Table 13-23. Analysis of Lactic Dehydrogenase (Discrete) (Continued)

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	27 (9.5)	1.00 (0.85,1.17)	0.989
Medium	285	30 (10.5)		
High	284	22 (7.7)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
847	1.01 (0.84,1.21)	0.892

[a] Relative risk for a twofold increase in 1987 dioxin.

13.2.2.3.14 Cholesterol (Continuous)

The Model 1 unadjusted and adjusted analyses showed no significant association between group and cholesterol (Table 13-24(a,b): p>0.14 for each analysis).

Table 13-24. Analysis of Cholesterol (mg/dl) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***859***	***211.4***	***–0.3 --***	***0.838***
	Comparison	***1,231***	***211.7***		
Officer	Ranch Hand	340	206.2	–3.8 --	0.149
	Comparison	490	210.0		
Enlisted Flyer	Ranch Hand	150	215.0	–1.3 --	0.760
	Comparison	185	216.3		
Enlisted Groundcrew	Ranch Hand	369	214.7	3.0 --	0.239
	Comparison	556	211.8		

[a] Transformed from square root scale.
[b] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on square root scale.
[c] P-value is based on difference of means on square root scale.

Table 13-24. Analysis of Cholesterol (mg/dl) (Continuous) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***854***	***212.3***	***–0.3 --***	***0.850***
	Comparison	***1,229***	***212.6***		
Officer	Ranch Hand	340	206.6	–3.8 --	0.141
	Comparison	489	210.4		
Enlisted Flyer	Ranch Hand	148	215.3	–1.2 --	0.781
	Comparison	184	216.4		
Enlisted Groundcrew	Ranch Hand	366	214.6	3.2 --	0.197
	Comparison	556	211.4		

[a] Transformed from square root scale.
[b] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on square root scale.
[c] P-value is based on difference of means on square root scale.

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[a,b]	R^2	Slope (Std. Error)[c]	p-Value
Low	158	205.9	205.7	0.017	0.129 (0.046)	0.005
Medium	159	215.1	215.1			
High	159	217.9	218.2			

[a] Transformed from square root scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on square root of cholesterol versus log_2 (initial dioxin).
Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	158	209.0	0.044	0.083 (0.054)	0.122
Medium	158	215.9			
High	157	217.4			

[a] Transformed from square root scale.
[b] Slope and standard error based on square root of cholesterol versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

Table 13-24. Analysis of Cholesterol (mg/dl) (Continuous) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[ab]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[c]	p-Value[d]
Comparison	1,194	211.7	211.7		
Background RH	376	209.4	208.8	–2.9 --	0.183
Low RH	236	209.1	209.3	–2.4 --	0.351
High RH	240	216.8	217.4	5.7 --	0.032
Low plus High RH	476	213.0	213.4	1.7 --	0.422

[a] Transformed from square root scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on square root scale.
[d] P-value is based on difference of means on square root scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,193	212.9		
Background RH	374	211.0	–1.9 --	0.392
Low RH	235	210.6	–2.3 --	0.389
High RH	238	217.3	4.4 --	0.115
Low plus High RH	473	214.0	1.1 --	0.616

[a] Transformed from square root scale.
[b] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on square root scale.
[c] P-value is based on difference of means on square root scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	210.9	0.008	0.077 (0.030)	0.009
Medium	285	206.6			
High	284	216.6			

[a] Transformed from square root scale.
[b] Slope and standard error based on square root of cholesterol versus $\log_2$ (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-24. Analysis of Cholesterol (mg/dl) (Continuous) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	214.9	0.023	0.046 (0.034)	0.178
Medium	283	209.6			
High	281	216.8			

[a] Transformed from square root scale.
[b] Slope and standard error based on square root of cholesterol versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

The unadjusted Model 2 analysis revealed a significant positive association between initial dioxin and cholesterol (Table 13-24(c): slope=0.129, p=0.005). After covariate adjustment, the relation became nonsignificant (Table 13-24(d): p=0.122).

A significant difference between Ranch Hands in the high dioxin category and Comparisons was found in the unadjusted Model 3 analysis of cholesterol (Table 13-24(e): difference of means=5.7 mg/dl, p=0.032). The adjusted analysis revealed no significant contrasts (Table 13-24(f): p>0.11 for each contrast).

Model 4 unadjusted analysis results showed a significant association between 1987 dioxin and cholesterol in its continuous form (Table 13-24(g): slope=0.077, p=0.009). The adjusted analysis results were nonsignificant (Table 13-24(h): p=0.178).

13.2.2.3.15 Cholesterol (Discrete)

No significant difference between Ranch Hands and Comparisons was revealed in either the unadjusted or adjusted Model 1 analysis of cholesterol (Table 13-25(a,b): p>0.16 for each contrast).

Table 13-25. Analysis of Cholesterol (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) High	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***859***	***130 (15.1)***	***1.03 (0.81,1.31)***	***0.826***
	Comparison	***1,231***	***182 (14.8)***		
Officer	Ranch Hand	340	39 (11.5)	0.80 (0.53,1.22)	0.310
	Comparison	490	68 (13.9)		
Enlisted Flyer	Ranch Hand	150	22 (14.7)	0.96 (0.53,1.77)	0.905
	Comparison	185	28 (15.1)		
Enlisted Groundcrew	Ranch Hand	369	69 (18.7)	1.26 (0.89,1.78)	0.198
	Comparison	556	86 (15.5)		

Table 13-25. Analysis of Cholesterol (Discrete) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***1.04 (0.82,1.34)***	***0.726***
Officer	0.80 (0.53,1.23)	0.312
Enlisted Flyer	1.00 (0.54,1.83)	0.993
Enlisted Groundcrew	1.28 (0.90,1.82)	0.167

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	158	19 (12.0)	1.21 (1.01,1.45)	0.036
Medium	159	31 (19.5)		
High	159	32 (20.1)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
473	1.23 (0.99,1.52)	0.062

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

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) High	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,194	177 (14.8)		
Background RH	376	48 (12.8)	0.80 (0.56,1.12)	0.195
Low RH	236	34 (14.4)	0.98 (0.66,1.46)	0.915
High RH	240	48 (20.0)	1.51 (1.06,2.16)	0.023
Low plus High RH	476	82 (17.2)	1.22 (0.91,1.63)	0.183

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-25. Analysis of Cholesterol (Discrete) (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,193		
Background RH	374	0.85 (0.60,1.21)	0.379
Low RH	235	1.01 (0.68,1.51)	0.964
High RH	238	1.41 (0.97,2.04)	0.071
Low plus High RH	473	1.19 (0.89,1.60)	0.240

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	40 (14.1)	1.15 (1.02,1.30)	0.025
Medium	285	32 (11.2)		
High	284	58 (20.4)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
847	1.08 (0.93,1.24)	0.312

[a] Relative risk for a twofold increase in 1987 dioxin.

The unadjusted Model 2 analysis found a significant association between cholesterol and initial dioxin (Table 13-25(c): Est. RR=1.21, p=0.036). Similarly, the adjusted Model 2 analysis was marginally significant (Table 13-25(d): Adj. RR=1.23, p=0.062). The percentages of participants with high cholesterol levels in the low, medium, and high initial dioxin categories were 12.0, 19.5, and 20.1, respectively.

The Model 3 unadjusted analysis of cholesterol revealed a significant difference between Ranch Hands in the high dioxin category and Comparisons (Table 13-25(e): Est. RR=1.51, p=0.023) and a marginally significant difference in the adjusted analysis (Table 13-25(f): Adj. RR=1.41, p=0.071). The percentage of Ranch Hands in the high dioxin category was 20.0 versus 14.8 in the Comparison category.

The Model 4 unadjusted analysis showed a significant relation between 1987 dioxin and cholesterol level (Table 13-25(g): Est. RR=1.15, p=0.025). After adjusting for covariates, the results became nonsignificant (Table 13-25(h): p=0.312).

13.2.2.3.16 HDL Cholesterol (Continuous)

The unadjusted Model 1 analysis of HDL cholesterol showed no group difference between Ranch Hands and Comparisons (Table 13-26(a): $p \geq 0.24$ for each analysis). Although the adjusted analysis showed no overall group difference, stratifying by occupation revealed a marginally significant difference between Ranch Hands and Comparisons among the enlisted flyer stratum (Table 13-26(b): difference of means=2.29 mg/dl, p=0.078). The adjusted mean HDL cholesterol level for enlisted flyers in the Ranch Hand group was 47.56 mg/dl versus 45.28 mg/dl for the enlisted flyers in the Comparison group. Models 2 and 3 unadjusted and adjusted analyses showed no significant relations between dioxin and HDL cholesterol (Table 13-26(c–f): $p \geq 0.13$ for each analysis).

