs. L	0.740
		95% C.I.	(1.26,2.66)	(1.44,2.81)	(1.64,3.09)	H vs. L	0.425

TABLE P-2. (continued)

Unadjusted Exposure Index Analyses for Endocrinological Variables by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
2-Hour Post-prandial Glucose	Officer	n	121	113	124	Overall	0.892
		Mean	109.0	107.5	107.6	M vs. L	0.666
		95% C.I.	(104.3,113.8)	(103.0,112.3)	(102.9,112.6)	H vs. L	0.694
	Enlisted Flyer	n	54	62	56	Overall	0.051
		Mean	100.9	118.0	110.9	M vs. L	0.015
		95% C.I.	(92.1,110.6)	(108.3,128.5)	(101.4,121.4)	H vs. L	0.149
	Enlisted Groundcrew	n	150	156	140	Overall	0.674
		Mean	105.5	106.7	109.1	M vs. L	0.750
		95% C.I.	(100.1,111.1)	(101.4,112.4)	(103.3,115.2)	H vs. L	0.380

TABLE P-3.

Interaction Summaries of Adjusted Exposure Index Analyses for Endocrinological Variables

Variable	Interaction (Occupation)	Stratifi- cation	Statistic	Exposure Index			Contrast	p-Value
				Low	Medium	High		
Testosterone	Exposure Index-by- % Body Fat (Enlisted Groundcrew)	<10%	n	1	2	3		
			Adj. Mean	72.7	828.8	684.5	M vs. L	<0.001
			95% C.I.	(0.3,273.0)	(537.8,1182.5)	(465.4,945.8)	H vs. L	<0.001
		10-25%	n	125	128	105		
			Adj. Mean	630.0	646.2	644.7	M vs. L	0.527
			95% C.I.	(586.1,675.5)	(601.6,692.5)	(598.2,692.9)	H vs. L	0.585
		>25%	n	27	31	29		
			Adj. Mean	501.8	503.0	467.5	M vs. L	0.980
			95% C.I.	(433.9,574.7)	(437.6,573.0)	(400.7,539.6)	H vs. L	0.471
2-Hour Cortisol	Exposure Index-by- % Body Fat (Officer)	10-25%	n	102	110	99		
			Adj. Mean	8.31	8.50	9.05	M vs. L	0.629
			95% C.I.	(7.20,9.58)	(7.41,9.76)	(7.86,10.43)	H vs. L	0.079
		>25%	n	22	20	20		
			Adj. Mean	10.03	7.46	8.26	M vs. L	0.006
			95% C.I.	(8.27,12.18)	(6.12,9.10)	(6.77,10.07)	H vs. L	0.068
2-Hour Cortisol	Exposure Index-by- Race (Enlisted Groundcrew)	Nonblack	n	138	146	129		
			Adj. Mean	9.30	9.33	9.32	M vs. L	0.921
			95% C.I.	(8.30,10.42)	(8.38,10.41)	(8.33,10.43)	H vs. L	0.961
		Black	n	16	14	11		
			Adj. Mean	12.89	9.36	8.41	M vs. L	0.013
			95% C.I.	(10.59,15.67)	(7.61,11.52)	(7.48,10.48)	H vs. L	0.002

TABLE P-3. (continued)

Interaction Summaries of Adjusted Exposure Index Analyses for Endocrinological Variables

Variable	Interaction (Occupation)	Stratifi- cation	Statistic	Exposure Index			Contrast	p-Value
				Low	Medium	High		
Initial Cortisol	Exposure Index-by- % Body Fat (Officer)	10-25%	n	102	110	99		
			Adj. Mean	11.51	11.19	12.25	M vs. L	0.514
			95% C.I.	(10.13,13.08)	(9.89,12.66)	(10.80,13.91)	H vs. L	0.154
		>25%	n	22	20	20		
			Adj. Mean	12.28	9.59	10.26	M vs. L	0.010
			95% C.I.	(10.33,14.60)	(8.03,11.45)	(8.59,12.26)	H vs. L	0.060
Differential Cortisol	Exposure Index-by- Race-by- Personality Type (Enlisted Groundcrew)	Nonblack Type A	n	49	63	53		
			Adj. Mean	0.96	1.94	2.00	M vs. L	0.237
			95% C.I.	(-0.74,2.66)	(0.38,3.49)	(0.32,3.68)	H vs. L	0.223
		Nonblack Type B	n	89	83	76		
			Adj. Mean	2.29	1.36	1.64	M vs. L	0.158
			95% C.I.	(0.80,3.78)	(-0.12,2.84)	(0.14,3.14)	H vs. L	0.336
		Black Type A	n	8	5	4		
			Adj. Mean	-5.49	3.27	3.10	M vs. L	<0.001
			95% C.I.	(-8.70,-2.28)	(-0.71,7.25)	(-1.30,7.49)	H vs. L	0.001
		Black Type B	n	8	9	7		
			Adj. Mean	1.16	2.99	0.48	M vs. L	0.384
			95% C.I.	(-2.04,4.37)	(-0.07,6.05)	(-2.80,3.76)	H vs. L	0.762

TABLE P-4.

