

APPENDIX L-4.

Interaction Tables for the Hematology Assessment Occupation Removed from Final Model

This appendix contains exposure analyses results of interactions between covariates and dioxin after occupation has been removed from those final dioxin models (Models 2 through 6) that contained occupation. These tables are supplements to tables in Appendix L-3, which are main effects results with occupation removed from the model. Results are presented for separate strata of the covariate and include sample sizes, percent abnormal, relative risks, confidence intervals, and p-values for discrete dependent variables. Sample sizes, adjusted means, differences of adjusted means and confidence intervals or adjusted slopes and standard errors, and p-values are given for continuous dependent variables. Chapter 7, Statistical Methods, provides further details on the analytical approaches used in the interaction analyses. The analysis model, covariate involved in the interaction, and a reference to the analysis table in Chapter 16 are given in the heading of each subtable. A summary of the interactions described in this appendix follows.

Appendix L-4 Table	Chapter 16 Table	Appendix L-3 Table	Dependent Variable	Model	Covariate
L-4-1	16-3	L-3-1	Red Blood Cell (RBC) Count (Continuous)	3	Current Cigarette Smoking
L-4-2	16-5	L-3-2	White Blood Cell (WBC) Count (Continuous)	2 5 6	Race Race Race
L-4-3	16-6	L-3-3	White Blood Cell (WBC) Count (Discrete)	5 6	Race Race
L-4-4	16-7	L-3-4	Hemoglobin (Continuous)	3	Current Cigarette Smoking
L-4-5	16-9	L-3-5	Hematocrit (Continuous)	3	Current Cigarette Smoking
L-4-6	16-13	L-3-7	Prothrombin Time (Continuous)	3	Age
L-4-7	16-16	L-3-10	Absolute Neutrophils (segs)	2 5	Race Race

Table L-4-1.
Interaction Table for Red Blood Cell (RBC) Count (million/mm³) (Continuous)
Occupation Removed from Final Model

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED (Dioxin Category-by-Current Cigarette Smoking: Tables 16-3 and L-3-1)					
Stratum	Dioxin Category	n	Adjusted Mean	Difference of Adjusted Mean vs. Comparisons (95% C.I.)	p-Value
0-Never Smoked	Comparison	282	5.065		
	Background RH	108	5.019	-0.046 (-0.130,0.037)	0.280
	Low RH	72	5.051	-0.014 (-0.111,0.084)	0.785
	High RH	65	5.016	-0.049 (-0.151,0.053)	0.345
	Low plus High RH	137	5.034	-0.030 (-0.107,0.047)	0.438
0-Former Smoker	Comparison	528	5.051		
	Background RH	168	4.987	-0.063 (-0.129,0.002)	0.058
	Low RH	126	5.008	-0.043 (-0.116,0.030)	0.250
	High RH	113	5.023	-0.027 (-0.104,0.050)	0.486
	Low plus High RH	239	5.015	-0.036 (-0.093,0.022)	0.226
>0-20 Cigarettes/Day	Comparison	152	5.098		
	Background RH	59	5.172	0.073 (-0.040,0.187)	0.207
	Low RH	38	4.992	-0.106 (-0.240,0.028)	0.120
	High RH	49	5.079	-0.019 (-0.140,0.102)	0.761
	Low plus High RH	87	5.041	-0.057 (-0.156,0.042)	0.259
>20 Cigarettes/Day	Comparison	97	5.103		
	Background RH	35	5.270	0.167 (0.022,0.313)	0.024
	Low RH	23	5.192	0.089 (-0.082,0.261)	0.307
	High RH	31	5.113	0.010 (-0.142,0.162)	0.896
	Low plus High RH	54	5.146	0.044 (-0.081,0.169)	0.493

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

Background (Ranch Hand): Current Dioxin ≤ 10 ppt.

Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 143 ppt.