The unadjusted Model 4 analysis revealed a significant association between 1987 dioxin and HDL cholesterol (Table 13-26(g): slope=–0.023, $p<0.001$). Similarly, the adjusted Model 4 analysis results were significant (Table 13-26(h): adjusted slope=–0.014, p=0.037). Both analyses showed a decrease in HDL cholesterol levels as 1987 dioxin increased. The adjusted mean HDL cholesterol levels were 49.22 mg/dl, 46.80 mg/dl, and 46.31 mg/dl in the low, medium, and high 1987 dioxin categories, respectively.

Table 13-26. Analysis of HDL Cholesterol (mg/dl) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***858***	***44.97***	***0.13 --***	***0.805***
	Comparison	***1,230***	***44.84***		
Officer	Ranch Hand	340	46.64	–0.04 --	0.965
	Comparison	489	46.68		
Enlisted Flyer	Ranch Hand	149	45.07	1.49 --	0.240
	Comparison	185	43.58		
Enlisted Groundcrew	Ranch Hand	369	43.44	–0.25 --	0.739
	Comparison	556	43.69		

[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.

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***853***	***47.08***	***0.28 --***	***0.600***
	Comparison	***1,228***	***46.81***		
Officer	Ranch Hand	340	48.76	–0.10 --	0.907
	Comparison	488	48.86		
Enlisted Flyer	Ranch Hand	147	47.56	2.29 --	0.078
	Comparison	184	45.28		
Enlisted Groundcrew	Ranch Hand	366	45.68	–0.13 --	0.866
	Comparison	556	45.81		

[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.

Table 13-26. Analysis of HDL Cholesterol (mg/dl) (Continuous) (Continued)

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[ab]	R^2	Slope (Std. Error)[c]	p-Value
Low	157	45.03	44.73	0.053	–0.009 (0.009)	0.312
Medium	159	43.33	43.30			
High	159	43.32	43.64			

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on natural logarithm of HDL cholesterol versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	157	46.09	0.132	0.005 (0.010)	0.625
Medium	158	44.96			
High	157	46.38			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of HDL cholesterol versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[ab]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[c]	p-Value[d]
Comparison	1,193	44.75	44.79		
Background RH	376	46.34	45.54	0.75 --	0.269
Low RH	235	44.98	45.23	0.44 --	0.585
High RH	240	42.83	43.58	–1.21 --	0.130
Low plus High RH	475	43.88	44.39	–0.40 --	0.519

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.
[d] P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-26. Analysis of HDL Cholesterol (mg/dl) (Continuous) (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,192	46.77		
Background RH	374	47.11	0.34 --	0.628
Low RH	234	47.10	0.33 --	0.687
High RH	238	46.77	0.00 --	0.999
Low plus High RH	472	46.93	0.16 --	0.795

[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.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	47.12	0.016	–0.023 (0.006)	<0.001
Medium	284	44.60			
High	284	43.23			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of HDL cholesterol versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	49.22	0.081	–0.014 (0.007)	0.037
Medium	282	46.80			
High	281	46.31			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of HDL cholesterol versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

13.2.2.3.17 HDL Cholesterol (Discrete)

All Model 1 analyses of HDL cholesterol in its discrete form were nonsignificant (Table 13-27(a,b); p>0.42 for each analysis).

The association between initial dioxin and HDL cholesterol examined in the unadjusted Model 2 analysis revealed nonsignificant results (Table 13-27(c): p=0.249). After adjusting for covariates, a significant association was shown (Table 13-27(d): Adj. RR=0.72, p=0.029). The percentages of low HDL cholesterol levels in the low, medium, and high initial dioxin categories were 8.3, 10.1, and 5.7, respectively.

Table 13-27. Analysis of HDL Cholesterol (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Low	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***858***	***71 (8.3)***	***1.14 (0.83,1.58)***	***0.421***
	Comparison	***1,230***	***90 (7.3)***		
Officer	Ranch Hand	340	19 (5.6)	1.15 (0.62,2.13)	0.664
	Comparison	489	24 (4.9)		
Enlisted Flyer	Ranch Hand	149	16 (10.7)	1.12 (0.55,2.27)	0.762
	Comparison	185	18 (9.7)		
Enlisted Groundcrew	Ranch Hand	369	36 (9.8)	1.14 (0.73,1.80)	0.561
	Comparison	556	48 (8.7)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***1.13 (0.81,1.57)***	***0.473***
Officer	1.15 (0.62,2.15)	0.650
Enlisted Flyer	0.98 (0.47,2.04)	0.957
Enlisted Groundcrew	1.18 (0.74,1.87)	0.483

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Low	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	157	13 (8.3)	0.86 (0.66,1.12)	0.249
Medium	159	16 (10.1)		
High	159	9 (5.7)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
472	0.72 (0.53,0.98)	0.029

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

Table 13-27. Analysis of HDL Cholesterol (Discrete) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Low	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,193	88 (7.4)		
Background RH	376	33 (8.8)	1.35 (0.88,2.05)	0.170
Low RH	235	19 (8.1)	1.07 (0.64,1.80)	0.798
High RH	240	19 (7.9)	0.98 (0.58,1.65)	0.937
Low plus High RH	475	38 (8.0)	1.02 (0.69,1.53)	0.910

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,192		
Background RH	374	1.57 (1.00,2.45)	0.049
Low RH	234	1.09 (0.64,1.84)	0.761
High RH	238	0.80 (0.47,1.37)	0.416
Low plus High RH	472	0.93 (0.62,1.40)	0.731

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Low	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	23 (8.1)	0.92 (0.78,1.09)	0.349
Medium	284	27 (9.5)		
High	284	21 (7.4)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
846	0.82 (0.68,0.98)	0.029

[a] Relative risk for a twofold increase in 1987 dioxin.

The unadjusted Model 3 analysis of HDL cholesterol did not show any of the Ranch Hand categories to be significantly different from the Comparison group (Table 13-27(e): $p \geq 0.17$ for all contrasts). In the adjusted analysis, a significant difference between Comparisons and Ranch Hands in the background dioxin category was revealed (Table 13-27(f): Adj. RR=1.57, p=0.049). The percentage of low HDL cholesterol values among Ranch Hands in the background dioxin category was 8.8 percent versus 7.4 percent for Comparisons.

The unadjusted Model 4 analysis showed nonsignificant results (Table 13-27(g): p=0.349). After covariate adjustment, a significant inverse relation between HDL cholesterol and 1987 dioxin level was shown (Table 13-27(h): Adj. RR=0.82, p=0.029). The percentages of low HDL cholesterol values in the low, medium, and high 1987 dioxin categories were 8.1, 9.5, and 7.4, respectively.

13.2.2.3.18 Cholesterol-HDL Ratio (Continuous)

The unadjusted Model 1 analysis of the cholesterol-HDL ratio did not disclose a significant difference between Ranch Hands and Comparisons (Table 13-28(a): $p > 0.15$ for all contrasts). The adjusted analysis showed no significant difference between Ranch Hands and Comparisons combined across all occupations. Stratifying the analysis by occupation revealed a marginally significant group difference for the enlisted flyers (Table 13-28(b): difference of adjusted means=–0.27, p=0.051). Within the enlisted flyer stratum, the mean cholesterol-HDL ratio was lower for the Ranch Hands than for the Comparisons (4.49 versus 4.76).

Table 13-28. Analysis of Cholesterol-HDL Ratio (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***858***	***4.66***	***–0.02 --***	***0.723***
	Comparison	***1,230***	***4.68***		
Officer	Ranch Hand	340	4.39	–0.07 --	0.425
	Comparison	489	4.46		
Enlisted Flyer	Ranch Hand	149	4.72	–0.21 --	0.155
	Comparison	185	4.93		
Enlisted Groundcrew	Ranch Hand	369	4.90	0.10 --	0.282
	Comparison	556	4.81		

[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.

Table 13-28. Analysis of Cholesterol-HDL Ratio (Continuous) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	*Ranch Hand*	*853*	*4.48*	*–0.03 --*	*0.546*
	Comparison	*1,228*	*4.51*		
Officer	Ranch Hand	340	4.21	–0.06 --	0.446
	Comparison	488	4.27		
Enlisted Flyer	Ranch Hand	147	4.49	–0.27 --	0.051
	Comparison	184	4.76		
Enlisted Groundcrew	Ranch Hand	366	4.67	0.08 --	0.316
	Comparison	556	4.58		

[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.

