TABLE 9-32.

Analysis of Global Severity Index (SCL-90-R)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Abnormal	Est. Relative Risk (95% C.I)[a]	p-Value
a) Minimal (n=464)	Low	116	8.6	1.25 (0.98,1.58)	0.073
	Medium	229	8.3		
	High	119	13.5		
b) Maximal (n=652)	Low	158	6.3	1.27 (1.06,1.53)	0.013
	Medium	328	6.4		
	High	166	14.5		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
c) Minimal (n=455)	1.10 (0.85,1.42)	0.467	EDUC (p=0.036) AGE*DRKYR (p=0.004)
d) Maximal (n=640)	1.12 (0.91,1.36)	0.294	EDUC (p=0.006) AGE (p=0.029) DRKYR (p=0.131)

[a]Relative risk for a twofold increase in dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-32. (Continued)

Analysis of Global Severity Index (SCL-90-R)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Abnormal/(n) Current Dioxin Low	Medium	High	Est. Relative Risk (95% C.I.)[a]	p-Value
e) Minimal						0.301[b]
(n=464)	≤18.6	9.2 (65)	8.9 (113)	16.7 (48)	1.11 (0.75,1.63)	0.609[c]
	>18.6	7.6 (53)	6.1 (114)	14.1 (71)	1.44 (1.04,1.98)	0.026[c]
f) Maximal						0.893[b]
(n=652)	≤18.6	4.4 (92)	8.8 (171)	12.5 (72)	1.31 (0.98,1.75)	0.069[c]
	>18.6	7.9 (63)	6.3 (159)	12.6 (95)	1.28 (0.99,1.64)	0.061[c]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
g) Minimal			0.338**[b]	CURR*TIME*RACE (p=0.049)
(n=455)	≤18.6	1.02 (0.67,1.55)**	0.915**[c]	EDUC*AGE (p=0.039)
	>18.6	1.33 (0.93,1.89)**	0.122**[c]	AGE*DRKYR (p=0.001)
h) Maximal			0.886[b]	AGE (p=0.040)
(n=640)	≤18.6	1.14 (0.84,1.55)	0.405[c]	DRKYR (p=0.124)
	>18.6	1.11 (0.84,1.46)	0.471[c]	EDUC (p=0.006)

[a]Relative risk for a twofold increase in dioxin.

[b]Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

[c]Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

**Log_2 (current dioxin)-by-time-by-covariate interaction ($0.01<p\leq0.05$); adjusted relative risk, confidence interval, and p-value derived from a model fitted after deletion of this interaction.

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-32. (Continued)

Analysis of Global Severity Index (SCL-90-R)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Abnormal	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	690	6.1	All Categories		0.025
Unknown	294	5.1	Unknown vs. Background	0.83 (0.45,1.52)	0.545
Low	171	7.6	Low vs. Background	1.27 (0.67,2.42)	0.469
High	167	12.6	High vs. Background	2.22 (1.28,3.86)	0.005
Total	1,322				

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	685	All Categories		0.333	AGE (p=0.016)
Unknown	291	Unknown vs. Background	0.92 (0.50,1.71)	0.803	ALC (p=0.019)
Low	167	Low vs. Background	1.22 (0.64,2.35)	0.546	EDUC (p=0.003)
High	166	High vs. Background	1.66 (0.93,2.97)	0.084	
Total	1,309				

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

Under the minimal assumption, the adjusted analysis detected a significant current dioxin-by-time-by-race interaction (Table 9-32 [g]: p=0.049). To examine this interaction, stratified analyses are presented for each race stratum (Appendix Table H-1). The stratified analyses did not exhibit a significant interaction between current dioxin and time since tour for either the Black or the non-Black stratum (p=0.176 and p=0.221). However, within the non-Black stratum, there was a significant positive association between current dioxin and the global severity index for Ranch Hands with time over 18.6 years (Adj. RR=1.46, p=0.046), and a nonsignificant positive association for Ranch Hands with 18.6 years or less since tour (Adj. RR=1.04, p=0.866). The Black stratum contained only four Ranch Hands with an abnormal global severity index (none of whom were in the high current dioxin category).

After deletion of the current dioxin-by-time-by-race interaction, the minimal adjusted analysis exhibited a nonsignificant current dioxin-by-time since tour interaction (Table 9-32 [g]: p=0.338). The association between current dioxin and the global severity index was also nonsignificant within each time stratum. Under the maximal assumption, the adjusted analysis also displayed a nonsignificant interaction between current dioxin and time (Table 9-32 [h]: p=0.886) as well as nonsignificant associations within time strata.

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

The analysis of categorized current dioxin found significant differences in the percentage of abnormal scores on the global severity index for the four current dioxin categories (Table 9-32 [i]: p=0.025). The frequencies of abnormal global severity indices for the background, unknown, low, and high current dioxin categories were 6.1, 5.1, 7.6, and 12.6 percent. Specifically, the percentage of participants with an abnormal global severity index was significantly higher for the Ranch Hands in the high category than for the Comparisons in the background category (Table 9-32 [i]: Est. RR=2.22, 95% C.I.: [1.28,3.86], p=0.005).

After adjusting for education, age, and current alcohol use, the contrast of the four current dioxin categories did not detect any significant differences among the prevalence rates of an abnormal global severity index (Table 9-32 [j]: p=0.333). However, the contrast of the Ranch Hands in the high category versus the Comparisons in the background category was marginally significant (Table 9-32 [j]: Adj. RR=1.66, 95% C.I.: [0.93,2.97], p=0.084) with Ranch Hands having a higher risk of abnormal global severity indices.

Positive Symptom Total—SCL-90-R

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis under the minimal assumption detected a marginally significant positive association between initial dioxin and the positive symptom total for Ranch Hands (Table 9-33 [a]: Est. RR=1.25, p=0.079). The associated relative frequencies of Ranch Hands with an abnormal positive symptom total for low, medium, and high initial dioxin categories were 6.9, 7.4, and 12.6 percent. For the maximal assumption, the unadjusted analysis displayed a significant positive association between initial dioxin and the positive symptom total (Table 9-33 [b]: Est. RR=1.23, p=0.043). The percentages of abnormalities for this cohort decreased from low to medium initial dioxin categories and then increased for the high initial dioxin category (low, 7.0%; medium, 5.5%; high, 13.3%).

TABLE 9-33.

Analysis of Positive Symptom Total (SCL-90-R)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Abnormal	Est. Relative Risk (95% C.I)[a]	p-Value
a) Minimal (n=464)	Low	116	6.9	1.25 (0.98,1.61)	0.079
	Medium	229	7.4		
	High	119	12.6		
b) Maximal (n=652)	Low	158	7.0	1.23 (1.01,1.49)	0.043
	Medium	328	5.5		
	High	166	13.3		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
c) Minimal (n=455)	1.12 (0.86,1.47)	0.398	EDUC*AGE (p=0.032) AGE*DRKYR (p=0.003)
d) Maximal (n=640)	1.08 (0.88,1.34)	0.454	AGE (p=0.038) DRKYR (p=0.049) EDUC (p=0.091)

[a]Relative risk for a twofold increase in dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-33. (Continued)

Analysis of Positive Symptom Total (SCL-90-R)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Abnormal/(n) Current Dioxin Low	Medium	High	Est. Relative Risk (95% C.I.)[a]	p-Value
e) Minimal						0.944[b]
(n=464)	≤18.6	7.7 (65)	7.1 (113)	18.8 (48)	1.29 (0.87,1.89)	0.201[c]
	>18.6	5.7 (53)	6.1 (114)	11.3 (71)	1.31 (0.93,1.85)	0.125[c]
f) Maximal						0.447[b]
(n=652)	≤18.6	5.4 (92)	7.0 (171)	13.9 (72)	1.36 (1.01,1.82)	0.041[c]
	>18.6	7.9 (63)	6.3 (159)	9.5 (95)	1.16 (0.88,1.53)	0.282[c]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
g) Minimal			0.966[b]	EDUC*AGE (p=0.024)
(n=455)	≤18.6	1.17 (0.77,1.76)	0.462[c]	AGE*DRKYR (p=0.004)
	>18.6	1.18 (0.81,1.72)	0.388[c]	
h) Maximal			0.401[b]	AGE (p=0.057)
(n=640)	≤18.6	1.21 (0.89,1.65)	0.233[c]	EDUC (p=0.046)
	>18.6	1.01 (0.75,1.36)	0.951[c]	DRKYR (p=0.045)

[a]Relative risk for a twofold increase in dioxin.

[b]Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

[c]Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-33. (Continued)

Analysis of Positive Symptom Total (SCL-90-R)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Abnormal	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	690	6.1	All Categories		0.084
Unknown	294	5.1	Unknown vs. Background	0.83 (0.45,1.52)	0.545
Low	171	7.0	Low vs. Background	1.16 (0.60,2.26)	0.653
High	167	11.4	High vs. Background	1.98 (1.12,3.50)	0.019
Total	1,322				

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	685	All Categories		0.429	AGE (p=0.091)
Unknown	291	Unknown vs. Background	0.92 (0.50,1.70)	0.785	ALC (p=0.012)
Low	167	Low vs. Background	1.19 (0.61,2.34)	0.608	EDUC (p=0.091)
High	166	High vs. Background	1.60 (0.88,2.92)	0.123	
Total	1,309				

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

After adjusting for an education-by-age interaction and an age-by-lifetime alcohol history interaction, the association between initial dioxin and the positive symptom total became nonsignificant for the minimal analysis (Table 9-33 [c]: p=0.398). Similarly, adjustment for age, lifetime alcohol history, and education caused the results of the maximal analysis to also become nonsignificant (Table 9-33 [d]: p=0.454).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis based on current dioxin and time since tour, neither the minimal nor the maximal cohort displayed a significant current dioxin-by-time interaction (Table 9-33 [e] and [f]: p=0.944 and p=0.447, respectively). However, for the maximal assumption, a significant increasing association between the positive symptom total and current dioxin was found for Ranch Hands with 18.6 years or less since tour (Table 9-33 [f]: Est. RR=1.36, p=0.041). Within this time stratum, the abnormal positive symptom total frequencies for low, medium, and high current dioxin were 5.4, 7.0, and 13.9 percent.