High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

Table L-4-2.
Interaction Table for White Blood Cell (WBC) Count (thousand/mm³) (Continuous)
Occupation Removed from Final Model

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED (Initial Dioxin-by-Race: Tables 16-5 and L-3-2)					
Initial Dioxin Category Summary Statistics				Analysis Results for Log₂ (Initial Dioxin)	
Stratum	Initial Dioxin	n	Adjusted Mean^a	Adjusted Slope (Std. Error)^b	p-Value
Black	Low	17	5.18	0.1110 (0.0411)	0.007
	Medium	10	6.95		
	High	9	7.09		
Non-Black	Low	157	7.24	0.0040 (0.0087)	0.641
	Medium	162	7.32		
	High	162	7.31		

b) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-5 and L-3-2)					
Current Dioxin Category Summary Statistics				Analysis Results for Log₂ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Adjusted Mean^a	Adjusted Slope (Std. Error)^b	p-Value
Black	Low	13	5.76	0.0659 (0.0271)	0.015
	Medium	23	5.66		
	High	15	7.25		
Non-Black	Low	283	7.05	0.0076 (0.0051)	0.140
	Medium	274	7.19		
	High	279	7.35		

c) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-5 and L-3-2)					
Current Dioxin Category Summary Statistics				Analysis Results for Log₂ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Adjusted Mean^a	Adjusted Slope (Std. Error)^b	p-Value
Black	Low	13	5.80	0.0635 (0.0272)	0.020
	Medium	23	5.68		
	High	15	7.25		
Non-Black	Low	282	7.08	0.0056 (0.0056)	0.312
	Medium	274	7.19		
	High	279	7.30		

^a Transformed from natural logarithm scale.

^b Slope and standard error based on natural logarithm of WBC count versus log₂ dioxin.

Note: Model 2: Low = 39-98 ppt; Medium = > 98-232 ppt; High = > 232 ppt.

Models 5 and 6: Low = ≤ 46 ppq; Medium = > 46-128 ppq; High = > 128 ppq.

Table L-4-3.
Interaction Table for White Blood Cell (WBC) Count (Discrete)
Occupation Removed from Final Model

a) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-6 and L-3-3)									
Analysis Results for Log ₂ (Current Dioxin + 1)									
Stratum	Current Dioxin	n	Percent			Abnormal Low vs. Normal		Abnormal High vs. Normal	
			Abnormal Low	Normal	Abnormal High	Adj. Relative Risk (95% C.I.) ^a	p-Value	Adj. Relative Risk (95% C.I.) ^a	p-Value
Non-Black	Low	283	2.8	91.9	5.3	1.05 (0.84,1.32)	0.676	0.92 (0.79,1.08)	0.307
	Medium	274	3.3	89.1	7.7				
	High	279	3.6	90.7	5.7				
Black	Low	13	23.1	69.2	7.7	0.53 (0.27,1.02)	0.057	--	--
	Medium	23	21.7	78.3	0.0				
	High	15	0.0	100.0	0.0				

b) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-6 and L-3-3)									
Analysis Results for Log ₂ (Current Dioxin + 1)									
Stratum	Current Dioxin	n	Percent			Abnormal Low vs. Normal		Abnormal High vs. Normal	
			Abnormal Low	Normal	Abnormal High	Adj. Relative Risk (95% C.I.) ^a	p-Value	Adj. Relative Risk (95% C.I.) ^a	p-Value
Non-Black	Low	282	2.8	91.8	5.3	1.03 (0.81,1.31)	0.792	0.88 (0.75,1.04)	0.133
	Medium	274	3.3	89.1	7.7				
	High	279	3.6	90.7	5.7				
Black	Low	13	23.1	69.2	7.7	0.53 (0.28,1.02)	0.059	--	--
	Medium	23	21.7	78.3	0.0				
	High	15	0.0	100.0	0.0				

^a Relative risk for a twofold increase in current dioxin.

--: Relative risk, confidence interval, and p-value not presented due to the sparse number of abnormalities.

Note: Models 5 and 6: Low = ≤ 46 ppq; Medium = > 46-128 ppq; High = > 128 ppq.