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[ab]	R^2	Slope (Std. Error)[c]	p-Value
Low	157	4.52	4.55	0.055	0.028 (0.009)	0.003
Medium	159	4.92	4.93			
High	159	4.99	4.96			

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on natural logarithm of cholesterol-HDL ratio versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	157	4.49	0.118	0.007 (0.011)	0.499
Medium	158	4.77			
High	157	4.66			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of cholesterol-HDL ratio versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

Table 13-28. Analysis of Cholesterol-HDL Ratio (Continuous) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[ab]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[c]	p-Value[d]
Comparison	1,193	4.69	4.69		
Background RH	376	4.49	4.55	–0.14 --	0.068
Low RH	235	4.60	4.58	–0.11 --	0.220
High RH	240	5.02	4.95	0.26 --	0.005
Low plus High RH	475	4.81	4.76	0.07 --	0.282

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.
[d] P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,192	4.52		
Background RH	374	4.45	–0.07 --	0.352
Low RH	234	4.43	–0.09 --	0.289
High RH	238	4.61	0.09 --	0.290
Low plus High RH	472	4.52	0.00 --	0.978

[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.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	4.44	0.030	0.033 (0.007)	<0.001
Medium	284	4.59			
High	284	4.97			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of cholesterol-HDL ratio versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-28. Analysis of Cholesterol-HDL Ratio (Continuous) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	4.34	0.074	0.021 (0.007)	0.006
Medium	282	4.44			
High	281	4.65			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of cholesterol-HDL ratio versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

A significant association between initial dioxin and the cholesterol-HDL ratio was seen in the Model 2 unadjusted analysis (Table 13-28(c): slope=0.028, p=0.003). The adjusted analysis results were nonsignificant (Table 13-28(d): p=0.499).

The unadjusted Model 3 analysis revealed significant differences between Ranch Hands in the background category and Comparisons, as well as between Ranch Hands in the high dioxin category and Comparisons (Table 13-28(e): difference of means=–0.14, p=0.068; difference of means=0.26, p=0.005, respectively). The adjusted Model 3 analysis did not show any of the Ranch Hand categories to be significantly different from the Comparison group (Table 13-28(f): p>0.28 for each analysis).

Both the unadjusted and adjusted Model 4 analyses revealed significant positive associations between 1987 dioxin and the cholesterol-HDL ratio (Table 13-28(g,h): slope=0.033, p<0.001, for unadjusted analysis; adjusted slope=0.021, p=0.006, for adjusted analysis). The mean cholesterol-HDL ratio values after covariate adjustment in the low, medium, and high 1987 dioxin categories were 4.34, 4.44, and 4.65, respectively.

13.2.2.3.19 Cholesterol-HDL Ratio (Discrete)

The unadjusted Model 1 analysis of the cholesterol-HDL ratio in its dichotomized form did not reveal a significant difference between Ranch Hands and Comparisons overall or stratified by occupation (Table 13-29(a): p>0.13 for all unadjusted contrasts). No significant overall group difference was found between all Ranch Hands and Comparisons in the adjusted analysis. After stratifying the adjusted analysis by occupation, a marginally significant group difference among the enlisted flyers was revealed (Table 13-29(b): Adj. RR=0.67, p=0.075). The percentage of Ranch Hand enlisted flyers with high cholesterol-HDL ratios was 38.9 percent versus 47.0 percent for Comparison enlisted flyers.

Table 13-29. Analysis of Cholesterol-HDL Ratio (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) High	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***858***	***356 (41.5)***	***1.02 (0.85,1.22)***	***0.843***
	Comparison	***1,230***	***505 (41.1)***		
Officer	Ranch Hand	340	114 (33.5)	1.08 (0.80,1.45)	0.623
	Comparison	489	156 (31.9)		
Enlisted Flyer	Ranch Hand	149	58 (38.9)	0.72 (0.46,1.11)	0.138
	Comparison	185	87 (47.0)		
Enlisted Groundcrew	Ranch Hand	369	184 (49.9)	1.12 (0.86,1.45)	0.414
	Comparison	556	262 (47.1)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***1.01 (0.85,1.22)***	***0.878***
Officer	1.09 (0.81,1.47)	0.563
Enlisted Flyer	0.67 (0.43,1.04)	0.075
Enlisted Groundcrew	1.11 (0.85,1.45)	0.436

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	157	54 (34.4)	1.25 (1.09,1.45)	0.002
Medium	159	77 (48.4)		
High	159	85 (53.5)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
472	1.08 (0.91,1.28)	0.378

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

Table 13-29. Analysis of Cholesterol-HDL Ratio (Discrete) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) High	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,193	492 (41.2)		
Background RH	376	136 (36.2)	0.88 (0.69,1.13)	0.321
Low RH	235	86 (36.6)	0.80 (0.60,1.07)	0.135
High RH	240	130 (54.2)	1.57 (1.18,2.08)	0.002
Low plus High RH	475	216 (45.5)	1.12 (0.90,1.40)	0.295

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,192		
Background RH	374	1.00 (0.77,1.28)	0.982
Low RH	234	0.83 (0.61,1.12)	0.221
High RH	238	1.26 (0.93,1.69)	0.133
Low plus High RH	472	1.02 (0.82,1.28)	0.849

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < lnitial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	104 (36.7)	1.22 (1.11,1.34)	<0.001
Medium	284	98 (34.5)		
High	284	150 (52.8)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-29. Analysis of Cholesterol-HDL Ratio (Discrete) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED		
Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
846	1.13 (1.01,1.26)	0.025

[a] Relative risk for a twofold increase in 1987 dioxin.

A significant positive association between the cholesterol-HDL ratio and initial dioxin was shown in the unadjusted Model 2 analysis (Table 13-29(c): Est. RR=1.25, p=0.002). After adjustment for covariates, the analysis results were nonsignificant (Table 13-29(d): p=0.378).

The Model 3 unadjusted analysis of the cholesterol-HDL ratio revealed a significant difference between Ranch Hands in the high dioxin category and Comparisons (Table 13-29(e): Est. RR=1.57, p=0.002). All contrasts between the Ranch Hand categories and Comparisons were nonsignificant in the adjusted analysis (Table 13-29(f): p>0.13 for each contrast).

The unadjusted and adjusted Model 4 analyses each revealed a significant relation between 1987 dioxin and cholesterol-HDL ratio (Table 13-29(g,h): Est. RR=1.22, p<0.001, for the unadjusted analysis; Adj. RR=1.13, p=0.025, for the adjusted analysis). The percentages of participants with high cholesterol-HDL ratios in the low, medium, and high 1987 dioxin categories were 36.7, 34.5, and 52.8, respectively.

13.2.2.3.20 Triglycerides (Continuous)

No significant associations with dioxin were shown in all Model 1 and 2 analyses (Table 13-30(a–d): p>0.10 for each analysis).

The unadjusted Model 3 analysis showed a significant difference between Ranch Hands in the high dioxin category and Comparisons, as well as between Ranch Hands in the low and high dioxin categories combined and Comparisons (Table 13-30(e): difference of means=20.1 mg/dl, p<0.001; difference of means=9.4 mg/dl, p=0.023, respectively).

Table 13-30. Analysis of Triglycerides (mg/dl) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED					
Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***858***	***122.8***	***2.1 --***	***0.539***
	Comparison	***1,231***	***120.7***		
Officer	Ranch Hand	339	114.9	3.2 --	0.523
	Comparison	490	111.7		
Enlisted Flyer	Ranch Hand	150	123.9	–13.8 --	0.122
	Comparison	185	137.7		
Enlisted Groundcrew	Ranch Hand	369	130.0	6.4 --	0.230
	Comparison	556	123.6		

[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.

Table 13-30. Analysis of Triglycerides (mg/dl) (Continuous) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	*Ranch Hand*	*853*	*107.4*	*1.8 --*	*0.546*
	Comparison	*1,229*	*105.6*		
Officer	Ranch Hand	339	100.3	3.2 --	0.458
	Comparison	489	97.1		
Enlisted Flyer	Ranch Hand	148	107.0	–12.4 --	0.109
	Comparison	184	119.5		
Enlisted Groundcrew	Ranch Hand	366	110.5	5.3 --	0.239
	Comparison	556	105.2		

[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.