Consistent with the initial dioxin analyses, the adjustment for the same covariates caused no significant results to be found in either the minimal or the maximal adjusted analysis of the positive symptom total (Table 9-33 [g] and [h]: p>0.20 for each analysis).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the unadjusted analysis of the positive symptom total, the contrast of the four current dioxin categories was marginally significant (Table 9-33 [i]: p=0.084). The frequencies of abnormal positive symptom totals for the background, unknown, low, and high current dioxin categories were 6.1, 5.1, 7.0, and 11.4 percent. Specifically, the analysis found Ranch Hands in the high category had a significantly higher percentage of abnormal positive symptom totals than the Comparisons in the background category (Table 9-33 [i]: Est. RR=1.98, 95% C.I.: [1.12,3.50], p=0.019).

After adjusting for education, age, and current alcohol use, the analysis found no differences regarding the positive symptom total among the four categories (Table 9-33 [j]: p>0.10 for each analysis).

Positive Symptom Distress Index—SCL-90-R

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

Neither the unadjusted minimal nor maximal analysis detected a significant association between initial dioxin and the positive symptom distress index of Ranch Hands (Table 9-34 [a] and [b]: p=0.922 and p=0.187, respectively).

After adjusting for lifetime alcohol history and current alcohol use, the minimal and maximal adjusted analyses displayed consistently nonsignificant results (Table 9-34 [c] and [d]: p=0.896 and p=0.164, respectively).

TABLE 9-34.

Analysis of Positive Symptom Distress Index (SCL-90-R)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Abnormal	Est. Relative Risk (95% C.I)[a]	p-Value
a) Minimal (n=464)	Low	116	10.3	1.01 (0.80,1.28)	0.922
	Medium	229	11.8		
	High	119	10.9		
b) Maximal (n=652)	Low	158	7.0	1.13 (0.94,1.35)	0.187
	Medium	328	11.6		
	High	166	9.6		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
c) Minimal (n=459)	1.02 (0.80,1.29)	0.896	ALC (p=0.070) DRKYR (p=0.011)
d) Maximal (n=644)	1.14 (0.95,1.37)	0.164	ALC (p=0.133) DRKYR (p=0.023)

[a]Relative risk for a twofold increase in dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-34. (Continued)

Analysis of Positive Symptom Distress Index (SCL-90-R)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Abnormal/(n) Current Dioxin Low	Medium	High	Est. Relative Risk (95% C.I.)[a]	p-Value
e) Minimal						0.643[b]
(n=464)	≤18.6	7.7 (65)	16.8 (113)	8.3 (48)	0.95 (0.65,1.39)	0.787[c]
	>18.6	11.3 (53)	7.9 (114)	12.7 (71)	1.07 (0.77,1.48)	0.691[c]
f) Maximal						0.783[b]
(n=652)	≤18.6	6.5 (92)	12.3 (171)	11.1 (72)	1.16 (0.88,1.52)	0.291[c]
	>18.6	7.9 (63)	9.4 (159)	10.5 (95)	1.10 (0.85,1.41)	0.465[c]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)[a]	p-Value	Covariate Remarks
g) Minimal			0.518[b]	RACE (p=0.147)
(n=459)	≤18.6	0.93 (0.63,1.36)	0.705[c]	DRKYR (p=0.007)
	>18.6	1.10 (0.79,1.51)	0.581[c]	ALC (p=0.084)
h) Maximal			0.796[b]	ALC (p=0.128)
(n=644)	≤18.6	1.17 (0.89,1.55)	0.254[c]	DRKYR (p=0.017)
	>18.6	1.12 (0.87,1.44)	0.392[c]	

[a]Relative risk for a twofold increase in dioxin.

[b]Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

[c]Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-34. (Continued)

Analysis of Positive Symptom Distress Index (SCL-90-R)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Abnormal	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	690	8.6	All Categories		0.076
Unknown	294	5.8	Unknown vs. Background	0.66 (0.38,1.15)	0.139
Low	171	12.3	Low vs. Background	1.50 (0.88,2.54)	0.135
High	167	10.8	High vs. Background	1.29 (0.74,2.26)	0.367
Total	1,322				

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	690	All Categories		0.076	--
Unknown	294	Unknown vs. Background	0.66 (0.38,1.15)	0.139	
Low	171	Low vs. Background	1.50 (0.88,2.54)	0.135	
High	167	High vs. Background	1.29 (0.74,2.26)	0.367	
Total	1,322				

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In both the minimal and maximal unadjusted and adjusted analyses, the current dioxin-by-time since tour interaction and the association between current dioxin and the positive symptom distress index within each time stratum were nonsignificant (Table 9-34 [e-h]: $p>0.25$ for each analysis).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

The unadjusted analysis with categorized current dioxin found a marginally significant difference in the percentage of Ranch Hands described as abnormal for the positive symptom distress index of the four current dioxin categories (Table 9-34 [i]: $p=0.076$). However, no significant differences were detected between the background group of Comparisons and any of the three categories of Ranch Hands. The percentages of participants with an abnormal positive symptom distress index for the background, unknown, low, and high current dioxin categories were 8.6, 5.8, 12.3, and 10.8 percent.

In the adjusted analysis, none of the candidate covariates were retained in the model; thus, the relative risks and associated p-values for the adjusted analysis (Table 9-34 [j]) are identical to the unadjusted results (Table 9-34 [i]).

Schizoid Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The schizoid score of the MCMI displayed a significant positive association with initial dioxin for both the unadjusted minimal and the unadjusted maximal analyses (Table 9-35 [a] and [b]: $p<0.001$ for both analyses). The unadjusted mean schizoid scores for the minimal cohort for the low, medium, and high initial dioxin categories were 22.9, 25.1, and 28.6. For the maximal cohort, the corresponding mean scores were 23.0, 24.3, and 27.0, respectively.

The adjusted analysis also displayed a significant positive association between the MCMI schizoid score and initial dioxin for both minimal and maximal cohorts (Table 9-35 [c] and [d]: $p=0.002$ for both analyses).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis based on current dioxin and time since tour, the minimal cohort displayed a marginally significant current dioxin-by-time interaction (Table 9-35 [e]: $p=0.070$). The schizoid score for Ranch Hands with 18.6 years or less since tour exhibited a nonsignificant positive association with current dioxin ($p=0.442$), and for Ranch Hands with time over 18.6 years there was a significant positive association ($p<0.001$). The unadjusted mean scores for the more than 18.6 years stratum for low and medium current dioxin were very similar (23.2 and 24.6). However, for Ranch Hands with high current dioxin, the mean schizoid score was much higher (32.5).

The unadjusted analysis under the maximal assumption also displayed a marginally significant current dioxin-by-time since tour interaction (Table 9-35 [f]: $p=0.054$). Similar to the minimal analysis, there was a nonsignificant positive association between the schizoid

TABLE 9-35.

Analysis of Schizoid Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal (n=514) (R^2=0.025)	Low	129	22.9	0.077 (0.021)	<0.001
	Medium	256	25.1		
	High	129	28.6		
b) Maximal (n=732) (R^2=0.023)	Low	182	23.0	0.065 (0.016)	<0.001
	Medium	368	24.3		
	High	182	27.0		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal (n=510) (R^2=0.037)	Low	128	22.8	0.068 (0.021)	0.002	EDUC (p=0.010)
	Medium	254	24.4			
	High	128	27.7			
d) Maximal (n=719) (R^2=0.046)	Low	179	23.9	0.051 (0.017)	0.002	EDUC (p=0.006)
	Medium	362	23.9			AGE*ALC (p=0.037)
	High	178	26.2			AGE*DRKYR (p=0.025)

[a]Transformed from natural logarithm scale.

[b]Slope and standard error based on natural logarithm schizoid score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-35. (Continued)

Analysis of Schizoid Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal						0.070[c]
(n=514)	≤18.6	22.3	25.4	25.0	0.027 (0.034)	0.442[d]
(R^2=0.033)		(72)	(128)	(53)		
	>18.6	23.2	24.6	32.5	0.107 (0.028)	<0.001[d]
		(56)	(129)	(76)		
f) Maximal						0.054[c]
(n=732)	≤18.6	23.3	23.7	25.3	0.029 (0.024)	0.231[d]
(R^2=0.029)		(105)	(190)	(82)		
	>18.6	22.9	24.0	30.3	0.091 (0.021)	<0.001[d]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal						0.074[c]	RACE (p=0.128)
(n=510)	≤18.6	20.8	23.0	22.5	0.015 (0.034)	0.662[d]	EDUC (p=0.008)
(R^2=0.049)		(71)	(127)	(53)			
	>18.6	21.8	22.4	29.3	0.094 (0.028)	0.001[d]	
		(56)	(128)	(75)			
h) Maximal						0.044**[c]	CURR*TIME*DRKYR
(n=719)	≤18.6	24.0**	23.3**	24.6**	0.012 (0.025)**	0.615**[d]	(p=0.040)
(R^2=0.051)		(104)	(186)	(81)			EDUC (p=0.004)
	>18.6	23.4**	23.7**	29.1**	0.077 (0.022)**	<0.001**[d]	
		(77)	(172)	(99)			

[a]Transformed from natural logarithm scale.

[b]Slope and standard error based on natural logarithm schizoid score versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

**Log_2 (current dioxin)-by-time-by-covariate interaction ($0.01<p\leq0.05$); adjusted mean, adjusted slope, standard error, and p-value derived from a model fitted after deletion of this interaction.