**Unadjusted Continuous and Categorical Analyses for Laboratory Endocrinological Variables by Group
(Original Comparisons Only)**

Variable	Statistic	Group		Original Comparison		Contrast	Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand						
T ₃ % Uptake	n	1,003		936				
	Mean	27.79		27.68				
	95% C.I.	(27.67,27.91)		(27.55,27.80)				0.203
	Number/%							
	Low	7	0.7%	13	1.4%	Overall		0.322
	Normal	969	96.6%	898	95.9%	Low vs. Normal	0.50 (0.20,1.26)	0.177
	High	27	2.7%	25	2.7%	High vs. Normal	1.00 (0.58,1.74)	0.999
TSH	n	1,003		936				
	Mean	1.16		1.11				
	95% C.I.	(1.13,1.19)		(1.08,1.14)			--	0.040
	Number/%							
	Normal	996	99.3%	931	99.5%		1.31 (0.41,4.14)	0.775
	High	7	0.7%	5	0.5%			
Testosterone	n	1,000		952				
	Mean	597.31		570.90				
	95% C.I.	(583.97,610.80)		(557.69,584.27)			--	0.006
	Number/%							
	Low	38	3.8%	37	3.9%	Overall		0.955
	Normal	949	94.9%	904	95.0%	Low vs. Normal	0.98 (0.62,1.55)	0.999
	High	13	1.3%	11	1.2%	High vs. Normal	1.13 (0.50,2.53)	0.839
Initial Cortisol	n	1,009		949				
	Mean	11.62		11.67				
	95% C.I.	(11.39,11.85)		(11.44,11.91)			--	0.729
	Number/%							
	Low	52	5.2%	44	4.6%	Overall		0.864
	Normal	950	94.2%	898	94.6%	Low vs. Normal	1.12 (0.74,1.69)	0.603
	High	7	0.7%	7	0.7%	High vs. Normal	0.95 (0.33,2.71)	0.999

TABLE P-4. (continued)

Unadjusted Continuous and Categorical Analyses for Laboratory Endocrinological Variables by Group
(Original Comparisons Only)

Variable	Statistic	Group				Contrast	Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison				
2-Hour Cortisol	n	1,009		949				
	Mean	9.30		9.32			---	0.924
	95% C.I.	(9.10,9.51)		(9.11,9.52)				
	Number/%							
	Low	0	0.0%	0	0.0%			
	Normal	1,005	99.6%	946	99.7%			
	High	4	0.4%	3	0.3%		1.26 (0.28,5.62)	0.999
Differential Cortisol	n	1,009		949				
	Mean	2.30		2.38			---	0.692
	95% C.I.	(2.05,2.55)		(2.12,2.64)				
2-Hour Post-prandial Glucose	n	976		909				
	Mean	107.93		110.03			---	0.154
	95% C.I.	(105.90,110.01)		(108.03,112.07)				
	Number/%							
	Normal	836	85.7%	748	82.3%	Overall Impaired vs. Normal	0.69 (0.53,0.91)	0.017
	Impaired	106	10.9%	137	15.1%	Diabetic vs. Normal	1.27 (0.75,2.16)	0.009
	Diabetic	34	3.5%	24	2.6%			0.423
Diabetes (Composite Indicator)	n	1,016		955				
	Number/%							
	Yes	74	7.3%	67	7.0%		1.04 (0.74,1.47)	0.861
	No	942	92.7%	888	93.0%			

-- No relative risk or confidence interval given for continuous analysis.

TABLE P-5.

Adjusted Continuous and Categorical Analyses for Laboratory Endocrinological Variables by Group
(Original Comparisons Only)

Variable	Statistic	Group		Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
		Ranch Hand	Original Comparison				
T ₃ % Uptake	n	998	933	Overall	—	0.332	OOC (p=0.025)
				Low vs. Normal	0.52 (0.45,2.36)	0.153	PERSTYPE (p=0.035)
				High vs. Normal	1.03 (0.59,1.78)	0.916	
TSH	n	1,003	936				
	Adj. Mean	1.16	1.11		—	0.020	AGE (p<0.001)
	95% C.I.	(1.13,1.19)	(1.08,1.14)				
				High vs. Normal	1.31 (0.41,4.14)	0.775	
Testosterone	n	1,000	951				
	Adj. Mean	****	****		—	****	RACE (p=0.015)
	95% C.I.	****	****				AGE*BFAT (p=0.039)
							GRP*BFAT (p=0.022)
	n	1,000	951				
				Overall		0.998	AGE (p<0.001)
				Low vs. Normal	1.01 90.63,1.61	0.980	ZBFAT (p<0.001)
				High vs. Normal	1.02 (0.42,2.52)	0.958	
Initial Cortisol	n	1,004	945				
	Adj. Mean	11.35	11.38		—	0.820	AGE (p<0.001)
	95% C.I.	(10.49,12.27)	(10.52,12.32)				ZBFAT (p<0.001)
							PERSTYPE (p=0.028)
							OOC*RACE (p=0.026)
Differential Cortisol	n	1,004	945				
	Adj. Mean	****	****		—	****	GRP*AGE*RACE (p=0.016)
	95% C.I.	****	****				PERSTYPE (p=0.002)
							ZBFAT (p=0.006)

TABLE P-5. (continued)

Adjusted Continuous and Categorical Analyses for Laboratory Endocrinological Variables by Group
(Original Comparisons Only)

Variable	Statistic	Group		Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
		Ranch Hand	Original Comparison				
2-Hour Post-prandial Glucose	n	976	908				ZBFAT (p<0.001)
	Adj. Mean	114.8	116.0			0.430	OCC (p=0.002)
	95% C.I.	(107.2,122.9)	(108.3,124.2)				AGE*RACE (p=0.002)
				Overall		0.023	AGE (p<0.001)
				Impaired vs. Normal	0.71 (0.54,0.93)	0.014	RACE (p=0.027)
				Diabetic vs. Normal	1.29 (0.71,2.38)	0.405	ZBFAT (p<0.001)
Diabetes (Composite Indicator)	n	1,016	954		1.13 (0.80,1.61)	0.484	AGE (p<0.001) ZBFAT (p<0.001) RACE (p=0.015)

***Group-by-covariate interaction—adjusted mean/relative risk, confidence interval, and p-value are not presented.

—No relative risk or confidence interval given for continuous analyses.