Table L-4.4.
Interaction Table for Hemoglobin (gm/dl) (Continuous)
Occupation Removed from Final Model

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED (Dioxin Category-by-Current Cigarette Smoking: Tables 16-7 and L-3-4)					
Stratum	Dioxin Category	n	Adjusted Mean	Difference of Adjusted Mean vs. Comparisons (95% C.I.)	p-Value
0-Never Smoked	Comparison	282	15.50		
	Background RH	108	15.40	-0.10 (-0.31,0.12)	0.389
	Low RH	72	15.49	-0.01 (-0.26,0.24)	0.937
	High RH	65	15.54	0.05 (-0.22,0.31)	0.735
	Low plus High RH	137	15.51	0.02 (-0.18,0.22)	0.873
0-Former Smoker	Comparison	528	15.55		
	Background RH	168	15.47	-0.08 (-0.25,0.09)	0.376
	Low RH	126	15.40	-0.15 (-0.34,0.04)	0.124
	High RH	113	15.64	0.09 (-0.11,0.29)	0.386
	Low plus High RH	239	15.51	-0.04 (-0.19,0.11)	0.629
>0-20 Cigarettes/Day	Comparison	152	15.87		
	Background RH	59	16.15	0.28 (-0.02,0.57)	0.064
	Low RH	38	15.76	-0.10 (-0.45,0.24)	0.556
	High RH	49	15.85	-0.02 (-0.33,0.30)	0.905
	Low plus High RH	87	15.81	-0.06 (-0.31,0.20)	0.667
>20 Cigarettes/Day	Comparison	97	16.17		
	Background RH	35	16.57	0.40 (0.02,0.78)	0.038
	Low RH	23	16.32	0.15 (-0.29,0.60)	0.508
	High RH	31	16.08	-0.10 (-0.49,0.30)	0.624
	Low plus High RH	54	16.18	0.01 (-0.32,0.33)	0.965

Note: Model 3: RH = Ranch Hand.
Comparison: Current Dioxin \leq 10 ppt.
Background (Ranch Hand): Current Dioxin \leq 10 ppt.
Low (Ranch Hand): Current Dioxin $>$ 10 ppt, 10 ppt $<$ Initial Dioxin \leq 143 ppt.
High (Ranch Hand): Current Dioxin $>$ 10 ppt, Initial Dioxin $>$ 143 ppt.

Table L-4-5.
Interaction Table for Hematocrit (percent) (Continuous)
Occupation Removed from Final Model

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED (Dioxin Category-by-Current Cigarette Smoking: Tables 16-9 and L-3-5)					
Stratum	Dioxin Category	n	Adjusted Mean	Difference of Adjusted Mean vs. Comparisons (95% C.I.)	p-Value
0-Never Smoked	Comparison	282	45.39		
	Background RH	108	45.07	-0.32 (-0.99,0.35)	0.355
	Low RH	72	45.33	-0.06 (-0.84,0.73)	0.889
	High RH	65	45.65	0.26 (-0.56,1.08)	0.534
	Low plus High RH	137	45.48	0.09 (-0.52,0.71)	0.766
0-Former Smoker	Comparison	528	45.52		
	Background RH	168	45.30	-0.22 (-0.75,0.30)	0.403
	Low RH	126	44.98	-0.54 (-1.13,0.04)	0.069
	High RH	113	45.88	0.36 (-0.25,0.98)	0.247
	Low plus High RH	239	45.41	-0.12 (-0.58,0.35)	0.624
>0-20 Cigarettes/Day	Comparison	152	46.78		
	Background RH	59	47.54	0.75 (-0.16,1.67)	0.104
	Low RH	38	46.23	-0.55 (-1.63,0.52)	0.315
	High RH	49	46.66	-0.12 (-1.09,0.86)	0.814
	Low plus High RH	87	46.47	-0.31 (-1.10,0.49)	0.449
>20 Cigarettes/Day	Comparison	97	47.58		
	Background RH	35	48.79	1.20 (0.03,2.37)	0.044
	Low RH	23	48.02	0.44 (-0.93,1.81)	0.530
	High RH	31	46.99	-0.60 (-1.82,0.62)	0.336
	Low plus High RH	54	47.43	-0.16 (-1.16,0.85)	0.761