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-35. (Continued)

Analysis of Schizoid Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	23.7	All Categories		<0.001
Unknown	340	22.7	Unknown vs. Background	-1.1 --	0.229
Low	194	24.9	Low vs. Background	1.2 --	0.306
High	184	27.9	High vs. Background	4.2 --	<0.001
Total	1,499		(R^2=0.011)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	23.7	All Categories		0.027	AGE*ALC (p=0.009)
Unknown	335	23.1	Unknown vs. Background	-0.6 --	0.522	AGE*DRKYR (p=0.017)
Low	190	24.4	Low vs. Background	0.7 --	0.519	ALC*EDUC (p=0.037)
High	180	27.0	High vs. Background	3.4 --	0.006	DRKYR*EDUC (p=0.027)
Total	1,480		(R^2=0.036)			

[a]Transformed from natural logarithm scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on natural logarithm scale.

[f]P-value is based on difference of means on natural logarithm scale.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

score and current dioxin for Ranch Hands with 18.6 years or less since tour (p=0.231) and a significant association for Ranch Hands with more than 18.6 years since tour (p<0.001). The unadjusted mean scores for the earlier tour stratum were nearly the same for low and medium current dioxin (22.9 and 24.0); but the mean score for high current dioxin was greater (30.3).

Consistent with the unadjusted analysis, the adjusted analysis based on the minimal assumption detected a current dioxin-by-time since tour interaction of borderline significance (Table 9-35 [g]: p=0.074). For the 18.6 years or less time stratum, the positive association between the schizoid score and current dioxin remained nonsignificant (p=0.662), while the positive association remained significant for the time greater than 18.6 years stratum (p=0.001).

The adjusted analysis for the maximal cohort detected a significant current dioxin-by-time-by-lifetime alcohol history interaction (Table 9-35 [h]: p=0.040). To examine this interaction, stratified analyses are presented for each lifetime alcohol history and time stratum.

For Ranch Hands with no drink-years, the current dioxin-by-time since tour interaction was not significant (Appendix Table H-1: p=0.136). There was a nonsignificant negative association between current dioxin and the schizoid score for the time less than or equal to 18.6 years stratum (p=0.734) and a significant positive association for the time over 18.6 years stratum (p=0.041). For Ranch Hands in the time over 18.6 years stratum, the adjusted mean schizoid scores were higher for Ranch Hands with low and high current dioxin than for those with medium current dioxin (low, 24.6; medium, 20.1; high, 31.4).

For Ranch Hands who had greater than 0 but less than 40 drink-years, the current dioxin-by-time since tour interaction was marginally significant (Appendix Table H-1: p=0.064). There was a nonsignificant positive association between current dioxin and the schizoid score for Ranch Hands with 18.6 years or less since tour (p=0.702) and a significant positive association for Ranch Hands with time over 18.6 years since tour (p=0.003). For the time greater than 18.6 years stratum, the adjusted mean schizoid scores for Ranch Hands with low and medium current dioxin were nearly the same (22.4 and 22.9, respectively), but the adjusted mean score for those with high current dioxin was much higher (28.7).

For Ranch Hands with greater than 40 drink-years, the current dioxin-by-time since tour interaction was nonsignificant (Appendix Table H-1: p=0.799) and the positive associations between current dioxin and the schizoid score were nonsignificant for both time strata (≤18.6, p=0.643; >18.6, p=0.317).

After deletion of the current dioxin-by-time-by-lifetime alcohol history interaction, the maximal adjusted analysis displayed a significant current dioxin-by-time since tour interaction (Table 9-35 [h]: p=0.044). The positive association between current dioxin and the schizoid score was nonsignificant for the time less than or equal to 18.6 years stratum (p=0.615). However, there was a significant positive association for Ranch Hands with time over 18.6 years (p<0.001). For Ranch Hands in the time over 18.6 years stratum, the adjusted mean schizoid scores for low and medium current dioxin were about the same (23.4 and 23.7) while the mean score was much higher for high current dioxin (29.1).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the unadjusted analysis of categorized current dioxin, there was an overall significant difference among the mean schizoid scores of the four current dioxin categories (Table 9-35 [i]: $p<0.001$). The unadjusted mean schizoid scores for the background, unknown, low, and high categories were 23.7, 22.7, 24.9, and 27.9. The mean schizoid score for the Ranch Hands in the high current dioxin category was significantly higher than the mean score for the Comparisons in the background current dioxin category ($p<0.001$).

Similarly, in the adjusted analysis of the MCMI schizoid score, the simultaneous contrast of the four current dioxin categories was significant ($p=0.027$). Also, the mean schizoid score for the Ranch Hands in the high current dioxin category remained significantly higher than that of the Comparisons in the background category ($p=0.006$).

Avoidant Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis of the MCMI avoidant score displayed a significant positive association with initial dioxin for both the minimal and maximal cohorts (Table 9-36 [a] and [b]: $p<0.001$ for each analysis). The unadjusted means for the minimal cohort for the low, medium, and high initial dioxin categories were 15.0, 17.3, and 20.1. For the maximal cohort, the corresponding means were 16.1, 16.1, and 19.4, respectively.

The adjusted analysis of the minimal cohort detected a significant interaction between initial dioxin and education level (Table 9-36 [c]: $p=0.037$). To examine this interaction, separate analyses were performed for each education stratum (Appendix Table H-1). The stratified analyses displayed a nonsignificant positive association between initial dioxin and the MCMI avoidant score for Ranch Hands with a high school level education ($p=0.249$). For Ranch Hands with a college level education, there was a significant positive association between the avoidant score and initial dioxin ($p<0.001$). The adjusted mean scores for this stratum increased steadily for increasing levels of initial dioxin (low, 10.5; medium, 13.4; high, 17.5).

After deletion of the initial dioxin-by-education interaction, the adjusted minimal analysis detected a positive association between initial dioxin and the MCMI avoidant score (Table 9-36 [c]: $p=0.003$). Concurrently, the maximal adjusted analysis also displayed a significant positive association between the MCMI avoidant score and initial dioxin (Table 9-36 [d]: $p=0.038$).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis of the MCMI avoidant score with current dioxin and time since tour under the minimal assumption, the interaction between current dioxin and time was significant (Table 9-36 [e]: $p=0.028$). A nonsignificant positive association was found for those Ranch Hands with time less than or equal to 18.6 years ($p=0.624$). For Ranch Hands with time over 18.6 years, there was a significant positive association between the avoidant

TABLE 9-36.

Analysis of Avoidant Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal	Low	129	15.0	0.110 (0.029)	<0.001
(n=514)	Medium	256	17.3		
(R^2=0.027)	High	129	20.1		
b) Maximal	Low	182	16.1	0.082 (0.021)	<0.001
(n=732)	Medium	368	16.1		
(R^2=0.020)	High	182	19.4		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal	Low	128	14.9**	0.086 (0.029)**	0.003**	INIT*EDUC (p=0.037)
(n=505)	Medium	250	16.1**			DRKYR (p=0.083)
(R^2=0.097)	High	127	18.6**			
d) Maximal	Low	179	17.5	0.046 (0.022)	0.038	DRKYR (p=0.052)
(n=719)	Medium	362	15.6			EDUC (p<0.001)
(R^2=0.066)	High	178	17.8			

[a]Transformed from natural logarithm (X + 1) scale.

[b]Slope and standard error based on natural logarithm (avoidant score + 1) versus log_2 dioxin.

**Log_2 (initial dioxin)-by-covariate interaction ($0.01<p\leq0.05$); adjusted mean, adjusted slope, standard error, and p-value derived from a model fitted after deletion of this interaction.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-36. (Continued)

Analysis of Avoidant Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal						0.028[c]
(n=514)	≤18.6	16.0 (72)	16.3 (128)	17.0 (53)	0.023 (0.047)	0.624[d]
(R^2=0.036)	>18.6	15.0 (56)	17.1 (129)	23.7 (76)	0.158 (0.039)	<0.001[d]
f) Maximal						0.076[c]
(n=732)	≤18.6	15.1 (105)	16.0 (190)	17.6 (82)	0.033 (0.033)	0.317[d]
(R^2=0.024)	>18.6	16.8 (78)	16.8 (175)	20.3 (102)	0.112 (0.029)	<0.001[d]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal						0.029[c]	DRKYR (p=0.096)
(n=505)	≤18.6	15.9 (71)	15.3 (126)	15.9 (53)	0.003 (0.046)	0.951[d]	EDUC (p<0.001)
(R^2=0.098)	>18.6	14.9 (56)	15.8 (125)	22.0 (74)	0.133 (0.038)	<0.001[d]	
h) Maximal						0.045[c]	DRKYR (p=0.061)
(n=719)	≤18.6	16.3 (104)	15.6 (186)	16.5 (81)	-0.006 (0.033)	0.848[d]	EDUC (p=0.001)
(R^2=0.073)	>18.6	17.5 (77)	16.4 (172)	18.4 (99)	0.081 (0.029)	0.006[d]	

[a]Transformed from natural logarithm (X + 1) scale.

[b]Slope and standard error based on natural logarithm (avoidant score + 1) versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-36. (Continued)

Analysis of Avoidant Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	16.3	All Categories		0.035
Unknown	340	15.0	Unknown vs. Background	-1.3 --	0.164
Low	194	16.8	Low vs. Background	0.5 --	0.667
High	184	19.1	High vs. Background	2.8 --	0.032
Total	1,499		(R^2=0.006)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	16.2	All Categories		0.351	DRKYR (p=0.007) EDUC (p<0.001)
Unknown	335	15.5	Unknown vs. Background	-0.8 --	0.406	
Low	190	16.3	Low vs. Background	0.1 --	0.957	
High	180	18.0	High vs. Background	1.8 --	0.166	
Total	1,480		(R^2=0.029)			

[a]Transformed from natural logarithm (X + 1) scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on natural logarithm (X + 1) scale.

[f]p-value is based on difference of means on natural logarithm (X + 1) scale.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

score and current dioxin ($p<0.001$). For this time stratum, the unadjusted mean scores for low, medium, and high current dioxin were 15.0, 17.1, and 23.7.