GRP: Group

OCC: Occupation

PERSTYPE: Personality type (A or B)

ZBFAT: Percent body fat

TABLE P-6.

**Summary of Group-by-Covariate Interactions for Endocrinological Variables
(Original Comparisons Only)**

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Original Comparison	
Testosterone	Group-by- % Body Fat	<10%	n	6	3	0.014
			Mean	522.6	1173.8	
			Adj. Mean	640.1	1074.7	
			95% C.I.	(472.2,833.5)	(794.4,1397.2)	
		10-25%	n	815	757	0.013
			Mean	627.8	595.9	
			Adj. Mean	602.3	577.7	
			95% C.I.	(581.2,623.7)	(556.7,599.1)	
		>25%	n	179	191	0.891
			Mean	470.5	470.7	
			Adj. Mean	461.5	459.1	
			95% C.I.	(432.9,491.1)	(431.8,487.2)	
Differential Cortisol	Group-by- Race-by Age	Nonblack Born $\geq$ 1942	n	374	342	0.331
			Mean	2.07	2.34	
			Adj. Mean	1.36	1.65	
			95% C.I.	(0.38,2.34)	(0.67,2.64)	
		Nonblack Born <1942	n	572	545	0.419
			Mean	2.53	2.36	
			Adj. Mean	1.85	1.66	
			95% C.I.	(0.92,2.79)	(0.71,2.60)	
		Black Born $\geq$ 1942	n	32	27	0.004
			Mean	0.17	3.05	
			Adj. Mean	-0.68	2.41	
			95% C.I.	(-2.35,0.99)	(0.64,4.17)	
		Black Born <1942	n	26	31	0.274
			Mean	3.24	2.22	
			Adj. Mean	2.72	1.54	
			95% C.I.	(0.98,4.47)	(-0.14,3.23)	

APPENDIX Q

Immunological Evaluation

APPENDIX Q: Immunological Evaluation

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TABLE Q-1.

Summary of Group-by-Covariate Interactions for Immunological Variables

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Comparison	
Total T Cells	Group-by-Race	Nonblack	n	424	532	0.619
			Adj. Mean	1,616	1,599	
			95% C.I.	(1,564, 1,669)	(1,554, 1,646)	
		Black	n	18	35	0.039
			Adj. Mean	1,566	1,888	
			95% C.I.	(1,340, 1,810)	(1,705, 2,080)	
B Cells (Nonblacks Only)	Group-by- Lifetime Smoking (Pack-years)	0	n	128	149	0.004
			Adj. Mean	153.8	189.9	
			95% C.I.	(135.6, 173.3)	(170.9, 210.0)	
		>0-20	n	200	265	0.998
			Adj. Mean	199.5	199.6	
			95% C.I.	(182.9, 216.9)	(185.3, 214.3)	
		>20-40	n	74	94	0.109
			Adj. Mean	200.4	172.8	
			95% C.I.	(174.0, 228.7)	(151.5, 195.4)	
		>40	n	32	29	0.857
			Adj. Mean	219.9	214.4	
			95% C.I.	(178.0, 266.3)	(172.5, 260.9)	
Monocytes	Group-by- Occupation Group-by- Current Alcohol Use (Drinks/day)	Officer 0	n	35	30	0.060
			Adj. Mean	44.19	32.33	
			95% C.I.	(34.72, 56.23)	(24.88, 42.03)	
		Officer >0-2	n	100	131	0.569
			Adj. Mean	40.43	38.38	
			95% C.I.	(34.35, 47.59)	(33.00, 44.64)	
		Officer >2-4	n	31	37	0.689
			Adj. Mean	41.53	44.35	
			95% C.I.	(32.00, 53.91)	(35.02, 56.17)	
		Officer >4	n	13	17	0.608
			Adj. Mean	37.65	33.12	
			95% C.I.	(25.58, 55.43)	(25.18, 43.56)	
		Enlisted Flyer 0	n	21	27	0.232
			Adj. Mean	35.65	45.10	
			95% C.I.	(26.32, 48.28)	(34.36, 59.20)	

TABLE Q-1. (continued)

Summary of Group-by-Covariate Interactions for Immunological Variables

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Comparison	
Monocytes (Cont.)		Enlisted >0-2 Flyer	n Adj. Mean 95% C.I.	35 34.95 (27.53, 44.36)	50 43.22 (35.00, 53.37)	0.159
		Enlisted >2-4 Flyer	n Adj. Mean 95% C.I.	8 32.71 (20.35, 52.56)	9 56.23 (36.38, 86.89)	0.097
		Enlisted >4 Flyer	n Adj. Mean 95% C.I.	5 41.10 (22.28, 75.80)	11 36.17 (23.99, 54.54)	0.729
		Enlisted 0 Groundcrew	n Adj. Mean 95% C.I.	76 45.04 (37.89, 53.54)	96 48.98 (41.73, 57.50)	0.421
		Enlisted >0-2 Groundcrew	n Adj. Mean 95% C.I.	81 42.42 (35.81, 50.24)	120 41.59 (36.10, 47.91)	0.839
		Enlisted >2-4 Groundcrew	n Adj. Mean 95% C.I.	19 45.15 (33.05, 61.67)	17 37.37 (27.08, 51.57)	0.397
		Enlisted >4 Groundcrew	n Adj. Mean 95% C.I.	16 68.86 (49.04, 96.68)	23 35.32 (26.42, 47.23)	0.003
HLA-DR Cells	Group-by- Current Alcohol Use (Drinks/day)	0	n Adj. Mean 95% C.I.	142 593.1 (555.1, 632.2)	158 581.0 (544.4, 618.9)	0.650
		>0-2	n Adj. Mean 95% C.I.	223 559.5 (529.5, 590.3)	306 582.8 (557.0, 609.2)	0.232
		>2-4	n Adj. Mean 95% C.I.	58 553.4 (497.8, 611.9)	65 565.9 (512.7, 621.7)	0.750
		>4	n Adj. Mean 95% C.I.	36 563.7 (491.7, 640.6)	51 472.7 (417.7, 531.0)	0.052