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[ab]	R^2	Slope (Std. Error)[c]	p-Value
Low	158	117.3	118.6	0.025	0.033 (0.023)	0.140
Medium	159	141.9	142.0			
High	159	141.0	139.4			

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on natural logarithm of triglycerides versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	158	106.9	0.055	0.006 (0.027)	0.830
Medium	158	123.9			
High	157	118.4			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of triglycerides versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

Table 13-30. Analysis of Triglycerides (mg/dl) (Continuous) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[a,b]	Difference of Adj. Mean vs. Comparisons (95% C.L.)[c]	p-Value[d]
Comparison	1,194	120.6	120.3		
Background RH	375	110.3	114.5	–5.8 --	0.172
Low RH	236	121.0	119.7	–0.6 --	0.897
High RH	240	145.8	140.4	20.1 --	<0.001
Low plus High RH	476	132.9	129.7	9.4 --	0.023

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.
[d] P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,193	105.9		
Background RH	373	103.2	–2.7 --	0.483
Low RH	235	107.0	1.1 --	0.820
High RH	238	118.2	12.3 --	0.013
Low plus High RH	473	112.5	6.6 --	0.070

[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.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	282	109.2	0.028	0.072 (0.015)	<0.001
Medium	285	118.3			
High	284	141.9			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of triglycerides versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-30. Analysis of Triglycerides (mg/dl) (Continuous) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	282	96.3	0.041	0.063 (0.017)	<0.001
Medium	283	105.7			
High	281	122.9			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of triglycerides versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

The adjusted Model 3 analysis of triglycerides revealed the same two significant contrasts: Ranch Hands in the high dioxin category versus Comparisons (Table 13-30(f): difference of adjusted means=12.3 mg/dl, p=0.013) and Ranch Hands in the low and high dioxin categories combined versus Comparisons (difference of adjusted means=6.6 mg/dl, p=0.070). The adjusted mean levels of triglycerides for Ranch Hands in the high dioxin category, Ranch Hands in the low and high dioxin categories combined, and Comparisons were 118.2 mg/dl, 112.5 mg/dl, and 105.9 mg/dl, respectively.

The Model 4 unadjusted and adjusted analyses both showed significant relations between 1987 dioxin and triglycerides (Table 13-30(g,h): slope=0.072, p<0.001, for the unadjusted analysis; adjusted slope=0.063, p<0.001, for the adjusted analysis). The adjusted mean triglyceride levels in the low, medium, and high 1987 dioxin categories were 96.3 mg/dl, 105.7 mg/dl, and 122.9 mg/dl, respectively.

13.2.2.3.21 Triglycerides (Discrete)

The unadjusted and adjusted Model 1 analyses of triglycerides in their discrete form showed no overall group differences (Table 13-31(a,b): p>0.31 for each analysis). After stratifying by occupation, significant group differences were noted within the enlisted groundcrew stratum for both the unadjusted and adjusted analyses (Table 13-31(a,b): Est. RR=1.36, p=0.052; Adj. RR=1.37, p=0.047, respectively). Among the enlisted groundcrew, 26.6 percent of the Ranch Hands had high triglyceride levels versus 21.0 percent of the Comparisons.

Table 13-31. Analysis of Triglycerides (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) High	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***858***	***188 (21.9)***	***1.10 (0.89,1.36)***	***0.377***
	Comparison	***1,231***	***250 (20.3)***		
Officer	Ranch Hand	339	60 (17.7)	1.07 (0.74,1.54)	0.717
	Comparison	490	82 (16.7)		
Enlisted Flyer	Ranch Hand	150	30 (20.0)	0.66 (0.39,1.10)	0.109
	Comparison	185	51 (27.6)		
Enlisted Groundcrew	Ranch Hand	369	98 (26.6)	1.36 (1.00,1.85)	0.052
	Comparison	556	117 (21.0)		

Table 13-31. Analysis of Triglycerides (Discrete) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***1.12 (0.90,1.39)***	***0.318***
Officer	1.10 (0.76,1.58)	0.628
Enlisted Flyer	0.66 (0.39,1.12)	0.123
Enlisted Groundcrew	1.37 (1.00,1.88)	0.047

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	158	37 (23.4)	1.09 (0.94,1.27)	0.275
Medium	159	45 (28.3)		
High	159	49 (30.8)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
473	0.96 (0.80,1.15)	0.690

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

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) High	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,194	240 (20.1)		
Background RH	375	53 (14.1)	0.72 (0.52,1.00)	0.051
Low RH	236	54 (22.9)	1.15 (0.82,1.62)	0.411
High RH	240	77 (32.1)	1.74 (1.27,2.37)	<0.001
Low plus High RH	476	131 (27.5)	1.42 (1.10,1.82)	0.006

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-31. Analysis of Triglycerides (Discrete) (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,193		
Background RH	373	0.79 (0.56,1.10)	0.161
Low RH	235	1.24 (0.88,1.76)	0.215
High RH	238	1.55 (1.12,2.15)	0.009
Low plus High RH	473	1.39 (1.07,1.80)	0.012

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	282	41 (14.5)	1.29 (1.16,1.44)	<0.001
Medium	285	58 (20.4)		
High	284	85 (29.9)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
846	1.23 (1.09,1.40)	0.001

[a] Relative risk for a twofold increase in 1987 dioxin.

The Model 2 unadjusted and adjusted analyses showed no significant association between initial dioxin and triglycerides (Table 13-31(c,d): p>0.27 for each analysis). The unadjusted Model 3 analysis of triglycerides revealed Ranch Hands in the background dioxin category, Ranch Hands in the high dioxin category, and Ranch Hands in the low and high dioxin categories combined each to be significantly different from the Comparisons (Table 13-31(e): Est. RR=0.72, p=0.051, for the background dioxin category contrast; Est. RR=1.74, p<0.001, for the high dioxin category contrast; and Est. RR=1.42, p=0.006, for the low and high dioxin categories combined contrast). The adjusted Model 3 analysis showed a significant difference between Ranch Hands in the high dioxin category and Comparisons (Table 13-31(f): Adj. RR=1.55, p=0.009), as well as a significant difference between Ranch Hands in the low and high dioxin categories combined and Comparisons (Adj. RR=1.39, p=0.012). The percentages of individuals with high triglyceride levels among Ranch Hands in the high dioxin category, Ranch Hands in the low and high dioxin categories combined, and Comparisons were 32.1, 27.5, and 20.1, respectively.

The unadjusted and adjusted Model 4 analyses each revealed a significant association between triglycerides and 1987 dioxin levels (Table 13-31(g,h): Est. RR=1.29, p<0.001, for the unadjusted analysis; Adj. RR=1.23, p=0.001, for the adjusted analysis). The percentages of participants with high levels of triglycerides in the low, medium, and high 1987 dioxin categories were 14.5, 20.4, and 29.9, respectively.

13.2.2.3.22 Creatine Phosphokinase (Continuous)

All unadjusted and adjusted analyses in Models 1 through 3 showed no significant associations between dioxin and creatine phosphokinase (Table 13-32(a–f): p>0.50 for each analysis).

Table 13-32. Analysis of Creatine Phosphokinase (U/l) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***859***	***106.3***	***0.8 --***	***0.791***
	Comparison	***1,231***	***105.5***		
Officer	Ranch Hand	340	105.8	1.4 --	0.748
	Comparison	490	104.3		
Enlisted Flyer	Ranch Hand	150	97.2	–3.8 --	0.562
	Comparison	185	101.0		
Enlisted Groundcrew	Ranch Hand	369	110.8	2.6 --	0.565
	Comparison	556	108.2		

[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.

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***854***	***140.3***	***0.9 --***	***0.809***
	Comparison	***1,229***	***139.4***		
Officer	Ranch Hand	340	147.7	2.4 --	0.696
	Comparison	489	145.3		
Enlisted Flyer	Ranch Hand	148	131.5	–4.9 --	0.568
	Comparison	184	136.4		
Enlisted Groundcrew	Ranch Hand	366	140.2	1.8 --	0.736
	Comparison	556	138.3		

[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.

Table 13-32. Analysis of Creatine Phosphokinase (U/l) (Continuous) (Continued)

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[ab]	R^2	Slope (Std. Error)[c]	p-Value
Low	158	111.8	112.7	0.013	0.005 (0.021)	0.800
Medium	159	104.0	104.1			
High	159	112.0	111.1			

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on natural logarithm of creatine phosphokinase versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	158	149.8	0.121	–0.004 (0.023)	0.871
Medium	158	139.9			
High	157	143.6			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of creatine phosphokinase versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[ab]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[c]	p-Value[d]
Comparison	1,194	105.6	105.4		
Background RH	376	102.7	105.6	0.2 --	0.961
Low RH	236	109.1	108.2	2.8 --	0.547
High RH	240	109.3	106.3	0.9 --	0.843
Low plus High RH	476	109.2	107.2	1.8 --	0.602

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.
[d] P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-32. Analysis of Creatine Phosphokinase (U/l) (Continuous) (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,193	140.2		
Background RH	374	139.5	–0.7 --	0.889
Low RH	235	142.6	2.4 --	0.679
High RH	238	143.8	3.6 --	0.549
Low plus High RH	473	143.2	3.0 --	0.503

[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.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	99.8	0.004	0.024 (0.014)	0.084
Medium	285	110.6			
High	284	108.7			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of creatine phosphokinase versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	126.6	0.091	0.039 (0.015)	0.011
Medium	283	141.1			
High	281	143.2			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of creatine phosphokinase versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

The unadjusted and adjusted Model 4 analyses each showed a positive relation between 1987 dioxin and creatine phosphokinase, with the unadjusted slope marginally significant and the adjusted slope significant (Table 13-32(g,h): slope=0.024, p=0.084; adjusted slope=0.039, p=0.011). The adjusted mean creatine phosphokinase levels in the low, medium, and high 1987 dioxin categories were 126.6 U/l, 141.1 U/l, and 143.2 U/l, respectively.