The unadjusted maximal analysis detected a marginally significant current dioxin-by-time since tour interaction (Table 9-36 [f]: $p=0.076$). The positive association between current dioxin and the avoidant score was nonsignificant for the time less than or equal to 18.6 years time stratum ($p=0.317$), but there was a significant positive association for Ranch Hands with time over 18.6 years ($p<0.001$). The unadjusted means for the time over 18.6 years stratum for low, medium, and high current dioxin were 16.8, 16.8, and 20.3.

The adjustment for lifetime alcohol history and education had little effect on the analysis of the minimal cohort. The current dioxin-by-time since tour interaction remained significant (Table 9-36 [g]: $p=0.029$). The time less than or equal to 18.6 years stratum displayed a nonsignificant positive association between the avoidant score and current dioxin ($p=0.951$), while for those Ranch Hands with time over 18.6 years, there was a significant positive association ($p<0.001$).

In the maximal cohort analysis, the adjustment for lifetime alcohol history and education caused the current dioxin-by-time since tour interaction to become significant (Table 9-36 [h]: $p=0.045$). For Ranch Hands in the time less than or equal to 18.6 years stratum, there was a nonsignificant negative association between the MCMI avoidant score and current dioxin ($p=0.848$); the positive association for the time over 18.6 years stratum remained significant ($p=0.006$).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

The unadjusted analysis of categorized current dioxin detected a significant overall difference in the mean avoidant scores of the four current dioxin categories (Table 9-36 [i]: $p=0.035$). The unadjusted mean scores for the background, unknown, low, and high categories were 16.3, 15.0, 16.8, and 19.1. There were no significant differences found between the Comparisons in the background category and the Ranch Hands in either the unknown or low current dioxin category ($p=0.164$ and $p=0.667$, respectively). The mean avoidant score was found to be significantly higher for the Ranch Hands in the high current dioxin category than for the the Comparisons in the background category ($p=0.032$).

After adjusting for lifetime alcohol history and education, the analysis of the four current dioxin categories found no significant differences in the mean avoidant scores of the four categories (Table 9-36 [j]: $p>0.15$ for each contrast).

Dependent Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The MCMI dependent score displayed a significant positive association with initial dioxin for both the unadjusted minimal and the unadjusted maximal analyses (Table 9-37 [a] and [b]: $p=0.027$ and $p=0.009$). The unadjusted mean dependent scores for the minimal cohort were nearly the same for the low and medium initial dioxin categories (40.8 and 40.7), but the mean score was larger for the high initial dioxin category (43.2). For the maximal

TABLE 9-37.

Analysis of Dependent Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal	Low	129	40.8	0.123 (0.056)	0.027
(n=514)	Medium	256	40.7		
(R^2=0.009)	High	129	43.2		
b) Maximal	Low	182	38.8	0.108 (0.041)	0.009
(n=732)	Medium	368	40.6		
(R^2=0.009)	High	182	43.1		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal	Low	128	41.6	0.137 (0.058)	0.018	AGE*DRKYR (p=0.005)
(n=505)	Medium	250	41.5			RACE*EDUC (p=0.046)
(R^2=0.049)	High	127	44.7			
d) Maximal	Low	179	42.2	0.091 (0.044)	0.037	EDUC (p=0.007)
(n=719)	Medium	362	41.9			AGE*DRKYR (p=0.005)
(R^2=0.043)	High	178	44.7			ALC*RACE(p=0.032)

[a]Transformed from square root scale.

[b]Slope and standard error based on square root dependent score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-37. (Continued)

Analysis of Dependent Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal (n=514) (R^2=0.010)	≤18.6	41.4 (72)	40.5 (128)	41.1 (53)	0.060 (0.091)	0.401[c] 0.506[d]
	>18.6	42.3 (56)	40.4 (129)	43.9 (76)	0.159 (0.074)	0.033[d]
f) Maximal (n=732) (R^2=0.010)	≤18.6	39.3 (105)	39.2 (190)	43.9 (82)	0.077 (0.064)	0.541[c] 0.231[d]
	>18.6	38.8 (78)	41.5 (175)	43.0 (102)	0.129 (0.057)	0.023[d]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal (n=505) (R^2=0.051)	≤18.6	41.9 (71)	41.6 (126)	43.2 (53)	0.097 (0.093)	0.477[c] 0.300[d]	AGE*DRKYR (p=0.006) RACE*EDUC (p=0.039)
	>18.6	42.6 (56)	41.0 (125)	44.7 (74)	0.179 (0.077)	0.020[d]	
h) Maximal (n=719) (R^2=0.045)	≤18.6	42.5 (104)	40.9 (186)	45.5 (81)	0.051 (0.066)	0.347[c] 0.443[d]	EDUC (p=0.006) AGE*DRKYR (p=0.005) ALC*RACE (p=0.030)
	>18.6	40.9 (77)	42.9 (172)	44.7 (99)	0.131 (0.059)	0.026[d]	

[a]Transformed from square root scale.

[b]Slope and standard error based on square root dependent score versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-37. (Continued)

Analysis of Dependent Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	42.1	All Categories		0.033
Unknown	340	39.3	Unknown vs. Background	-2.8 --	0.032
Low	194	39.2	Low vs. Background	-2.9 --	0.066
High	184	43.4	High vs. Background	1.3 --	0.451
Total	1,499		(R^2=0.006)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	42.2	All Categories		0.115	EDUC (p<0.001) ALC*DRKYR (p=0.004)
Unknown	335	40.2	Unknown vs. Background	-2.0 --	0.133	
Low	190	38.8	Low vs. Background	-3.4 --	0.037	
High	180	42.3	High vs. Background	0.1 --	0.944	
Total	1,480		(R^2=0.022)			

[a]Transformed from square root scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on square root scale.

[f]P-value is based on difference of means on square root scale.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

cohort, the corresponding mean scores for the low, medium, and high initial dioxin categories were 38.8, 40.6, and 43.1.

The adjusted analysis also displayed a significant positive association between the MCMI dependent score and initial dioxin for both the minimal and maximal cohorts (Table 9-37 [c] and [d]: p=0.018 and p=0.037).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis, under both the minimal and maximal assumptions, the interaction between current dioxin and time since tour was not significant (Table 9-37 [e] and [f]: p=0.401 and p=0.541, respectively); thus, the slopes for the two time strata did not differ significantly. Under the minimal assumption, a significant positive association was found between the MCMI dependent score and current dioxin for Ranch Hands with time over 18.6 years (Table 9-37 [e]: p=0.033). For these Ranch Hands, the mean dependent scores for low, medium, and high current dioxin were 42.3, 40.4, and 43.9.

Based on the maximal assumption, the unadjusted analysis detected a significant positive association between the MCMI dependent score and current dioxin for Ranch Hands with time over 18.6 years (Table 9-37 [f]: p=0.023). The mean dependent scores became larger for increasing levels of current dioxin for Ranch Hands in this time stratum (low, 38.8; medium, 41.5; high 43.0).

In the adjusted analysis based on both the minimal and maximal assumptions, the interaction between current dioxin and time was nonsignificant (Table 9-37 [g] and [h]: p=0.477 and p=0.347, respectively). In both the minimal and maximal cohorts, there were significant positive associations between current dioxin and the dependent score for the time over 18.6 years stratum (p=0.020 and p=0.026, respectively).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the unadjusted analysis, the mean MCMI dependent scores were significantly different for the four current dioxin categories (Table 9-37 [i]: p=0.033). The unadjusted mean scores for the background, unknown, low, and high current dioxin categories were 42.1, 39.3, 39.2, and 43.4. The mean dependent score for the Ranch Hands in the unknown current dioxin category was significantly lower than the mean score for the Comparisons in the background category (p=0.032). There was also a marginally significant difference between the mean dependent scores of the Comparisons and the mean score of the Ranch Hands in the low current dioxin level category (p=0.066) with the Ranch Hands having a lower mean score than the Comparisons. The mean score of the Ranch Hands in the high category did not differ significantly from that of the Comparisons in the background category (p=0.451).

After adjusting for education and a current alcohol use-by-lifetime alcohol history interaction, the analysis of categorized current dioxin did not find any significant differences in the mean dependent scores of the four current dioxin categories (Table 9-37 [j]: p=0.115). However, the individual analysis of the low versus background categories found the mean

dependent score of the Ranch Hands in the low current dioxin category to be significantly lower than that of the Comparisons in the background category (p=0.037).

Histrionic Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

In the unadjusted analysis of the MCMI histrionic score, there was a significant negative association with initial dioxin under both the minimal and the maximal assumptions (Table 9-38 [a] and [b]: p=0.003 and p=0.002). In the minimal cohort, the unadjusted mean histrionic scores for the low, medium, and high initial dioxin categories were 63.9, 63.4, and 59.8. In the maximal cohort, the corresponding mean scores were 64.1, 63.9, and 60.9, respectively.

After adjusting for covariate information, a significant negative association remained between initial dioxin and the MCMI histrionic score in both the minimal and maximal cohorts (Table 9-38 [c] and [d]: p=0.011 and p=0.037).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis of the MCMI histrionic score with current dioxin and time since tour, there was a marginally significant current dioxin-by-time interaction under both the minimal and maximal assumptions (Table 9-38 [e] and [f]: p=0.099 and p=0.073). For the minimal cohort, the negative association between current dioxin and the MCMI histrionic score was not significant for those Ranch Hands with 18.6 years or less since their tour (p=0.616), but the negative association was significant for the time over 18.6 years stratum (p=0.001). For the time over 18.6 years stratum, the unadjusted mean histrionic score for low, medium, and high current dioxin were 65.4, 62.7, and 58.4.

The unadjusted maximal analysis also found a nonsignificant association between current dioxin and the histrionic score for the time less than or equal to 18.6 years stratum (Table 9-38 [f]: p=0.513), and a significant negative association for the time over 18.6 years stratum (p<0.001). The unadjusted mean scores for the time over 18.6 years stratum were nearly the same for low and medium current dioxin (64.0 and 64.1), while the mean score for high current dioxin was lower (59.8).