TABLE Q-1. (continued)

Summary of Group-by-Covariate Interactions for Immunological Variables

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Comparison	
MLC Net Response	Group-by- Lifetime Smoking (Pack-years)	0	n	129	156	0.053
			Adj. Mean	68,921	77,232	
			95% C.I.	(56,625, 82,424)	(64,572, 91,025)	
		>0-20	n	201	277	0.057
			Adj. Mean	67,976	74,333	
			95% C.I.	(56,990, 79,930)	(62,947, 86,665)	
		>20-40	n	71	88	0.128
			Adj. Mean	76,511	67,758	
			95% C.I.	(63,097, 91,216)	(55,676, 81,025)	
		>40	n	29	29	0.444
			Adj. Mean	71,116	63,991	
			95% C.I.	(54,784, 89,576)	(48,837, 81,189)	

TABLE Q-2.

Unadjusted Exposure Index Analyses for Cell Surface Markers by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Total T Cells	Officer	n	62	63	56	Overall	0.885
		Mean	1,594	1,550	1,578	M vs. L	0.626
		95% C.I.	(1471,1723)	(1429,1676)	(1449,1713)	H vs. L	0.865
	Enlisted Flyer	n	24	25	28	Overall	0.923
		Mean	1,677	1,659	1,622	M vs. L	0.901
		95% C.I.	(1477,1889)	(1464,1866)	(1439,1815)	H vs. L	0.697
	Enlisted Groundcrew	n	69	78	59	Overall	0.076
		Mean	1,759	1,555	1,586	M vs. L	0.032
		95% C.I.	(1623,1901)	(1434,1680)	(1446,1732)	H vs. L	0.091
Helper T Cells	Officer	n	62	63	55	Overall	0.970
		Mean	838.3	839.6	852.7	M vs. L	0.983
		95% C.I.	(755.8,925.1)	(757.7,925.8)	(764.5,945.8)	H vs. L	0.821
	Enlisted Flyer	n	24	26	27	Overall	0.832
		Mean	917.5	888.3	861.7	M vs. L	0.755
		95% C.I.	(789.3,1055.3)	(767.1,1018.5)	(744.5,987.5)	H vs. L	0.545
	Enlisted Groundcrew	n	69	76	59	Overall	0.296
		Mean	948.9	865.4	874.6	M vs. L	0.146
		95% C.I.	(867.6,1033.9)	(791.3,942.7)	(790.4,963.1)	H vs. L	0.227

TABLE Q-2. (continued)

Unadjusted Exposure Index Analyses for Cell Surface Markers by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Suppressor T Cells	Officer	n	62	64	56	Overall	0.287
		Mean	522.6	461.4	497.3	M vs. L	0.117
		95% C.I.	(467.9,583.6)	(413.8,514.4)	(442.7,558.7)	H vs. L	0.546
	Enlisted Flyer	n	24	26	28	Overall	0.891
		Mean	528.1	533.9	557.7	M vs. L	0.930
		95% C.I.	(443.1,629.3)	(451.1,631.9)	(474.1,656.0)	H vs. L	0.656
	Enlisted Groundcrew	n	69	77	59	Overall	0.123
		Mean	575.5	502.3	505.5	M vs. L	0.063
		95% C.I.	(518.9,638.3)	(455.4,554.0)	(451.9,565.3)	H vs. L	0.097
B Cells	Officer	n	62	64	55	Overall	0.453
		Mean	167.4	154.1	176.8	M vs. L	0.445
		95% C.I.	(143.5,193.2)	(131.5,178.4)	(150.7,205.0)	H vs. L	0.618
	Enlisted Flyer	n	24	25	26	Overall	0.262
		Mean	233.2	228.6	183.3	M vs. L	0.897
		95% C.I.	(185.4,286.6)	(182.1,280.3)	(142.7,228.9)	H vs. L	0.144
	Enlisted Groundcrew	n	69	73	59	Overall	0.966
		Mean	202.4	196.7	199.2	M vs. L	0.792
		95% C.I.	(173.3,233.8)	(168.8,226.8)	(168.1,233.0)	H vs. L	0.889

TABLE Q-2. (continued)

Unadjusted Exposure Index Analyses for Cell Surface Markers by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Monocytes	Officer	n	62	64	55	Overall	0.799
		Mean	43.32	46.85	47.39	M vs. L	0.584
		95% C.I.	(35.48, 52.89)	(38.49, 57.02)	(38.34, 58.58)	H vs. L	0.546
	Enlisted Flyer	n	24	26	27	Overall	0.816
		Mean	36.91	37.52	41.76	M vs. L	0.940
		95% C.I.	(27.27, 49.97)	(28.05, 50.20)	(31.38, 55.56)	H vs. L	0.563
	Enlisted Groundcrew	n	69	76	59	Overall	0.975
		Mean	46.97	47.03	48.18	M vs. L	0.992
		95% C.I.	(39.65, 55.64)	(40.02, 55.27)	(40.12, 57.87)	H vs. L	0.842
HLA-DR Cells	Officer	n	62	63	56	Overall	0.750
		Mean	527.5	544.1	564.9	M vs. L	0.727
		95% C.I.	(463.9, 595.1)	(480.0, 612.2)	(495.8, 638.7)	H vs. L	0.449
	Enlisted Flyer	n	24	26	28	Overall	0.932
		Mean	570.3	547.1	568.3	M vs. L	0.739
		95% C.I.	(475.4, 673.9)	(457.7, 644.5)	(480.3, 663.7)	H vs. L	0.977
	Enlisted Groundcrew	n	69	76	58	Overall	0.973
		Mean	578.0	587.3	580.7	M vs. L	0.820
		95% C.I.	(521.7, 637.1)	(533.2, 644.0)	(519.4, 645.6)	H vs. L	0.949