13.2.2.3.23 Creatine Phosphokinase (Discrete)

All analyses of high creatine phosphokinase levels in Models 1 through 3 were nonsignificant (Table 13-33(a–f): p≥0.21 for each analysis).

Table 13-33. Analysis of Creatine Phosphokinase (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) High	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***859***	***72 (8.4)***	***0.89 (0.65,1.21)***	***0.448***
	Comparison	***1,231***	***115 (9.3)***		
Officer	Ranch Hand	340	26 (7.6)	0.84 (0.51,1.39)	0.497
	Comparison	490	44 (9.0)		
Enlisted Flyer	Ranch Hand	150	7 (4.7)	0.55 (0.22,1.40)	0.212
	Comparison	185	15 (8.1)		
Enlisted Groundcrew	Ranch Hand	369	39 (10.6)	1.06 (0.69,1.62)	0.807
	Comparison	556	56 (10.1)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.87 (0.63,1.20)***	***0.390***
Officer	0.84 (0.50,1.41)	0.519
Enlisted Flyer	0.55 (0.21,1.41)	0.210
Enlisted Groundcrew	1.00 (0.63,1.58)	0.998

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	158	16 (10.1)	1.05 (0.83,1.32)	0.698
Medium	159	12 (7.5)		
High	159	17 (10.7)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
473	1.09 (0.82,1.45)	0.542

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

Table 13-33. Analysis of Creatine Phosphokinase (Discrete) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) High	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,194	111 (9.3)		
Background RH	376	26 (6.9)	0.81 (0.51,1.26)	0.345
Low RH	236	20 (8.5)	0.87 (0.53,1.44)	0.599
High RH	240	25 (10.4)	1.03 (0.65,1.64)	0.905
Low plus High RH	476	45 (9.5)	0.95 (0.66,1.37)	0.781

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,193		
Background RH	374	0.75 (0.46,1.20)	0.227
Low RH	235	0.80 (0.47,1.35)	0.402
High RH	238	1.20 (0.73,1.98)	0.465
Low plus High RH	473	0.98 (0.67,1.45)	0.923

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	17 (6.0)	1.14 (0.97,1.33)	0.123
Medium	285	26 (9.1)		
High	284	28 (9.9)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
847	1.22 (1.00,1.49)	0.043

[a] Relative risk for a twofold increase in 1987 dioxin.

The unadjusted Model 4 analysis results were nonsignificant (Table 13-33(g): p=0.123). After adjusting for covariates, a significant relation between creatine phosphokinase in its dichotomous form and 1987 dioxin was revealed (Table 13-33(h): Adj. RR=1.22, p=0.043). The percentages of participants with high levels of creatine phosphokinase in the low, medium, and high 1987 dioxin categories were 6.0, 9.1, and 9.9, respectively.

13.2.2.3.24 Serum Amylase (Continuous)

The unadjusted and adjusted Model 1 analyses of serum amylase did not show a significant overall group difference between Ranch Hands and Comparisons (Table 13-34(a,b): p>0.92 for each analysis). Stratifying the analyses by occupation revealed a significant group difference among the officers in both the unadjusted and adjusted analyses (Table 13-34(a,b): difference of means=–2.98 U/l, p=0.048, for the unadjusted analysis; difference of adjusted means=–3.50 U/l, p=0.037, for the adjusted analysis). The adjusted mean serum amylase level among the officers in the Ranch Hand group was 61.86 U/l versus 65.36 U/l among the officers in the Comparison group.

The results from the unadjusted Model 2 analysis revealed a marginally significant inverse association between serum amylase and initial dioxin (Table 13-34(c): slope=–0.024, p=0.070). Similarly, after covariate adjustment, a marginally significant inverse association between serum amylase and initial dioxin was present (Table 13-34(d): adjusted slope=–0.029, p=0.060). The adjusted mean serum amylase levels in the low, medium, and high initial dioxin categories were 67:45 U/l, 64.22 U/l, and 64.25 U/l, respectively.

Table 13-34. Analysis of Serum Amylase (U/l) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Mean[a]	Difference of Means (95% C.I.)[b]	p-Value[c]
All	***Ranch Hand***	***859***	***56.92***	***0.07 --***	***0.942***
	Comparison	***1,231***	***56.85***		
Officer	Ranch Hand	340	54.88	–2.98 --	0.048
	Comparison	490	57.86		
Enlisted Flyer	Ranch Hand	150	58.46	2.55 --	0.284
	Comparison	185	55.91		
Enlisted Groundcrew	Ranch Hand	369	58.23	1.95 --	0.182
	Comparison	556	56.29		

[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.

Table 13-34. Analysis of Serum Amylase (U/l) (Continuous) (Continued)

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Group	n	Adj. Mean[a]	Difference of Adj. Means (95% C.I.)[b]	p-Value[c]
All	*Ranch Hand*	*854*	*63.65*	*–0.09 --*	*0.929*
	Comparison	*1,229*	*63.74*		
Officer	Ranch Hand	340	61.86	–3.50 --	0.037
	Comparison	489	65.36		
Enlisted Flyer	Ranch Hand	148	65.17	2.73 --	0.301
	Comparison	184	62.44		
Enlisted Groundcrew	Ranch Hand	366	64.84	1.98 --	0.218
	Comparison	556	62.86		

[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.

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)[b]		
Initial Dioxin	n	Mean[a]	Adj. Mean[ab]	R^2	Slope (Std. Error)[c]	p-Value
Low	158	59.22	58.66	0.052	–0.024 (0.013)	0.070
Medium	159	55.89	55.83			
High	159	55.54	56.13			

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Slope and standard error based on natural logarithm of serum amylase versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean[a]	R^2	Adj. Slope (Std. Error)[b]	p-Value
Low	158	67.45	0.125	–0.029 (0.015)	0.060
Medium	158	64.22			
High	157	64.25			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of serum amylase versus log_2 (initial dioxin).

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

Table 13-34. Analysis of Serum Amylase (U/l) (Continuous) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean[a]	Adj. Mean[ab]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[c]	p-Value[d]
Comparison	1,194	56.82	56.88		
Background RH	376	57.03	55.87	−1.01 --	0.419
Low RH	236	60.17	60.54	3.66 --	0.019
High RH	240	53.78	54.89	−1.99 --	0.178
Low plus High RH	476	56.86	57.63	0.75 --	0.523

[a] Transformed from natural logarithm scale.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.
[d] P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)[b]	p-Value[c]
Comparison	1,193	63.45		
Background RH	374	62.33	−1.12 --	0.427
Low RH	235	66.45	3.00 --	0.078
High RH	238	61.31	−2.14 --	0.205
Low plus High RH	473	63.82	0.37 --	0.774

[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.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-34. Analysis of Serum Amylase (U/l) (Continuous) (Continued)

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	57.84	0.005	–0.019 (0.009)	0.035
Medium	285	57.77			
High	284	55.23			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of serum amylase versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean[a]	R^2	Adjusted Slope (Std. Error)[b]	p-Value
Low	283	68.24	0.063	–0.030 (0.010)	0.003
Medium	283	66.40			
High	281	62.16			

[a] Transformed from natural logarithm scale.
[b] Slope and standard error based on natural logarithm of serum amylase versus log_2 (1987 dioxin + 1).

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

The unadjusted Model 3 analysis revealed a significant difference in mean serum amylase levels between Ranch Hands in the low dioxin category and Comparisons (Table 13-34(e): difference of means=3.66 U/l, p=0.019). The adjusted results showed a marginally significant difference between Ranch Hands in the low dioxin category and Comparisons (Table 13-34(f): difference of adjusted means=3.00 U/l, p=0.078). The adjusted mean serum amylase level for Ranch Hands in the low dioxin category was 66.45 U/l versus 63.45 U/l for Comparisons.

Both the unadjusted and adjusted Model 4 analyses showed serum amylase to be significantly inversely associated with 1987 dioxin (Table 13-34(g,h): slope=–0.019, p=0.035; adjusted slope=–0.030, p=0.003). The adjusted mean serum amylase levels in the low, medium, and high 1987 dioxin categories were 68.24 U/l, 66.40 U/l, and 62.16 U/l, respectively.