After adjusting for age, race, lifetime alcohol history, and education, the analysis of the minimal cohort detected a nonsignificant current dioxin-by-time since tour interaction (Table 9-38 [g]: p=0.112). For the time over 18.6 years stratum, there was a significant negative association between current dioxin and the histrionic score (p=0.006).

The adjusted analysis of the maximal cohort displayed a significant current dioxin-by-time-by-race interaction (Table 9-38 [h]: p=0.009). To investigate this interaction, separate analyses are presented for each race and time stratum. The analysis of the Black stratum exhibited a significant current dioxin-by-time since tour interaction (Appendix Table H-1: p=0.003). Within the time less than or equal to 18.6 years stratum, there was a significant positive association between current dioxin and the histrionic score (p=0.001). The adjusted mean scores for this stratum for low, medium, and high current dioxin were 57.6, 72.4, and

TABLE 9-38.

Analysis of Histrionic Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal	Low	129	63.9	-192.7 (63.7)	0.003
(n=514)	Medium	256	63.4		
(R^2=0.018)	High	129	59.8		
b) Maximal	Low	182	64.1	-150.8 (47.9)	0.002
(n=732)	Medium	368	63.9		
(R^2=0.013)	High	182	60.9		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal	Low	128	68.1	-166.6 (65.4)	0.011	AGE (p=0.043)
(n=505)	Medium	250	68.4			RACE (p<0.001)
(R^2=0.089)	High	127	65.1			DRKYR (p=0.040)
						EDUC (p<0.001)
d) Maximal	Low	179	67.6	-105.1 (50.2)	0.037	AGE (p=0.047)
(n=719)	Medium	362	68.4			RACE (p<0.001)
(R^2=0.074)	High	178	66.2			DRKYR (p=0.028)
						EDUC (p<0.001)

[a]Transformed from square scale.

[b]Slope and standard error based on square histrionic score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-38. (Continued)

Analysis of Histrionic Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal						0.099[c]
(n=514)	≤18.6	63.8	63.5	61.6	-52.0 (103.7)	0.616[d]
(R^2=0.022)		(72)	(128)	(53)		
	>18.6	65.4	62.7	58.4	-274.0 (85.0)	0.001[d]
		(56)	(129)	(76)		
f) Maximal						0.073[c]
(n=732)	≤18.6	63.5	64.1	62.3	-48.6 (74.3)	0.513[d]
(R^2=0.017)		(105)	(190)	(82)		
	>18.6	64.0	64.1	59.8	-226.9 (65.7)	<0.001[d]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal						0.112[c]	AGE (p=0.064)
(n=505)	≤18.6	68.3	68.7	66.8	-32.0 (105.0)	0.760[d]	RACE (p<0.001)
(R^2=0.094)		(71)	(126)	(53)			DRKYR (p=0.043)
	>18.6	69.5	67.5	63.9	-240.6 (86.4)	0.006[d]	EDUC (p<0.001)
		(56)	(125)	(74)			
h) Maximal						****	CURR*TIME*RACE (p=0.009)
(n=719)	≤18.6	****	****	****	****	****	DRKYR (p=0.055)
(R^2=0.099)		(104)	(186)	(81)			EDUC (p<0.001)
	>18.6	****	****	****	****	****	AGE*RACE (p=0.036)
		(77)	(172)	(99)			

[a]Transformed from square scale.

[b]Slope and standard error based on square histrionic score versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

****Log_2 (current dioxin)-by-time-by-covariate interaction ($p \leq 0.01$); adjusted mean, adjusted slope, standard error, and p-value not presented.

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-38. (Continued)

Analysis of Histrionic Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	64.4	All Categories		0.014
Unknown	340	64.6	Unknown vs. Background	0.2 --	0.806
Low	194	63.2	Low vs. Background	-1.2 --	0.287
High	184	60.9	High vs. Background	-3.5 --	0.003
Total	1,499		(R^2=0.007)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	66.8	All Categories		0.132	RACE (p<0.001)
						AGE*DRKYR (p=0.021)
Unknown	335	66.7	Unknown vs. Background	-0.1 --	0.896	ALC*EDUC (p=0.036)
Low	190	66.0	Low vs. Background	-0.7 --	0.492	DRKYR*EDUC (p=0.006)
High	180	64.2	High vs. Background	-2.6 --	0.020	
Total	1,480		(R^2=0.053)			

[a]Transformed from square scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on square scale.

[f]P-value is based on difference of means on square scale.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

83.2. For the time over 18.6 years stratum, there was a nonsignificant negative association (p=0.656).

The analysis of the non-Black stratum detected a marginally significant current dioxin-by-time since tour interaction (Appendix Table H-1: p=0.057). For the time less than or equal to 18.6 years stratum, there was a nonsignificant negative association between current dioxin and the MCMI histrionic score (p=0.871), but there was a significant negative association for those Ranch Hands with time since tour greater than 18.6 years (p=0.003).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the unadjusted analysis of the MCMI histrionic score, the overall contrast of the four current dioxin categories was significant (Table 9-38 [i]: p=0.014). The unadjusted mean histrionic scores for the background, unknown, low, and high current dioxin categories were 64.4, 64.6, 63.2, and 60.9. The contrasts of the mean histrionic scores of the unknown versus background and low versus background current dioxin categories were not statistically significant (p=0.806 and p=0.287). However, the mean score of the Ranch Hands in the high current dioxin category was significantly lower than the mean score of the Comparisons in the background category (p=0.003).

After adjusting for race, an age-by-lifetime alcohol history interaction, a current alcohol use-by-education interaction, and a lifetime alcohol history-by-education interaction, the analysis did not detect a significant overall difference among the mean histrionic scores of the four current dioxin categories (Table 9-38 [j]: p=0.132). However, the mean histrionic score for the Ranch Hands in the high current dioxin category was significantly lower than that of the Comparisons in the background category (p=0.020).

Narcissistic Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis of both the minimal and the maximal cohorts detected a significant negative association between initial dioxin and the MCMI narcissistic score (Table 9-39 [a] and [b]: p=0.007 and p=0.003, respectively). The unadjusted mean narcissistic scores for the minimal cohort for the low, medium, and high initial dioxin categories were 63.5, 65.3, and 60.8. The corresponding unadjusted mean scores for the maximal cohort were 65.1, 65.0, and 62.0, respectively.

After the adjustment for race, current alcohol use, and education, the minimal analysis detected a marginally significant negative association between initial dioxin and the MCMI narcissistic score (Table 9-39 [c]: p=0.053). The adjustment for covariate information did not affect the significance of the negative association in the maximal analysis (Table 9-39 [d]: p=0.012).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis, under both the minimal and maximal assumptions, the interactions between current dioxin and time since tour were not significant (Table 9-39 [e]

TABLE 9-39.

Analysis of Narcissistic Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean	Slope (Std. Error)[a]	p-Value
a) Minimal	Low	129	63.5	-1.454 (0.534)	0.007
(n=514)	Medium	256	65.3		
(R^2=0.014)	High	129	60.8		
b) Maximal	Low	182	65.1	-1.206 (0.403)	0.003
(n=732)	Medium	368	65.0		
(R^2=0.012)	High	182	62.0		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
c) Minimal	Low	128	66.5	-1.051 (0.542)	0.053	RACE (p=0.008)
(n=508)	Medium	252	69.1			ALC (p=0.080)
(R^2=0.040)	High	128	65.2			EDUC (p=0.028)
d) Maximal	Low	179	68.5	-1.082 (0.430)	0.012	DRKYR (p=0.140)
(n=719)	Medium	362	68.9			AGE*EDUC (p=0.045)
(R^2=0.048)	High	178	66.2			ALC*RACE (p=0.037)

[a]Slope and standard error based on narcissistic score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-39. (Continued)

Analysis of Narcissistic Score

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[a]	p-Value
e) Minimal						0.217[b]
(n=514)	≤18.6	65.2	65.9	63.1	-0.352 (0.868)	0.686[c]
(R^2=0.021)		(72)	(128)	(53)		
	>18.6	62.1	64.1	59.5	-1.741 (0.712)	0.015[c]
		(56)	(129)	(76)		
f) Maximal						0.153[b]
(n=732)	≤18.6	65.0	66.3	63.7	-0.376 (0.625)	0.548[c]
(R^2=0.017)		(105)	(190)	(82)		
	>18.6	64.7	63.8	60.8	-1.569 (0.553)	0.005[c]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
g) Minimal						0.223[b]	RACE (p=0.005)
(n=508)	≤18.6	68.4	69.8	67.5	0.056 (0.869)	0.948[c]	ALC (p=0.078)
(R^2=0.049)		(71)	(127)	(53)			EDUC (p=0.022)
	>18.6	65.3	67.8	63.8	-1.307 (0.718)	0.069[c]	
		(56)	(126)	(75)			
h) Maximal						0.080[b]	AGE*EDUC (p=0.042)
(n=719)	≤18.6	68.2	70.0	68.0	-0.055 (0.649)	0.933[c]	DRKYR*RACE (p=0.022)
(R^2=0.055)		(104)	(186)	(81)			
	>18.6	68.5	67.5	64.8	-1.517 (0.575)	0.009[c]	
		(77)	(172)	(99)			

[a]Slope and standard error based on narcissistic score versus log_2 dioxin.

[b]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[c]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-39. (Continued)

Analysis of Narcissistic Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean	Contrast	Difference of Means (95% C.I.)	p-Value
Background	781	64.0	All Categories		0.025
Unknown	340	66.0	Unknown vs. Background	2.0 (0.0,3.9)	0.048
Low	194	65.5	Low vs. Background	1.5 (-0.9,3.9)	0.225
High	184	62.1	High vs. Background	-1.9 (-4.4,0.5)	0.122
Total	1,499		(R^2=0.006)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.)	p-Value	Covariate Remarks
Background	775	66.7	All Categories		0.084	RACE (p<0.001) DRKYR (p=0.078)
Unknown	335	68.5	Unknown vs. Background	1.8 (-0.2,3.7)	0.075	EDUC (p=0.002)
Low	190	68.5	Low vs. Background	1.8 (-0.6,4.2)	0.145	
High	180	65.6	High vs. Background	-1.2 (-3.6,1.3)	0.361	
Total	1,480		(R^2=0.021)			

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

and [f]: p=0.217 and p=0.153, respectively). Under the minimal assumption, a significant negative association between current dioxin and the narcissistic score was found for Ranch Hands with time over 18.6 years (Table 9-39 [e]: p=0.015). For these Ranch Hands, the mean narcissistic scores for low, medium, and high current dioxin were 62.1, 64.1, and 59.5.