TABLE Q-2. (continued)

Unadjusted Exposure Index Analyses for Cell Surface Markers by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
T ₄ /T ₈ Ratio	Officer	n	62	63	55	Overall	0.207
		Mean	1.732	2.002	1.758	M vs. L	0.106
		95% C.I.	(1.500,1.964)	(1.773,2.232)	(1.512,2.004)	H vs. L	0.881
	Enlisted Flyer	n	24	26	27	Overall	0.692
		Mean	1.793	1.781	1.625	M vs. L	0.955
		95% C.I.	(1.478,2.108)	(1.478,2.083)	(1.328,1.922)	H vs. L	0.449
	Enlisted Groundcrew	n	69	76	59	Overall	0.965
		Mean	1.751	1.780	1.780	M vs. L	0.812
		95% C.I.	(1.580,1.922)	(1.617,1.943)	(1.595,1.965)	H vs. L	0.822

TABLE Q-3.

Unadjusted Exposure Index Analyses for Functional Stimulation Tests by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Unstimulated Response (PHA)	Officer	n	61	64	56	Overall	0.047
		Mean	1,705	1,428	1,809	M vs. L	0.071
		95% C.I.	(1487,1955)	(1249,1632)	(1568,2087)	H vs. L	0.557
	Enlisted Flyer	n	24	26	28	Overall	0.466
		Mean	1,668	1,973	1,642	M vs. L	0.320
		95% C.I.	(1315,2114)	(1571,2478)	(1318,2045)	H vs. L	0.926
	Enlisted Groundcrew	n	69	78	58	Overall	0.818
		Mean	1,814	1,923	1,843	M vs. L	0.541
		95% C.I.	(1583,2079)	(1691,2186)	(1588,2139)	H vs. L	0.877
PHA Net Response	Officer	n	61	64	55	Overall	0.853
		Mean	213,383	205,057	209,661	M vs. L	0.575
		95% C.I.	(192,608, 234,158)	(184,775, 225,339)	(187,782 231,539)	H vs. L	0.809
	Enlisted Flyer	n	24	26	28	Overall	0.297
		Mean	245,179	209,656	219,358	M vs. L	0.131
		95% C.I.	(212,269, 278,089)	(178,038, 241,275)	(188,890, 249,827)	H vs. L	0.263
	Enlisted Groundcrew	n	69	78	58	Overall	0.414
		Mean	227,062	221,793	208,537	M vs. L	0.690
		95% C.I.	(208,219, 245,905)	(204,070, 239,515)	(187,984, 229,089)	H vs. L	0.194

TABLE Q-3. (continued)

Unadjusted Exposure Index Analyses for Functional Stimulation Tests by Occupation

Variable	Occupation	Statistic	Exposure Index			Contrast	p-Value
			Low	Medium	High		
Pokeweed Net Response	Officer	n	62	64	56	Overall	0.633
		Mean	85,479	86,250	96,107	M vs. L	0.947
		95% C.I.	(70,144, 102,328)	(71,074, 102,894)	(78,992, 114,899)	H vs. L	0.388
	Enlisted Flyer	n	24	26	28	Overall	0.004
		Mean	92,847	101,256	55,480	M vs. L	0.619
		95% C.I.	(71,008, 117,610)	(79,227, 125,985)	(40,058, 73,410)	H vs. L	0.011
	Enlisted Groundcrew	n	69	78	58	Overall	0.345
		Mean	77,859	92,188	87,540	M vs. L	0.151
		95% C.I.	(64,872, 92,030)	(78,815, 106,610)	(72,540, 103,950)	H vs. L	0.360
MLC Net Response	Officer	n	58	63	54	Overall	0.940
		Mean	74,175	78,069	76,486	M vs. L	0.727
		95% C.I.	(59,443, 90,536)	(63,516, 94,123)	(61,000, 93,722)	H vs. L	0.841
	Enlisted Flyer	n	23	26	26	Overall	0.724
		Mean	71,959	74,217	62,391	M vs. L	0.892
		95% C.I.	(50,336, 97,436)	(53,426, 98,416)	(43,471, 84,721)	H vs. L	0.550
	Enlisted Groundcrew	n	68	77	57	Overall	0.248
		Mean	69,460	85,901	81,091	M vs. L	0.102
		95% C.I.	(56,591, 83,647)	(72,345, 100,620)	(65,912, 97,842)	H vs. L	0.275

TABLE Q-4.

Interaction Summaries of Adjusted Exposure Index Analyses for Immunological Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Contrast	p-Value
				Low	Medium	High		
Unstimulated Response (PHA)	Exposure Index-by- Lifetime Alcohol Use (Drink/years) (Officer)	0	n	4	0	5	M vs. L	--
			Adj. Mean	3,273	--	1,557	H vs. L	0.031
		>0-5	n	22	22	16	M vs. L	0.655
			Adj. Mean	2,118	1,975	2,770	H vs. L	0.125
		>5-30	n	24	22	15	M vs. L	0.071
			Adj. Mean	2,752	2,069	2,788	H vs. L	0.941
		>30-100	n	10	17	16	M vs. L	0.628
			Adj. Mean	2,357	2,120	1,892	H vs. L	0.319
		>100	n	1	2	3	M vs. L	0.725
			Adj. Mean	1,983	1,555	6,700	H vs. L	0.049
PHA Net Response	Exposure Index-by- Age (Officer)	Born $\geq$ 1942	n	18	9	7	M vs. L	0.002
			Adj. Mean	261,397	153,534	299,002	H vs. L	0.302
		Born 1923-1941	n	40	43	46	M vs. L	0.943
			Adj. Mean	234,921	236,262	223,373	H vs. L	0.534
		Born $\leq$ 1922	n	3	11	1	M vs. L	0.095
			Adj. Mean	139,307	229,757	191,111	H vs. L	0.632

TABLE Q-5.