13.2.2.3.25 Serum Amylase (Discrete)

The unadjusted and adjusted Model 1 analyses revealed no significant overall group difference in the percentage of individuals with high serum amylase levels (Table 13-35(a,b): p>0.73 for each analysis). In both the unadjusted and adjusted analyses, stratifying by occupation revealed marginally significant reduction in risk among the Ranch Hand officers (Table 13-35(a,b): Est. RR=0.45, p=0.067, for the unadjusted analysis; Adj. RR=0.43, p=0.058, for the adjusted analysis). Among the officers in the Ranch Hand group, 2.1 percent had high serum amylase levels versus 4.5 percent of officers in the Comparison group. All analyses of Models 2, 3, and 4 showed no significant associations between serum amylase and dioxin (Table 13-35(c–h): p>0.11 for each analysis).

Table 13-35. Analysis of Serum Amylase (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) High	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***859***	***25 (2.9)***	***0.94 (0.56,1.57)***	***0.816***
	Comparison	***1,231***	***38 (3.1)***		
Officer	Ranch Hand	340	7 (2.1)	0.45 (0.19,1.06)	0.067
	Comparison	490	22 (4.5)		
Enlisted Flyer	Ranch Hand	150	4 (2.7)	1.66 (0.37,7.54)	0.510
	Comparison	185	3 (1.6)		
Enlisted Groundcrew	Ranch Hand	369	14 (3.8)	1.65 (0.77,3.55)	0.202
	Comparison	556	13 (2.3)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.91 (0.54,1.54)***	***0.733***
Officer	0.43 (0.18,1.03)	0.058
Enlisted Flyer	1.66 (0.36,7.69)	0.514
Enlisted Groundcrew	1.60 (0.73,3.50)	0.240

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	158	7 (4.4)	0.86 (0.58,1.29)	0.458
Medium	159	5 (3.1)		
High	159	5 (3.1)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
473	1.04 (0.63,1.71)	0.884

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

Table 13-35. Analysis of Serum Amylase (Discrete) (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) High	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,194	38 (3.2)		
Background RH	376	8 (2.1)	0.61 (0.28,1.32)	0.210
Low RH	236	11 (4.7)	1.51 (0.76,3.01)	0.236
High RH	240	6 (2.5)	0.84 (0.35,2.02)	0.697
Low plus High RH	476	17 (3.6)	1.13 (0.62,2.06)	0.701

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,193		
Background RH	374	0.53 (0.24,1.16)	0.112
Low RH	235	1.37 (0.67,2.77)	0.387
High RH	238	1.02 (0.41,2.59)	0.959
Low plus High RH	473	1.18 (0.63,2.21)	0.602

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) High	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	283	7 (2.5)	0.93 (0.70,1.22)	0.590
Medium	285	10 (3.5)		
High	284	8 (2.8)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-35. Analysis of Serum Amylase (Discrete) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
847	0.93 (0.68,1.26)	0.623

[a] Relative risk for a twofold increase in 1987 dioxin.

13.2.2.3.26 Antibodies for Hepatitis A

All unadjusted and adjusted analyses in Models 1 through 4 showed no significant associations between dioxin and the presence of antibodies for hepatitis A (Table 13-36(a–h): p>0.12 for each analysis).

Table 13-36. Analysis of Antibodies for Hepatitis A

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***870***	***283 (32.5)***	***0.95 (0.79,1.14)***	***0.580***
	Comparison	***1,250***	***421 (33.7)***		
Officer	Ranch Hand	341	92 (27.0)	1.00 (0.73,1.36)	0.999
	Comparison	493	133 (27.0)		
Enlisted Flyer	Ranch Hand	151	74 (49.0)	1.13 (0.73,1.73)	0.581
	Comparison	187	86 (46.0)		
Enlisted Groundcrew	Ranch Hand	378	117 (31.0)	0.82 (0.62,1.08)	0.153
	Comparison	570	202 (35.4)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.93 (0.76,1.12)***	***0.434***
Officer	0.95 (0.68,1.31)	0.739
Enlisted Flyer	1.07 (0.69,1.68)	0.754
Enlisted Groundcrew	0.85 (0.64,1.14)	0.285

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	160	57 (35.6)	0.98 (0.85,1.14)	0.830
Medium	162	54 (33.3)		
High	160	57 (35.6)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

Table 13-36. Analysis of Antibodies for Hepatitis A (Continued)

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
479	1.02 (0.86,1.22)	0.813

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

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,212	405 (33.4)		
Background RH	381	112 (29.4)	0.84 (0.65,1.08)	0.175
Low RH	239	84 (35.1)	1.08 (0.80,1.44)	0.619
High RH	243	84 (34.6)	1.04 (0.78,1.39)	0.784
Low plus High RH	482	168 (34.9)	1.06 (0.85,1.32)	0.615

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,211		
Background RH	378	0.92 (0.70,1.21)	0.561
Low RH	238	0.92 (0.67,1.25)	0.577
High RH	241	0.96 (0.70,1.32)	0.787
Low plus High RH	479	0.94 (0.74,1.19)	0.588

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	288	81 (28.1)	1.08 (0.98,1.19)	0.125
Medium	287	103 (35.9)		
High	288	96 (33.3)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-36. Analysis of Antibodies for Hepatitis A (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
857	1.06 (0.94,1.19)	0.346

[a] Relative risk for a twofold increase in 1987 dioxin.

13.2.2.3.27 Evidence of Prior Hepatitis B

The unadjusted Model 1 analysis of serological evidence of prior hepatitis B revealed a significant overall group difference between Ranch Hands and Comparisons (Table 13-37(a): Est. RR=0.62, p=0.001). After stratifying by occupation, a significant difference between Ranch Hands and Comparisons was seen within each occupational stratum (Table 13-37(a): Est. RR=0.49, p=0.031, for officers; Est. RR=0.58, p=0.079, for enlisted flyers; and Est. RR=0.66, p=0.035, for enlisted groundcrew). In each stratum, the percentage of participants with evidence of prior hepatitis B was greater for Comparisons than for Ranch Hands.

Table 13-37. Analysis of Evidence of Prior Hepatitis B

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***869***	***77 (8.9)***	***0.62 (0.46,0.82)***	***0.001***
	Comparison	***1,249***	***170 (13.6)***		
Officer	Ranch Hand	340	13 (3.8)	0.49 (0.26,0.94)	0.031
	Comparison	494	37 (7.5)		
Enlisted Flyer	Ranch Hand	151	19 (12.6)	0.58 (0.32,1.06)	0.079
	Comparison	187	37 (19.8)		
Enlisted	Ranch Hand	378	45 (11.9)	0.66 (0.45,0.97)	0.035
Groundcrew	Comparison	568	96 (16.9)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.59 (0.44,0.80)***	***<0.001***
Officer	0.47 (0.25,0.91)	0.024
Enlisted Flyer	0.58 (0.31,1.07)	0.079
Enlisted Groundcrew	0.66 (0.44,0.97)	0.035

Table 13-37. Analysis of Evidence of Prior Hepatitis B (Continued)

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	159	17 (10.7)	1.06 (0.86,1.31)	0.588
Medium	162	14 (8.6)		
High	160	22 (13.8)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
478	0.95 (0.74,1.22)	0.669

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

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,211	166 (13.7)		
Background RH	381	23 (6.0)	0.42 (0.27,0.66)	<0.001
Low RH	238	26 (10.9)	0.76 (0.49,1.18)	0.229
High RH	243	27 (11.1)	0.76 (0.49,1.17)	0.214
Low plus High RH	481	53 (11.0)	0.76 (0.55,1.06)	0.105

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,210		
Background RH	378	0.50 (0.31,0.80)	0.004
Low RH	237	0.71 (0.45,1.12)	0.143
High RH	241	0.59 (0.37,0.92)	0.021
Low plus High RH	478	0.65 (0.46,0.91)	0.012

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-37. Analysis of Evidence of Prior Hepatitis B (Continued)

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	288	14 (4.9)	1.20 (1.03,1.40)	0.023
Medium	286	27 (9.4)		
High	288	35 (12.2)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
856	1.06 (0.89,1.25)	0.531

[a] Relative risk for a twofold increase in 1987 dioxin.

The adjusted Model 1 analysis mirrored the unadjusted analysis. Significant differences were seen between all Ranch Hands and Comparisons (Table 13-37(b): Adj. RR=0.59, p<0.001) and within each occupational stratum (Table 13-37(b): Adj. RR=0.47, p=0.024, for officers; Adj. RR=0.58, p=0.079, for enlisted flyers; and Adj. RR=0.66, p=0.035, for enlisted groundcrew). Both the unadjusted and adjusted Model 2 analyses revealed no relation between prior hepatitis B and initial dioxin (Table 13-37(c,d): p>0.58 for each analysis).