Under the maximal assumption, the unadjusted analysis detected a significant negative association between current dioxin and the narcissistic score for Ranch Hands with over 18.6 years since tour (Table 9-39 [f]: p=0.005). The unadjusted mean scores for these Ranch Hands decreased as current dioxin increased (low, 64.7; medium, 63.8; high, 60.8).

After adjusting for race, current alcohol use, and education, the minimal analysis displayed a nonsignificant current dioxin-by-time since tour interaction (Table 9-39 [g]: p=0.223). For Ranch Hands with time over 18.6 years, there was a marginally significant negative association between current dioxin and the MCMI narcissistic score (p=0.069).

After adjusting for an age-by-education interaction and a lifetime alcohol history-by-race interaction, the current dioxin-by-time since tour interaction was marginally significant for the maximal cohort (Table 9-39 [h]: p=0.080). For those Ranch Hands with time less than or equal to 18.6 years, there was a nonsignificant positive association between current dioxin and the narcissistic score (p=0.933). However, there was a significant negative association for Ranch Hands with over 18.6 years since their tour (p=0.009).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

The analysis of categorized current dioxin detected a significant difference in the mean narcissistic scores of the four current dioxin categories (Table 9-39 [i]: p=0.025). The unadjusted mean scores for the background, unknown, low, and high current dioxin categories were 64.0, 66.0, 65.5, and 62.1. The mean narcissistic score for Ranch Hands in the unknown category was significantly higher than the mean score for Comparisons in the background category (p=0.048). Neither the low versus background nor the high versus background contrast was significant (p=0.225 and p=0.122).

After adjusting for race, lifetime alcohol history, and education, there was a marginally significant difference in the mean narcissistic scores of the four current dioxin categories (Table 9-39 [j]: p=0.084). The adjusted mean narcissistic scores for the background, unknown, low, and high current dioxin categories were 66.7, 68.5, 68.5, and 65.6. A marginally significant difference was detected between the mean score of Comparisons in the background category and Ranch Hands in the unknown category (p=0.075) with the Ranch Hands having a higher mean narcisstic score. No other significant differences in mean narcissistic scores were found (low versus background: p=0.145; high versus background: p=0.361).

Antisocial Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

In the unadjusted analysis of the MCMI antisocial score, there was a nonsignificant association with initial dioxin under the minimal and maximal assumptions (Table 9-40 [a] and [b]: p=0.417 and p=0.643).

In the adjusted analysis, there were significant interactions between initial dioxin and current alcohol use under both the minimal and the maximal assumptions (Table 9-40 [c] and [d]: p=0.022 and p=0.005). To examine these interactions, associations between the antisocial score and initial dioxin are presented separately for each current alcohol use stratum.

In the minimal analysis, there was a nonsignificant negative association between initial dioxin and the antisocial score for Ranch Hands who had less than one drink per day and a nonsignificant positive association for those who drank between one and four drinks per day (Appendix Table H-1: p=0.685 and p=0.513). For those who drank more than four drinks per day, there was a significant negative association (p=0.023). Within this stratum, the adjusted mean antisocial scores for the low, medium, and high initial dioxin categories were 54.2, 38.6, and 25.2. After deletion of the initial dioxin-by-current alcohol use from the model, there was a nonsignificant negative association between initial dioxin and the antisocial score for the minimal cohort (Table 9-40 [c]: p=0.238).

Under the maximal assumption, there was a nonsignificant negative association between initial dioxin and the antisocial score for Ranch Hands who drank less than one drink per day and for Ranch Hands who drank between one and four drinks per day (Appendix Table H-1: p=0.993 and p=0.642, respectively). For Ranch Hands who drank more than four drinks per day, there was a significant negative association between initial dioxin and the MCMI antisocial score (p<0.001). The adjusted mean scores for this stratum decreased steadily for increasing levels of initial dioxin (low, 82.6; medium, 65.5; high, 37.5).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In both the unadjusted and adjusted minimal and maximal analyses, the current dioxin-by-time since tour interactions and the associations between current dioxin and the MCMI antisocial score within each time stratum were nonsignificant (Table 9-40 [e-h]: p>0.25 for each analysis).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

The unadjusted analysis of the four current dioxin categories detected a marginally significant difference among the mean antisocial scores of the four categories (Table 9-40 [i]: p=0.074). The unadjusted mean scores for the background, unknown, low, and high current dioxin categories were 59.6, 61.6, 63.3, and 61.2. The mean antisocial score of the Ranch Hands in the low current dioxin category was significantly higher than the mean score of the Comparisons in the background category (p=0.016).

TABLE 9-40.

Analysis of Antisocial Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean	Slope (Std. Error)[a]	p-Value
a) Minimal	Low	129	60.3	-0.557 (0.685)	0.417
(n=514)	Medium	256	62.7		
(R^2=0.001)	High	129	61.0		
b) Maximal	Low	182	60.6	-0.236 (0.508)	0.643
(n=732)	Medium	368	62.2		
(R^2<0.001)	High	182	61.1		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
c) Minimal	Low	129	60.3**	-0.860 (0.727)**	0.238**	INIT*ALC (p=0.022)
(n=509)	Medium	252	62.1**			AGE*ALC (p=0.008)
(R^2=0.039)	High	128	60.1**			ALC*RACE (p=0.007)
						ALC*DRKYR (p=0.035)
d) Maximal	Low	180	****	****	****	INIT*ALC (p=0.005)
(n=724)	Medium	365	****			AGE (p=0.048)
(R^2=0.021)	High	179	****			DRKYR (p=0.022)

[a]Slope and standard error based on antisocial score versus log_2 dioxin.

**Log_2 (initial dioxin)-by-covariate interaction ($0.01<p\leq0.05$); adjusted mean, adjusted slope, standard error, and p-value derived from a model fitted after deletion of this interaction.

****Log_2 (initial dioxin)-by-covariate interaction ($p\leq0.01$); adjusted mean, adjusted slope, standard error, and p-value not presented.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-40. (Continued)

Analysis of Antisocial Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[a]	p-Value
e) Minimal						0.323[b]
(n=514)	≤18.6	61.2	63.4	64.0	0.526 (1.116)	0.638[c]
(R^2=0.006)		(72)	(128)	(53)		
	>18.6	58.6	61.6	60.0	-0.901 (0.915)	0.325[c]
		(56)	(129)	(76)		
f) Maximal						0.378[b]
(n=732)	≤18.6	60.7	63.6	62.3	0.450 (0.789)	0.568[c]
(R^2=0.004)		(105)	(190)	(82)		
	>18.6	59.7	61.0	60.3	-0.478 (0.698)	0.493[c]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
g) Minimal						0.407[b]	DRKYR (p=0.056)
(n=509)	≤18.6	61.7	63.5	63.9	0.428 (1.145)	0.709[c]	AGE*ALC (p=0.043)
(R^2=0.025)		(72)	(127)	(53)			
	>18.6	57.9	61.7	60.4	-0.771 (0.951)	0.418[c]	
		(56)	(126)	(75)			
h) Maximal						0.380[b]	AGE (p=0.080)
(n=724)	≤18.6	60.8	63.6	61.8	0.162 (0.807)	0.841[c]	DRKYR (p=0.028)
(R^2=0.013)		(104)	(189)	(81)			
	>18.6	60.1	61.5	59.5	-0.765 (0.718)	0.286[c]	
		(77)	(173)	(100)			

[a]Slope and standard error based on antisocial score versus log_2 dioxin.

[b]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[c]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-40. (Continued)

Analysis of Antisocial Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean	Contrast	Difference of Means (95% C.I.)	p-Value
Background	781	59.6	All Categories		0.074
Unknown	340	61.6	Unknown vs. Background	2.0 (-0.5,4.4)	0.117
Low	194	63.3	Low vs. Background	3.7 (0.7,6.8)	0.016
High	184	61.2	High vs. Background	1.6 (-1.5,4.8)	0.300
Total	1,499		(R^2=0.005)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.)	p-Value	Covariate Remarks
Background	780	59.6**	All Categories		0.061**	DXCAT*ALC (p=0.014) DRKYR (p=0.005)
Unknown	337	61.6**	Unknown vs. Background	2.0 (-0.4,4.5)**	0.107**	AGE*ALC (p=0.015)
Low	192	63.5**	Low vs. Background	3.9 (0.9,7.0)**	0.012**	
High	181	60.9**	High vs. Background	1.3 (-1.8,4.5)**	0.405**	
Total	1,490		(R^2=0.020)			

**Categorized current dioxin-by-covariate interaction ($0.01<p\leq0.05$); adjusted mean, confidence interval, and p-value derived from a model fitted after deletion of this interaction.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

The adjusted analysis detected a significant interaction between categorized current dioxin and current alcohol use (Table 9-40 [j]: p=0.014). After stratifying by current alcohol use, there was a marginally significant difference found among the mean antisocial scores of the four current dioxin categories for participants who drank one or fewer drinks per day (Appendix Table H-1: p=0.076). The mean adjusted antisocial scores for the background, unknown, low, and high current dioxin categories were 59.5, 61.6, 63.4, and 62.1. Specifically, the mean antisocial score of the low category was significantly higher than the mean score of the background category (p=0.024).