**Unadjusted Analyses for Cell Surface Markers by Group
(Original Comparisons Only)**

Variable	Statistic	Group		p-Value
		Ranch Hand	Original Comparison	
Total T Cells	n	464	424	0.711
	Mean	1,606	1,592	
	95% C.I.	(1551,1662)	(1537,1648)	
Helper T Cells	n	461	423	0.765
	Mean	868.1	861.0	
	95% C.I.	(833.3,903.6)	(826.4,896.3)	
Suppressor T Cells	n	465	425	0.630
	Mean	521.9	529.7	
	95% C.I.	(498.5,546.5)	(505.7,554.8)	
B Cells	n	457	418	0.708
	Mean	185.2	188.1	
	95% C.I.	(173.8,197.0)	(176.5,200.1)	
Monocytes	n	462	424	0.744
	Mean	46.19	45.47	
	95% C.I.	(43.05,49.56)	(42.39,48.79)	
HLA-DR Cells	n	462	424	0.917
	Mean	571.6	569.9	
	95% C.I.	(547.6,596.2)	(546.1,594.3)	
T ₄ /T ₈ Ratio	n	461	421	0.410
	Mean	1.597	1.558	
	95% C.I.	(1.528,1.669)	(1.491,1.629)	

TABLE Q-6.

Adjusted Analyses for Cell Surface Markers by Group
(Original Comparisons Only)

Variable	Statistic	Group		p-Value	Covariate Remarks*
		Ranch Hand	Original Comparison		
Total T Cells	n	442	414		BATCH (p<0.001)
	Adj. Mean	****	****	****	GRP*ACE (p=0.028)
	95% C.I.	****	****		DRKYR*PACKYR (p=0.004)
					CSMOK (p<0.001)
					ALC (p=0.005)
					AGE (p=0.049)
Helper Cells	n	439	413		BATCH (p=0.014)
	Adj. Mean	862.9	867.5	0.835	DAY (BATCH) (p=0.007)
	95% C.I.	(829.8, 896.6)	(834.6, 901.1)		AGE (p<0.001)
					CSMOK (p<0.001)
					ALC*OCC (p=0.025)
					DRKYR*PACKYR (p=0.001)
Suppressor T Cells	n	465	425		BATCH (p<0.001)
	Adj. Mean	****	****	****	GRP*ACE (p=0.010)
	95% C.I.	****	****		OCC (p=0.021)
					AGE (p=0.006)
					CSMOK (p<0.001)
B Cells	n	455	416		BATCH (p<0.001)
	Adj. Mean	185.5	191.1	0.451	OCC (p=0.041)
	95% C.I.	(174.2, 197.1)	(179.6, 202.9)		AGE (p=0.005)
					ALC (p=0.002)
					CSMOK (p<0.001)
Monocytes	n	440	414		BATCH (p<0.001)
	Adj. Mean	****	****	****	DAY (BATCH) (p<0.001)
	95% C.I.	****	****		GRP*AGE (p=0.040)
					OCC (p=0.010)
					DRKYR (p=0.008)
					CSMOK (p<0.001)
					PACKYR (p=0.020)
HLA-DR Cells	n	461	423		BATCH (p<0.001)
	Adj. Mean	570.5	568.2	0.887	DAY (BATCH) (p=0.014)
	95% C.I.	(546.9, 594.5)	(545.0, 592.0)		OCC (p=0.017)
					CSMOK (p<0.001)
					AGE*PACKYR (p=0.007)

TABLE Q-6. (continued)

Adjusted Analyses for Cell Surface Markers by Group
(Original Comparisons Only)

Variable	Statistic	Group		p-Value	Covariate Remarks*
		Ranch Hand	Original Comparison		
T ₄ /T ₈ Ratio	n	461	421		
	Adj. Mean	****	****	****	BATCH (p<0.001)
	95% C.I.	****	****		OCC (p=0.002) GRP*CSMOK (p=0.016)

*Abbreviations:

BATCH: batch-to-batch variation among examination groups

DAY (BATCH): blood-draw day variation

ALC: current alcohol use

CSMOK: current smoking

OCC: occupation

GRP: group

DRKYR: lifetime alcohol use (drink-years)

PACKYR: lifetime smoking (pack-years)

****Group-by-covariate interaction - adjusted mean, confidence interval, and p-value not presented.

TABLE Q-7.