The unadjusted Model 3 analysis revealed a significant difference in prior hepatitis B between Ranch Hands in the background dioxin category and Comparisons (Table 13-37(e): Est. RR=0.42, p<0.001). The adjusted results showed a significant difference between Ranch Hands in the background dioxin category and Comparisons (Table 13-37(f): Adj. RR=0.50, p=0.004), as well as differences between Ranch Hands in the high dioxin category and Comparisons and Ranch Hands in the low and high dioxin categories combined and Comparisons (Table 13-37(f): Adj. RR=0.59, p=0.021; Adj. RR=0.65, p=0.012, respectively). The percentages of participants with evidence of prior hepatitis B were 6.0 in the background dioxin category, 11.1 in the high dioxin category, 11.0 in the low and high dioxin categories combined, and 13.7 in the Comparison category.

The unadjusted Model 4 analysis revealed a significant relation between evidence of prior hepatitis B and 1987 dioxin (Table 13-37(g): Est. RR=1.20, p=0.023). After adjusting for covariates, the relation became nonsignificant (Table 13-37(h): p=0.531).

13.2.2.3.28 Current Hepatitis B

All unadjusted and adjusted analyses of current hepatitis B for Models 1 through 4 were nonsignificant (Table 13-38(a,b): p>0.45 for each analysis).

Table 13-38. Analysis of Current Hepatitis B

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***870***	***1 (0.1)***	***0.72 (0.07,7.94)***	***0.784***
	Comparison	***1,251***	***2 (0.2)***		
Officer	Ranch Hand	341	0 (0.0)	--	--
	Comparison	494	0 (0.0)		
Enlisted Flyer	Ranch Hand	151	0 (0.0)	--	--
	Comparison	187	0 (0.0)		
Enlisted Groundcrew	Ranch Hand	378	1 (0.3)	0.75 (0.07,8.34)	0.817
	Comparison	570	2 (0.4)		

--: Results not presented because of the sparse number of participants with current hepatitis B.

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.56 (0.05,6.93)***	***0.646***
Officer	--	--
Enlisted Flyer	--	--
Enlisted Groundcrew	0.68 (0.06,8.27)	0.762

--: Results not presented because of the sparse number of participants with current hepatitis B.

Note: Results for analysis across all occupational categories are not adjusted for occupation because of the sparse number of participants with current hepatitis B.

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	160	0 (0.0)	0.99 (0.17,5.76)	0.987
Medium	162	1 (0.6)		
High	160	0 (0.0)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
479	0.39 (0.02,9.42)	0.497

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

Note: Results are adjusted only for percent body fat at the time of the blood measurement of dioxin, age, and lifetime alcohol history because of the sparse number of Ranch Hands with current hepatitis B.

Table 13-38. Analysis of Current Hepatitis B (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,213	2 (0.2)		
Background RH	381	0 (0.0)	--	0.999[c]
Low RH	239	1 (0.4)	2.52 (0.23,27.92)	0.453
High RH	243	0 (0.0)	--	0.999[c]
Low plus High RH	482	1 (0.2)	--	0.999[c]

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[c] P-value determined using a chi-square test with continuity correction because of the sparse number of Ranch Hands with current hepatitis B.
--: Results not presented because of the sparse number of Ranch Hands with current hepatitis B.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,212		
Background RH	378	--	--
Low RH	238	1.94 (0.14,26.64)	0.622
High RH	241	--	--
Low plus High RH	479	--	--

[a] Relative risk and confidence interval relative to Comparisons.
--: Results not presented because of the sparse number of Ranch Hands with current hepatitis B.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Results are not adjusted for occupation because of the sparse number of Ranch Hands with current hepatitis B.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	288	0 (0.0)	1.37 (0.41,4.55)	0.617
Medium	287	0 (0.0)		
High	288	1 (0.3)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-38. Analysis of Current Hepatitis B (Continued)

(b) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
857	1.33 (0.27,6.59)[b]	0.719

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Results are not adjusted for race, occupation, industrial chemical exposure, and degreasing chemical exposure because of the sparse number of Ranch Hands with current hepatitis B.

13.2.2.3.29 Antibodies for Hepatitis C

No significant associations were seen between dioxin and hepatitis C for all unadjusted and adjusted analyses in Models 1 through 4 (Table 13-39(a–h): p>0.13).

Table 13-39. Analysis of Antibodies for Hepatitis C

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***870***	***9 (1.0)***	***0.72 (0.32,1.60)***	***0.408***
	Comparison	***1,251***	***18 (1.4)***		
Officer	Ranch Hand	341	1 (0.3)	0.36 (0.04,3.24)	0.362
	Comparison	494	4 (0.8)		
Enlisted Flyer	Ranch Hand	151	1 (0.7)	0.62 (0.06,6.87)	0.694
	Comparison	187	2 (1.1)		
Enlisted Groundcrew	Ranch Hand	378	7 (1.9)	0.88 (0.34,2.25)	0.785
	Comparison	570	12 (2.1)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.63 (0.27,1.47)***	***0.274***
Officer	0.36 (0.04,3.27)	0.367
Enlisted Flyer	0.61 (0.05,6.87)	0.690
Enlisted Groundcrew	0.73 (0.27,1.98)	0.532

Table 13-39. Analysis of Antibodies for Hepatitis C (Continued)

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	160	2 (1.3)	0.61 (0.24,1.60)	0.271
Medium	162	2 (1.2)		
High	160	0 (0.0)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Analysis Results for Log_2 (Initial Dioxin)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
479	0.63 (0.23,1.75)	0.344

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

Note: Results are not adjusted for occupation, industrial chemical exposure, and degreasing chemical exposure because of the sparse number of Ranch Hands with antibodies for hepatitis C.

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,213	17 (1.4)		
Background RH	381	5 (1.3)	0.89 (0.32,2.44)	0.819
Low RH	239	2 (0.8)	0.60 (0.14,2.62)	0.497
High RH	243	2 (0.8)	0.61 (0.14,2.67)	0.512
Low plus High RH	482	4 (0.8)	0.61 (0.20,1.81)	0.369

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-39. Analysis of Antibodies for Hepatitis C (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,212		
Background RH	378	0.87 (0.28,2.73)	0.816
Low RH	238	0.54 (0.12,2.40)	0.415
High RH	241	0.50 (0.11,2.23)	0.359
Low plus High RH	479	0.52 (0.17,1.57)	0.243

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	288	5 (1.7)	0.69 (0.42,1.14)	0.139
Medium	287	2 (0.7)		
High	288	2 (0.7)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

Analysis Results for Log_2 (1987 Dioxin + 1)		
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
857	0.67 (0.40,1.14)	0.141

[a] Relative risk for a twofold increase in 1987 dioxin.

13.2.2.3.30 Antibodies for Hepatitis D

Only one participant had positive results for hepatitis D antibodies. He was a Black Ranch Hand in the enlisted groundcrew occupational stratum. No further analyses were performed.

13.2.2.3.31 Stool Hemoccult

All unadjusted and adjusted analyses of stool hemoccult for Models 1 through 4 were nonsignificant (Table 13-40(a–h): p>0.17 for each analysis).

Table 13-40. Analysis of Stool Hemoccult

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***834***	***29 (3.5)***	***0.78 (0.49,1.23)***	***0.279***
	Comparison	***1,196***	***53 (4.4)***		
Officer	Ranch Hand	332	14 (4.2)	0.92 (0.46,1.83)	0.818
	Comparison	483	22 (4.6)		
Enlisted Flyer	Ranch Hand	147	2 (1.4)	0.34 (0.07,1.65)	0.179
	Comparison	178	7 (3.9)		
Enlisted Groundcrew	Ranch Hand	355	13 (3.7)	0.81 (0.41,1.61)	0.547
	Comparison	535	24 (4.5)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***0.78 (0.49,1.25)***	***0.301***
Officer	0.90 (0.45,1.80)	0.774
Enlisted Flyer	0.34 (0.07,1.70)	0.191
Enlisted Groundcrew	0.82 (0.41,1.64)	0.574

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	156	4 (2.6)	0.85 (0.59,1.24)	0.390
Medium	156	11 (7.1)		
High	152	4 (2.6)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

	Analysis Results for Log_2 (Initial Dioxin)	
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
461	0.97 (0.62,1.51)	0.880

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

Table 13-40. Analysis of Stool Hemoccult (Continued)

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[ab]	p-Value
Comparison	1,162	50 (4.3)		
Background RH	365	10 (2.7)	0.68 (0.34,1.35)	0.270
Low RH	232	11 (4.7)	1.08 (0.55,2.12)	0.814
High RH	232	8 (3.4)	0.74 (0.35,1.59)	0.443
Low plus High RH	464	19 (4.1)	0.90 (0.52,1.55)	0.696

[a] Relative risk and confidence interval relative to Comparisons.
[b] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
Comparison	1,161		
Background RH	363	0.63 (0.31,1.28)	0.201
Low RH	231	1.08 (0.55,2.13)	0.822
High RH	230	0.86 (0.39,1.90)	0.705
Low plus High RH	461	0.96 (0.55,1.68)	0.895

[a] Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	275	8 (2.9)	1.04 (0.81,1.34)	0.760
Medium	280	9 (3.2)		
High	274	12 (4.4)		

[a] Relative risk for a twofold increase in 1987 dioxin.