For participants who drank more than one but less than or equal to four drinks per day, there were no significant differences found among the adjusted mean antisocial scores of the four current dioxin categories (Appendix Table H-1: p=0.820). The adjusted mean scores for the background, unknown, low, and high categories were 60.5, 60.3, 63.9, and 60.5.

The adjusted mean antisocial scores of the four current dioxin categories were found to differ significantly for the participants who drank more than four drinks per day (Appendix Table H-1: p=0.003). The adjusted mean scores for the background, unknown, low, and high categories were 59.0, 75.0, 69.6, and 38.0. Thus, the mean antisocial score of the Ranch Hands in the unknown current dioxin category was significantly higher than the mean score of the Comparisons in the background category (p=0.049) and Ranch Hands in the high category had a significantly lower mean antisocial score than the Comparisons in the background category (p=0.010).

After deletion of the current dioxin-by-current alcohol use interaction from the model, the analysis of categorized current dioxin detected a marginally significant difference among the mean antisocial scores of the four categories (Table 9-40 [j]: p=0.061). The mean score of the low category was found to be significantly higher than the mean score of the background category (p=0.012).

Compulsive Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis under both the minimal and the maximal assumption displayed nonsignificant associations between the MCMI compulsive score and initial dioxin (Table 9-41 [a] and [b]: p=0.193 and p=0.178, respectively). After the adjustment for covariate information, the associations were still nonsignificant for both the minimal and the maximal cohorts (Table 9-41 [c] and [d]: p=0.976 and p=0.580).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis of the MCMI compulsive score, under both the minimal and maximal assumptions, the interactions between current dioxin and time since tour were not significant (Table 9-41 [e] and [f]: p=0.576 and p=0.832, respectively). The associations between current dioxin and the compulsive score were also nonsignificant within the time strata for both minimal and maximal cohorts.

TABLE 9-41.

Analysis of Compulsive Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal	Low	129	69.2	-58.779 (45.095)	0.193
(n=514)	Medium	256	68.5		
(R^2=0.003)	High	129	68.0		
b) Maximal	Low	182	68.9	-42.347 (31.425)	0.178
(n=732)	Medium	368	68.9		
(R^2=0.002)	High	182	67.8		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal	Low	129	68.7	1.385 (45.155)	0.976	AGE (p<0.001)
(n=509)	Medium	252	68.5			DRKYR (p<0.001)
(R^2=0.080)	High	128	68.7			
d) Maximal	Low	179	68.6	18.043 (32.578)	0.580	DRKYR (p<0.001)
(n=719)	Medium	362	68.8			AGE*EDUC
(R^2=0.071)	High	178	68.9			(p=0.048)

[a]Transformed from square scale.

[b]Slope and standard error based on square compulsive score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-41. (Continued)

Analysis of Compulsive Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal						0.576[c]
(n=514)	≤18.6	69.1	68.4	67.7	-35.019 (73.555)	0.634[d]
(R^2=0.005)		(72)	(128)	(53)		
	>18.6	69.4	68.8	67.8	-88.219 (60.291)	0.144[d]
		(56)	(129)	(76)		
f) Maximal						0.832[c]
(n=732)	≤18.6	69.5	68.2	68.5	-42.543 (48.816)	0.384[d]
(R^2=0.003)		(105)	(190)	(82)		
	>18.6	69.2	69.0	67.8	-56.414 (43.184)	0.192[d]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal						0.476[c]	AGE (p<0.001)
(n=505)	≤18.6	68.1	68.6	68.9	65.987 (72.879)	0.366[d]	DRKYR (p<0.001)
(R^2=0.089)		(71)	(126)	(53)			EDUC (p=0.129)
	>18.6	69.1	68.9	68.8	0.742 (60.259)	0.990[d]	
		(56)	(125)	(74)			
h) Maximal						0.963[c]	DRKYR (p<0.001)
(n=719)	≤18.6	69.3	68.1	69.4	16.780 (49.397)	0.734[d]	AGE*EDUC (p=0.047)
(R^2=0.071)		(104)	(186)	(81)			
	>18.6	68.3	69.0	69.0	13.836 (43.818)	0.752[d]	
		(77)	(172)	(99)			

[a]Transformed from square scale.

[b]Slope and standard error based on square compulsive score versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-41. (Continued)

Analysis of Compulsive Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	68.4	All Categories		0.838
Unknown	340	68.7	Unknown vs. Background	0.3 --	0.621
Low	194	68.7	Low vs. Background	0.3 --	0.641
High	184	68.1	High vs. Background	-0.3 --	0.621
Total	1,499		(R^2<0.001)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	68.5	All Categories		0.962	AGE*DRKYR (p<0.001) AGE*EDUC (p=0.020)
Unknown	335	68.6	Unknown vs. Background	0.1 --	0.829	
Low	190	68.7	Low vs. Background	0.2 --	0.730	
High	180	68.8	High vs. Background	0.3 --	0.641	
Total	1,480		(R^2=0.056)			

[a]Transformed from square scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on square scale.

[f]p-value is based on difference of means on square scale.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

These findings did not change after adjusting for covariate information (Table 9-41 [g] and [h]: $p>0.35$ for each analysis).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In both the unadjusted and the adjusted analysis of categorized current dioxin, there were no significant differences detected among the mean MCMI compulsive scores of the four current dioxin categories (Table 9-41 [i] and [j]: $p>0.60$ for each analysis).

Passive-Aggressive Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis of the MCMI passive-aggressive score detected significant positive associations with initial dioxin for both the minimal and the maximal cohorts (Table 9-42 [a] and [b]: $p=0.046$ and $p<0.001$). In the minimal analysis, the unadjusted mean passive-aggressive scores for the low, medium, and high initial dioxin categories were 18.7, 20.3, and 21.2. The corresponding mean scores for the maximal cohort were 17.3, 18.9, and 21.5, respectively.

After the adjustment for age, lifetime alcohol history, and education, the minimal analysis detected a nonsignificant positive association between initial dioxin and the passive-aggressive score (Table 9-42 [c]: $p=0.950$). Similarly, after adjustment for age, race, lifetime alcohol history, and a current alcohol use-by-education interaction, the maximal analysis also exhibited a nonsignificant positive association between initial dioxin and the passive-aggressive score (Table 9-42 [d]: $p=0.295$).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis of the minimal cohort, the current dioxin-by-time since tour interaction was nonsignificant (Table 9-42 [e]: $p=0.371$). Within the over 18.6 years time stratum, there was a significant positive association between current dioxin and the passive-aggressive score ($p=0.037$). The unadjusted mean scores for Ranch Hands with time greater than 18.6 years increased steadily for increasing levels of current dioxin (low, 17.8; medium, 20.5; high, 21.4).

Based upon the maximal assumption, the unadjusted analysis again displayed a nonsignificant current dioxin-by-time since tour interaction (Table 9-42 [f]: $p=0.768$). However, both time strata exhibited a significant positive association between current dioxin and the passive-aggressive score (≤18.6 years: $p=0.044$; >18.6 years: $p=0.007$). The unadjusted mean scores for the time less than or equal to 18.6 years stratum for low, medium, and high current dioxin were 16.2, 20.1, and 19.7. For the time over 18.6 years stratum, the unadjusted mean passive-aggressive scores increased for increasing current dioxin levels (low, 16.8; medium, 19.6; high, 20.9).

TABLE 9-42.

Analysis of Passive-Aggressive Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean[a]	Slope (Std. Error)[b]	p-Value
a) Minimal	Low	129	18.7	0.130 (0.065)	0.046
(n=514)	Medium	256	20.3		
(R^2=0.008)	High	129	21.2		
b) Maximal	Low	182	17.3	0.156 (0.046)	<0.001
(n=732)	Medium	368	18.9		
(R^2=0.015)	High	182	21.5		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean[a]	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
c) Minimal	Low	128	19.7	0.004 (0.066)	0.950	AGE (p<0.001)
(n=505)	Medium	250	19.7			DRKYR (p<0.001)
(R^2=0.080)	High	127	19.0			EDUC (p=0.003)
d) Maximal	Low	179	20.6	0.050 (0.048)	0.295	AGE (p<0.001)
(n=719)	Medium	362	21.0			RACE (p=0.056)
(R^2=0.096)	High	178	21.4			DRKYR (p<0.001)
						ALC*EDUC (p=0.031)

[a]Transformed from square root scale.

[b]Slope and standard error based on square root passive-aggressive score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-42. (Continued)

Analysis of Passive-Aggressive Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean[a]/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[b]	p-Value
e) Minimal						0.371[c]
(n=514)	≤18.6	18.6 (72)	20.2 (128)	21.7 (53)	0.059 (0.106)	0.578[d]
(R^2=0.009)	>18.6	17.8 (56)	20.5 (129)	21.4 (76)	0.182 (0.087)	0.037[d]
f) Maximal						0.768[c]
(n=732)	≤18.6	16.2 (105)	20.1 (190)	19.7 (82)	0.145 (0.072)	0.044[d]
(R^2=0.016)	>18.6	16.8 (78)	19.6 (175)	20.9 (102)	0.174 (0.064)	0.007[d]

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean[a]/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[b]	p-Value	Covariate Remarks
g) Minimal						0.324[c]	AGE (p<0.001)
(n=505)	≤18.6	19.8 (71)	19.4 (126)	18.9 (53)	-0.089 (0.106)	0.401[d]	DRKYR (p<0.001)
(R^2=0.082)							EDUC (p=0.003)
	>18.6	18.9 (56)	20.1 (125)	19.5 (74)	0.042 (0.088)	0.630[d]	
h) Maximal						0.823[c]	AGE (p<0.001)
(n=719)	≤18.6	19.0 (104)	21.9 (186)	19.5 (81)	0.033 (0.073)	0.646[d]	RACE (p=0.059)
(R^2=0.096)							DRKYR (p<0.001)
	>18.6	20.8 (77)	21.8 (172)	20.2 (99)	0.054 (0.064)	0.399[d]	ALC*EDUC (p=0.032)

[a]Transformed from square root scale.

[b]Slope and standard error based on square root passive-aggressive score versus log_2 dioxin.