Summary of Group-by-Covariate Interactions for Cell Surface Markers
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Original Comparison	
Total T Cells	Group-by-Race	Nonblack	n	424	391	0.324
			Adj. Mean	1,601.7	1,567.3	
			95% C.I.	(1,554.6, 1,649.6)	(1,518.6, 1,161.6)	
		Black	n	18	23	0.043
			Adj. Mean	1,558.3	1,888.6	
			95% C.I.	(1,338.6, 1,794.8)	(1,673.1, 2,117.1)	
Suppressor T Cells	Group-by-Race	Nonblack	n	444	402	0.960
			Adj. Mean	530.0	530.8	
			95% C.I.	(505.5, 555.6)	(506.2, 556.6)	
		Black	n	21	23	0.008
			Adj. Mean	497.5	708.8	
			95% C.I.	(411.0, 602.2)	(589.6, 852.2)	
Monocytes	Group-by-Age	Born ≥ 1942	n	174	162	0.048
			Adj. Mean	41.39	48.02	
			95% C.I.	(36.88, 46.44)	(42.89, 53.76)	
		Born 1923-1941	n	247	232	0.058
			Adj. Mean	48.20	42.82	
			95% C.I.	(44.04, 52.76)	(39.02, 46.99)	
		Born ≤ 1922	n	19	20	0.924
			Adj. Mean	47.88	46.90	
			95% C.I.	(35.06, 65.40)	(34.85, 63.13)	
T_4/T_8 Ratio	Group-by- Current Smoking (Cigarettes/ day)	0	n	277	273	0.454
			Adj. Mean	1.44	1.48	
			95% C.I.	(1.36, 1.52)	(1.40, 1.56)	
		>0-20	n	78	69	0.811
			Adj. Mean	1.70	1.73	
			95% C.I.	(1.54, 1.88)	(1.56, 1.92)	
		>20-40	n	90	71	0.004
			Adj. Mean	1.84	1.51	
			95% C.I.	(1.68, 2.01)	(1.36, 1.67)	
		>40	n	16	8	0.895
			Adj. Mean	1.70	1.75	
			95% C.I.	(1.38, 2.11)	(1.30, 2.35)	

TABLE Q-8.

**Unadjusted Analyses for Functional
Stimulation Tests by Group
(Original Comparisons Only)**

Variable	Statistic	Group		p-Value
		Ranch Hands	Original Comparison	
Unstimulated Response (PHA)	n	464	426	0.608
	Mean	1,669	1,640	
	95% C.I.	(1,578, 1,755)	(1,559, 1,724)	
PHA Net Response	n	463	425	0.168
	Mean	212,481	206,796	
	95% C.I.	(206,424, 218,539)	(200,733, 212,858)	
Pokeweed Net Response	n	465	426	0.522
	Mean	85,559	83,724	
	95% C.I.	(81,373, 89,849)	(79,579, 87,974)	
MLC Net Response	n	452	415	0.285
	Mean	79,451	82,387	
	95% C.I.	(75,485, 83,519)	(78,363, 86,512)	

TABLE Q-9.

Adjusted Analyses for Functional Stimulation Tests by Group
(Original Comparisons Only)

Variable	Statistic	Group		p-Value	Covariate Remarks
		Ranch Hand	Original Comparison		
Unstimulated Response (PHA)	n	464	426	0.613	BATCH (p<0.001) DAY (BATCH) (p<0.001) RACE (p<0.001) AGE (p<0.001)
	Adj. Mean	1,813	1,783		
	95% C.I.	(1,645, 1,997)	(1,620, 1,962)		
PHA Net Response	n	461	423	****	BATCH (p<0.001) DAY (BATCH) (p<0.001) GRP*OCC (p=0.017) RACE (p=0.005) AGE (p=0.001) ALC*CSMOK (p=0.037)
	Adj. Mean	****	****		
	95% C.I.	****	****		
Pokeweed Net Response	n	465	426	0.746	BATCH (p<0.001) DAY (BATCH) (p<0.001) OCC (p=0.046) CSMOK (p<0.001)
	Adj. Mean	92,684	91,738		
	95% C.I.	(86,712, 98,855)	(85,660, 98,023)		
MLC Net Response	n	431	405	0.197	BATCH (p<0.001) DAY (BATCH) (p<0.001) ALC (p<0.001) DRKYR (p=0.001) CSMOK (p<0.001)
	Adj. Mean	79,412	82,916		
	95% C.I.	(73,680, 85,359)	(76,848, 89,214)		

****Group-by-covariate interaction - adjusted mean, confidence interval, and p-value not presented.

TABLE Q-10.

**Summary of Group-by-Covariate Interactions for Functional Stimulation Tests
(Original Comparisons Only)**

Variable	Interaction	Stratification	Statistic	Group		p-Value
				Ranch Hand	Original Comparison	
PHA Net Response	Group-by-Occupation	Officer	n	180	163	0.280
			Adj. Mean	217,397	210,363	
			95% C.I.	(201,412, 233,382)	(193,843, 226,883)	
		Enlisted Flyer	n	78	77	0.003
			Adj. Mean	230,597	202,077	
			95% C.I.	(212,032, 249,162)	(183,749, 220,405)	
		Enlisted Groundcrew	n	203	183	0.504
			Adj. Mean	208,347	212,473	
			95% C.I.	(193,386, 223,308)	(197,550, 227,397)	
MLC Net Response	Group-by-Lifetime Smoking (Pack-years)	0	n	129	109	0.107
			Adj. Mean	78,900	87,110	
			95% C.I.	(69,737, 88,627)	(77,309, 97,496)	
		>0-20	n	201	206	0.079
			Adj. Mean	76,689	83,468	
			95% C.I.	(69,735, 83,973)	(76,169, 91,101)	
		>20-40	n	71	67	0.086
			Adj. Mean	86,904	75,456	
			95% C.I.	(77,241, 97,135)	(65,854, 85,711)	
		>40	n	29	23	0.679
			Adj. Mean	80,525	75,984	
			95% C.I.	(66,260, 96,180)	(60,806, 92,850)	

APPENDIX R

Pulmonary Disease

APPENDIX R: Pulmonary Disease

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APPENDIX R: Pulmonary Disease

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TABLE R-1.

**Unadjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)**

Variable	Statistic	Group				Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison			
		Number	Percent	Number	Percent		
Asthma	n	1,016		954		0.98 (0.64,1.51)	0.92
	Abnormal	44	4.3	42	4.4		
	Normal	972	95.7	912	95.6		
Bronchitis	n	1,015		954		0.91 (0.71,1.19)	0.50
	Abnormal	129	12.7	131	13.7		
	Normal	886	87.3	823	86.3		
Pleurisy	n	1,016		953		0.98 (0.65,1.49)	0.92
	Abnormal	47	4.6	45	4.7		
	Normal	969	95.4	908	95.3		
Pneumonia	n	1,016		953		0.95 (0.76,1.18)	0.64
	Abnormal	195	19.2	191	20.0		
	Normal	821	80.8	762	80.0		
Tuberculosis	n	1,015		954		1.32 (0.43,3.97)	0.64
	Abnormal	7	0.7	5	0.5		
	Normal	1,008	99.3	949	99.5		
Thorax & Lungs	n	1,015		955		1.29 (0.87,1.92)	0.20
	Abnormal	61	6.0	45	4.7		
	Normal	954	94.0	910	95.3		

TABLE R-1. (continued)

Unadjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Statistic	Group				Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison			
		Number	Percent	Number	Percent		
Asymmetrical Exp.	n	1,015		955		0.94 (0.16,5.49)	0.95
	Abnormal	2	0.2	2	0.2		
	Normal	1,013	99.8	953	99.8		
Hyperresonance	n	1,015		955		1.01 (0.60,1.69)	0.98
	Abnormal	30	3.0	28	2.9		
	Normal	985	97.0	927	97.1		
Dullness	n	1,015		955		--	0.17
	Abnormal	2	0.2	0	0.0		
	Normal	1,013	99.8	955	100.0		
Wheezes	n	1,015		955		1.42 (0.76,2.67)	0.28
	Abnormal	24	2.4	16	1.7		
	Normal	991	97.6	939	98.3		
Rales	n	1,015		955		1.41 (0.42,4.70)	0.59
	Abnormal	6	0.6	4	0.4		
	Normal	1,009	99.4	951	99.6		
X ray	n	1,012		951		0.83 (0.63,1.10)	0.20
	Abnormal	102	10.1	113	11.9		
	Normal	910	89.9	838	88.1		

TABLE R-2.

Adjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
	Ranch Hand	Original Comparison			
Asthma	1,012	953	****	****	PACKYR (p=0.02) GRP*PACKYR (p=0.03)
Bronchitis	1,011	953	0.91 (0.70,1.18)	0.44	GRP*PACKYR (Borderline: p=0.09)
Pleurisy	1,012	952	****	****	GRP*PACKYR (p=0.0006)
Pneumonia	1,012	952	0.97 (0.77,1.22)	0.74	AGE (p=0.002)
Tuberculosis	1,011	953	1.32 (0.43,3.98)	0.60	GRP*PACKYR (Borderline: p=0.06)
Thorax and Lungs	1,011	954	1.33 (0.88,2.01)	0.14	AGE (p<0.0001) PACKYR (p<0.0001)
Asymmetrical Exp.	1,011	954	0.94 (0.16,5.50)	0.97	AGE*PACKYR (Borderline: p=0.08)
Hyperresonance	1,011	954	1.00 (0.58,1.74)	0.87	AGE (p<0.0001) PACKYR (p<0.0001) GRP*PACKYR (Borderline: p=0.09)

TABLE R-2. (continued)

Adjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
	Ranch Hand	Original Comparison			
Dullness	1,011	954	--	--	None
Wheezes	1,011	954	1.43 (0.75,2.76)	0.25	PACKYR (p<0.0006)
Rales	1,011	954	1.42 (0.39,5.18)	0.59	AGE*PACKYR (p=0.04) GRP*AGE (p=0.09)
X Ray	1,008	950	0.86 (0.64,1.16)	0.31	AGE (p<0.0001) PACKYR (p=0.02) GRP*PACKYR (Borderline: p=0.07)

*Abbreviations

PACKYR: lifetime smoking history (pack-years)

GRP: group

TABLE R-3.

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
Asthma	Group-by-Pack-Year	0	n	291		268		4.78 (1.39,15.56)	0.04
			Abnormal	11	3.78	3	1.12		
			Normal	280	96.22	265	98.88		
		>0-10	n	284		280		1.33 (0.63,2.83)	0.46
			Abnormal	16	5.63	12	4.29		
			Normal	268	94.37	268	95.71		
		>10	n	437		405		0.57 (0.31,1.05)	0.07
			Abnormal	17	3.89	27	6.67		
			Normal	420	96.11	378	93.33		
Bronchitis	Group-by-Pack-Year	0	n	291		268		1.46 (0.86,2.48)	0.16
			Abnormal	38	13.06	25	9.33		
			Normal	253	86.94	243	90.67		
		>0-10	n	284		280		0.93 (0.58,1.49)	0.75
			Abnormal	38	13.38	40	14.29		
			Normal	246	86.62	240	85.71		
		>10	n	436		405		0.70 (0.47,1.03)	0.07
			Abnormal	52	11.93	66	16.30		
			Normal	384	88.07	339	83.70		

TABLE R-3. (continued)

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
Pleurisy	Group-by-Pack-Year	0	n	291		267		1.48 (0.50,4.37)	0.49
			Abnormal	8	2.75	5	1.87		
			Normal	283	97.25	262	98.13		
		>0-10	n	284		280		4.67 (1.61,13.02)	<0.001
			Abnormal	18	6.34	4	1.43		
			Normal	266	93.66	276	98.57		
		>10	n	437		405		0.52 (0.30,0.90)	0.02
			Abnormal	21	4.81	36	8.89		
			Normal	416	95.19	369	91.11		
Tuberculosis	Group-by-Pack-Year	0	n	290		268		0.31 (0.05,2.34)	0.28
			Abnormal	1	0.34	3	1.12		
			Normal	289	99.66	265	98.88		
		>0-10	n	284		280		—	0.05
			Abnormal	4	1.41	0	0.00		
			Normal	280	98.59	280	100.00		
		>10	n	437		405		0.93 (0.16,5.42)	0.92
			Abnormal	2	0.46	2	0.49		
			Normal	435	99.54	403	99.51		