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

Table 13-40. Analysis of Stool Hemoccult (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED		
	Analysis Results for Log_2 (1987 Dioxin + 1)	
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
824	1.13 (0.83,1.53)	0.448

[a] Relative risk for a twofold increase in 1987 dioxin.

13.2.2.3.32 Prealbumin (Continuous)

The unadjusted and adjusted analyses of prealbumin in its continuous form displayed no significant associations with dioxin in any of Models 1 through 4 (Table 13-41(a–h): p>0.38 for each analysis).

Table 13-41. Analysis of Prealbumin (mg/dl) (Continuous)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED					
Occupational Category	Group	n	Mean	Difference of Means (95% C.I.)	p-Value
All	***Ranch Hand***	***859***	***29.54***	***–0.07 (–0.50,0.37)***	***0.766***
	Comparison	***1,231***	***29.61***		
Officer	Ranch Hand	340	29.65	–0.22 (–0.92,0.47)	0.532
	Comparison	490	29.87		
Enlisted Flyer	Ranch Hand	150	29.56	0.23 (–0.85,1.31)	0.679
	Comparison	185	29.33		
Enlisted Groundcrew	Ranch Hand	369	29.44	–0.03 (–0.70,0.63)	0.922
	Comparison	556	29.48		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED					
Occupational Category	Group	n	Adj. Mean	Difference of Adj. Means (95% C.I.)	p-Value
All	***Ranch Hand***	***854***	***29.66***	***–0.04 (–0.47,0.39)***	***0.861***
	Comparison	***1,229***	***29.70***		
Officer	Ranch Hand	340	30.03	–0.17 (–0.86,0.51)	0.621
	Comparison	489	30.20		
Enlisted Flyer	Ranch Hand	148	30.03	0.48 (–0.59,1.55)	0.382
	Comparison	184	29.55		
Enlisted Groundcrew	Ranch Hand	366	29.10	–0.11 (–0.76,0.54)	0.746
	Comparison	556	29.21		

Table 13-41. Analysis of Prealbumin (mg/dl) (Continuous) (Continued)

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics				Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Mean	Adj. Mean[a]	R^2	Slope (Std. Error)	p-Value
Low	158	29.72	29.61	0.030	–0.041 (0.178)	0.818
Medium	159	28.77	28.76			
High	159	29.83	29.95			

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)		
Initial Dioxin	n	Adj. Mean	R^2	Adj. Slope (Std. Error)	p-Value
Low	158	29.69	0.072	–0.127 (0.207)	0.538
Medium	158	28.68			
High	157	29.77			

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(e) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – UNADJUSTED

Dioxin Category	n	Mean	Adj. Mean[a]	Difference of Adj. Mean vs. Comparisons (95% C.I.)	p-Value
Comparison	1,194	29.61	29.62		
Background RH	376	29.72	29.53	–0.09 (–0.67,0.49)	0.760
Low RH	236	29.41	29.47	–0.15 (–0.85,0.54)	0.665
High RH	240	29.47	29.65	0.03 (–0.66,0.73)	0.927
Low plus High RH	476	29.44	29.56	–0.06 (–0.59,0.47)	0.825

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

Table 13-41. Analysis of Prealbumin (mg/dl) (Continuous) (Continued)

(f) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED

Dioxin Category	n	Adj. Mean	Difference of Adj. Mean vs. Comparisons (95% C.I.)	p-Value
Comparison	1,193	29.65		
Background RH	374	29.51	–0.15 (–0.73,0.44)	0.626
Low RH	235	29.69	0.04 (–0.65,0.73)	0.908
High RH	238	29.72	0.06 (–0.64,0.77)	0.860
Low plus High RH	473	29.71	0.05 (–0.48,0.58)	0.847

Note: RH = Ranch Hand.
Comparison: 1987 Dioxin ≤ 10 ppt.
Background (Ranch Hand): 1987 Dioxin ≤ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 94 ppt.
High (Ranch Hand): 1987 Dioxin > 10 ppt, Initial Dioxin > 94 ppt.

(g) MODEL 4: RANCH HANDS – 1987 DIOXIN – UNADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin +1)		
1987 Dioxin	n	Mean	R^2	Adjusted Slope (Std. Error)	p-Value
Low	283	30.00	<0.001	–0.047 (0.124)	0.704
Medium	285	29.28			
High	284	29.41			

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED

1987 Dioxin Category Summary Statistics			Analysis Results for Log_2 (1987 Dioxin + 1)		
1987 Dioxin	n	Adj. Mean	R^2	Adjusted Slope (Std. Error)	p-Value
Low	283	29.90	0.053	–0.007 (0.140)	0.961
Medium	283	29.43			
High	281	29.35			

Note: Low = ≤7.9 ppt; Medium = >7.9–19.6 ppt; High = >19.6 ppt.

13.2.2.3.33 Prealbumin (Discrete)

The unadjusted and adjusted Model 1 analyses did not disclose a significant overall difference in prealbumin levels between Ranch Hands and Comparisons (Table 13-42(a,b): p>0.13 for each analysis). After stratifying the unadjusted analysis by occupation, a marginally significant difference between Ranch Hands and Comparisons was noted among enlisted groundcrew (Table 13-42(a): Est. RR=3.56, p=0.067). Similarly, the stratified adjusted analysis revealed a significant difference between enlisted groundcrew Ranch Hands and enlisted groundcrew Comparisons (Table 13-42(b): Adj. RR=4.27, p=0.043). The percentage of Ranch Hand enlisted groundcrew with low prealbumin levels was 1.9 percent versus 0.5 percent of Comparison enlisted groundcrew.

Table 13-42. Analysis of Prealbumin (Discrete)

(a) MODEL 1: RANCH HANDS VS. COMPARISONS – UNADJUSTED

Occupational Category	Group	n	Number (%) Low	Est. Relative Risk (95% C.I.)	p-Value
All	***Ranch Hand***	***859***	***13 (1.5)***	***1.70 (0.76,3.82)***	***0.195***
	Comparison	***1,231***	***11 (0.9)***		
Officer	Ranch Hand	340	5 (1.5)	1.03 (0.32,3.27)	0.960
	Comparison	490	7 (1.4)		
Enlisted Flyer	Ranch Hand	150	1 (0.7)	1.23 (0.08,19.91)	0.882
	Comparison	185	1 (0.5)		
Enlisted Groundcrew	Ranch Hand	369	7 (1.9)	3.56 (0.92,13.87)	0.067
	Comparison	556	3 (0.5)		

(b) MODEL 1: RANCH HANDS VS. COMPARISONS – ADJUSTED

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	***1.87 (0.82,4.26)***	***0.136***
Officer	1.03 (0.32,3.29)	0.962
Enlisted Flyer	1.64 (0.09,28.94)	0.736
Enlisted Groundcrew	4.27 (1.05,17.39)	0.043

(c) MODEL 2: RANCH HANDS – INITIAL DIOXIN – UNADJUSTED

Initial Dioxin Category Summary Statistics			Analysis Results for Log_2 (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Low	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	158	1 (0.6)	1.44 (0.84,2.47)	0.203
Medium	159	3 (1.9)		
High	159	2 (1.3)		

[a] Adjusted for percent body fat at the time of the blood measurement of dioxin.
[b] Relative risk for a twofold increase in initial dioxin.

Note: Low = 27–63 ppt; Medium = >63–152 ppt; High = >152 ppt.

(d) MODEL 2: RANCH HANDS – INITIAL DIOXIN – ADJUSTED

	Analysis Results for Log_2 (Initial Dioxin)	
n	Adjusted Relative Risk (95% C.I.)[a]	p-Value
473	1.76 (0.94,3.30)	0.081

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

Note: Results are not adjusted for occupation because of the sparse number of Ranch Hands with low prealbumin levels.