[c]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[d]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 9-42. (Continued)

Analysis of Passive-Aggressive Score (MCMI)

i) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Mean[a]	Contrast	Difference of Means (95% C.I.)[e]	p-Value[f]
Background	781	19.0	All Categories		0.054
Unknown	340	17.6	Unknown vs. Background	-1.4 --	0.132
Low	194	20.8	Low vs. Background	1.8 --	0.128
High	184	20.4	High vs. Background	1.4 --	0.268
Total	1,499		(R^2=0.005)		

j) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Adj. Mean[a]	Contrast	Difference of Adj. Means (95% C.I.)[e]	p-Value[f]	Covariate Remarks
Background	775	18.9**	All Categories		0.248**	DXCAT*AGE (p=0.031) DRKYR (p<0.001)
Unknown	335	18.0**	Unknown vs. Background	-0.9 --**	0.315**	EDUC (p=0.037)
Low	190	20.7**	Low vs. Background	1.8 --**	0.138**	
High	180	18.9**	High vs. Background	0.0 --**	0.965**	
Total	1,480		(R^2=0.051)			

[a]Transformed from square root scale.

[e]Difference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on square root scale.

[f]P-value is based on difference of means on square root scale.

**Categorized current dioxin-by-covariate interaction ($0.01<p\leq0.05$); adjusted mean, confidence interval, and p-value derived from a model fitted after deletion of this interaction.

Note: Background (Comparisons): Current Dioxin ≤10 ppt.
Unknown (Ranch Hands): Current Dioxin ≤10 ppt.
Low (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.
High (Ranch Hands): Current Dioxin >33.3 ppt.

After the adjustment for covariate information, the interactions between current dioxin and time remained nonsignificant (Table 9-42 [g] and [h]: p=0.324 and p=0.823, respectively). The associations between current dioxin and the passive-aggressive score became nonsignificant within both time strata for the minimal cohort after age, lifetime alcohol history, and education were retained in the model. Similarly, after adjustment for age, race, lifetime alcohol history, and a current alcohol use-by-education interaction in the maximal analysis, the associations between current dioxin and the passive-aggressive score became nonsignificant.

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the unadjusted analysis, there was a marginally significant difference among the mean passive-aggressive scores of the four current dioxin categories (Table 9-42 [i]: p=0.054). However, the mean score of the background group of Comparisons did not differ significantly from the mean score of the unknown, low, or high current dioxin categories (p=0.132, p=0.128, and p=0.268, respectively). The unadjusted mean scores for the background, unknown, low, and high current dioxin categories were 19.0, 17.6, 20.8, and 20.4.

The adjusted analysis of the MCMI passive-aggressive score detected a significant interaction between categorized current dioxin and age (Table 9-42 [j]: p=0.031). To examine this interaction, adjusted analyses were performed for Ranch Hands and Comparisons born in or after 1942 and for those born before 1942. For the younger participants, the overall contrast of the four current dioxin categories was significant (Appendix Table H-1: p=0.004). For these participants, the mean passive-aggressive scores for the background, unknown, low, and high categories were 19.5, 19.7, 26.7, and 20.9. The contrast of the Ranch Hands in the low category versus the Comparisons in the background category was also significant (p<0.001) with the Ranch Hands having a higher mean passive-aggressive score than the Comparisons. In fact, the Ranch Hands in the unknown, low, and high categories had higher mean adjusted passive-aggressive scores than the Comparisons in the background category.

For the older participants (born before 1942), the simultaneous contrast of the four current dioxin categories was not significant (Appendix Table H-1: p=0.450). The mean adjusted passive-aggressive scores for these participants in the background, unknown, low, and high categories were 18.4, 16.8, 16.8, and 17.8. Unlike the analysis of the younger participants, the older Comparisons in the background category had a higher mean adjusted passive-aggressive score than the older Ranch Hands in the unknown, low, and high categories.

After deletion of the interaction from the model and adjusting only for lifetime alcohol history and education, the adjusted analysis of the passive-aggressive score and categorized current dioxin was not significant (Table 9-42 [j]: p=0.248).

Schizotypal Score—MCMI

Model 1: Ranch Hands - Log_2 (Initial Dioxin)

The unadjusted analysis of both the minimal and the maximal cohort displayed a significant positive association between initial dioxin and the MCMI schizotypal score (Table 9-43 [a] and [b]: $p<0.001$ and $p<0.001$, respectively). The unadjusted mean schizotypal scores for the minimal analysis for the low, medium, and high initial dioxin categories were 31.9, 34.8, and 39.1. For the maximal cohort, the corresponding mean scores were 32.2, 33.2, and 38.1, respectively.

The adjustment for covariate information did not change the significance of the positive association between initial dioxin and the schizotypal score for either the minimal or the maximal cohort analysis (Table 9-43 [c] and [d]: $p<0.001$ and $p=0.001$).

Model 2: Ranch Hands - Log_2 (Current Dioxin) and Time

In the unadjusted analysis of the MCMI schizotypal score with current dioxin and time since tour under the minimal assumption, the interaction between current dioxin and time was not significant (Table 9-43 [e]: $p=0.264$). A significant positive association between current dioxin and the schizotypal score was found for Ranch Hands with time over 18.6 years ($p<0.001$). The unadjusted mean scores for this time stratum became larger for increasing levels of current dioxin (low, 33.6; medium, 34.7; high, 41.8).

Under the maximal assumption, the unadjusted analysis detected a nonsignificant current dioxin-by-time since tour interaction (Table 9-43 [f]: $p=0.290$). Thus, the positive relationships between current dioxin and the schizotypal score did not differ significantly for the two time strata. Within each time stratum, there was a significant positive association between current dioxin and the schizotypal score ($\leq$18.6: $p=0.037$; >18.6: $p<0.001$). The unadjusted mean scores for the time less than or equal to 18.6 years stratum for low, medium, and high current dioxin were 31.7, 32.1, and 36.6. The corresponding mean scores for the time over 18.6 years stratum were 32.4, 34.4, and 39.8.

After adjusting for education, both the minimal and the maximal analysis displayed a nonsignificant current dioxin-by-time since tour interaction (Table 9-43 [g] and [h]: $p=0.296$ and $p=0.225$, respectively). Under both the minimal and the maximal assumptions, there was a significant positive association between current dioxin and the MCMI schizotypal score for Ranch Hands with time over 18.6 years ($p=0.002$ for both analyses).

Model 3: Ranch Hands and Comparisons by Current Dioxin Category

In the analysis of categorized current dioxin, a significant difference was detected among the mean schizotypal scores of the participants in the four current dioxin categories (Table 9-43 [i]: $p=0.003$). The unadjusted mean scores for the background, unknown, low, and high current dioxin categories were 33.9, 31.9, 34.0, and 38.4. The mean schizotypal scores of the Ranch Hands in the unknown and low categories did not differ significantly from the mean score of the background category of Comparisons (unknown versus background: $p=0.114$; low versus background: $p=0.914$). However, the mean schizotypal score for the Ranch Hands in

TABLE 9-43.

Analysis of Schizotypal Score (MCMI)

Ranch Hands - Log_2 (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Mean	Slope (Std. Error)[a]	p-Value
a) Minimal	Low	129	31.9	2.836 (0.667)	<0.001
(n=514)	Medium	256	34.8		
(R^2=0.034)	High	129	39.1		
b) Maximal	Low	182	32.2	2.298 (0.497)	<0.001
(n=732)	Medium	368	33.2		
(R^2=0.028)	High	182	38.1		

Ranch Hands - Log_2 (Initial Dioxin) - Adjusted

Assumption	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
c) Minimal	Low	128	31.8	2.448 (0.670)	<0.001	EDUC (p<0.001)
(n=510)	Medium	254	33.6			
(R^2=0.062)	High	128	37.8			
d) Maximal	Low	181	33.6	1.681 (0.516)	0.001	EDUC (p<0.001)
(n=727)	Medium	365	32.7			
(R^2=0.050)	High	181	36.7			

[a]Slope and standard error based on schizotypal score versus log_2 dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.
Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 9-43. (Continued)

Analysis of Schizotypal Score (MCMI)

Ranch Hands - Log_2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Mean/(n) Current Dioxin Low	Medium	High	Slope (Std. Error)[a]	p-Value
e) Minimal						0.264[b]
(n=514)	≤18.6	31.0	34.6	35.3	1.724 (1.088)	0.114[c]
(R^2=0.036)		(72)	(128)	(53)		
	>18.6	33.6	34.7	41.8	3.296 (0.891)	<0.001[c]
		(56)	(129)	(76)		
f) Maximal						0.290[b]
(n=732)	≤18.6	31.7	32.1	36.6	1.610 (0.771)	0.037[c]
(R^2=0.031)		(105)	(190)	(82)		
	>18.6	32.4	34.4	39.8	2.701 (0.682)	<0.001[c]
		(78)	(175)	(102)		

Ranch Hands - Log_2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Mean/(n) Current Dioxin Low	Medium	High	Adj. Slope (Std. Error)[a]	p-Value	Covariate Remarks
g) Minimal						0.296[b]	EDUC (p<0.001)
(n=510)	≤18.6	30.7	33.5	34.0	1.397 (1.081)	0.197[c]	
(R^2=0.064)		(71)	(127)	(53)			
	>18.6	33.8	33.4	40.5	2.855 (0.893)	0.002[c]	
		(56)	(128)	(75)			
h) Maximal						0.225[b]	EDUC (p<0.001)
(n=727)	≤18.6	33.0	31.6	35.4	0.904 (0.784)	0.250[c]	
(R^2=0.054)		(105)	(187)	(82)			
	>18.6	33.3	34.1	38.2	2.148 (0.691)	0.002[c]	
		(78)	(174)	(101)			

[a]Slope and standard error based on schizotypal score versus log_2 dioxin.

[b]Test of significance for homogeneity of slopes (current dioxin continuous, time categorized).

[c]Test of significance for slope equal to 0 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.
Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.