Note: Model 3: RH = Ranch Hand.
 Comparison: Current Dioxin \leq 10 ppt.
 Background (Ranch Hand): Current Dioxin \leq 10 ppt.
 Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin \leq 143 ppt.
 High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

Table L-4-6.
Interaction Table for Prothrombin Time (seconds) (Continuous)
Occupation Removed from Final Model

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY -- ADJUSTED (Dioxin Category-by-Age: Tables 16-13 and L-3-7)					
Stratum	Dioxin Category	n	Adjusted Mean ^a	Difference of Adjusted Mean vs. Comparisons (95% C.I.) ^b	p-Value ^c
Born ≥ 1942	Comparison	426	12.01		
	Background RH	121	12.07	0.06 --	0.203
	Low RH	75	11.85	-0.16 --	0.005
	High RH	146	11.96	-0.05 --	0.277
	Low plus High RH	221	11.92	-0.09 --	0.023
Born < 1942	Comparison	551	11.95		
	Background RH	220	11.97	0.02 --	0.548
	Low RH	159	11.96	0.01 --	0.822
	High RH	94	11.99	0.04 --	0.436
	Low plus High RH	253	11.97	0.02 --	0.554

^a Transformed from natural logarithm scale.

^b Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

^c P-value is based on difference of means on natural logarithm scale.

^d Slope and standard error based on natural logarithm of prothrombin time versus log₂ dioxin.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

Background (Ranch Hand): Current Dioxin ≤ 10 ppt.

Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 143 ppt.

High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

Table L-4-7.
Interaction Table for Absolute Neutrophils (segs) (thousand/mm³)
Occupation Removed from Final Model

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED (Initial Dioxin-by-Race: Tables 16-16 and L-3-10)					
Initial Dioxin Category Summary Statistics				Analysis Results for Log₂ (Initial Dioxin)	
Stratum	Initial Dioxin	n	Adjusted Mean^a	Adjusted Slope (Std. Error)^b	p-Value
Black	Low	17	2.737	0.1202 (0.0560)	0.032
	Medium	10	3.636		
	High	9	3.697		
Non-Black	Low	157	4.161	0.0045 (0.0118)	0.701
	Medium	162	4.071		
	High	162	4.150		

b) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-16 and L-3-10)					
Current Dioxin Category Summary Statistics				Analysis Results for Log₂ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Adjusted Mean^a	Adjusted Slope (Std. Error)^b	p-Value
Black	Low	13	2.764	0.0972 (0.0364)	0.008
	Medium	23	2.845		
	High	15	3.681		
Non-Black	Low	283	3.960	0.0113 (0.0069)	0.103
	Medium	274	4.030		
	High	279	4.189		

Table L-4-7. (Continued)
Interaction Table for Absolute Neutrophils (segs) (thousand/mm³)
Occupation Removed from Final Model

c) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Race: Tables 16-16 and L-3-10)					
Current Dioxin Category Summary Statistics				Analysis Results for Log ₂ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Adjusted Mean ^a	Adjusted Slope (Std. Error) ^b	p-Value
Black	Low	12	2.775	0.0956 (0.0365)	0.009
	Medium	23	2.851		
	High	15	3.679		
Non-Black	Low	282	3.967	0.0104 (0.0075)	0.166
	Medium	274	4.030		
	High	279	4.172		

^a Transformed from natural logarithm scale.

^b Slope and standard error based on natural logarithm versus log₂ dioxin.

Note: Model 2: Low = 39-98 ppt; Medium = > 98-232 ppt; High = > 232 ppt.
 Models 5 and 6: Low = ≤ 46 ppq; Medium = > 46-128 ppq; High = > 128 ppq.