Table 10-4. Analysis of Malignant Skin Neoplasms (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED		
	Analysis Results for $\log_2$ (1987 Dioxin + 1) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	1.06 (0.91,1.25)	0.447

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

A significant inverse relation between initial dioxin levels and malignant skin neoplasms was revealed in the Model 2 unadjusted analysis (Table 10-4(c): Est. RR=0.79, p=0.015). Results were nonsignificant after adjustment for covariates (Table 10-4(d): p=0.287).

The Model 3 unadjusted analysis showed significantly more Ranch Hands in the low dioxin category with malignant skin neoplasms than Comparisons (Table 10-4(e): Est. RR=1.52, p=0.023). After adjustment for covariates, the result was marginally significant (Table 10-4(f): Adj. RR=1.45, p=0.062). All other Model 3 contrasts and the Model 4 analysis results were nonsignificant (Table 10-4(e-h): p>0.10).

10.2.2.1.3 Benign Skin Neoplasms

The Model 1 unadjusted analysis showed a significant difference in the history of benign skin neoplasms between Ranch Hands and Comparisons when examined across all occupations and within the officer stratum (Table 10-5(a): Est. RR=1.31; p=0.010; Est. RR=1.42, p=0.031, respectively). Both contrasts displayed more Ranch Hands than Comparisons with benign skin neoplasms. Results were also significant in the adjusted analysis (Table 10-5(b): Adj. RR=1.31, p=0.011; Adj. RR=1.41, p=0.035, respectively). All other Model 1 contrasts were nonsignificant (Table 10-5(a,b): p≥0.22).

Table 10-5. Analysis of Benign Skin Neoplasms

(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*	*860*	*225 (26.2)*	*1.31 (1.07,1.61)*	*0.010*
	Comparison	*1,240*	*264 (21.3)*		
Officer	Ranch Hand	336	96 (28.6)	1.42 (1.03,1.96)	0.031
	Comparison	487	107 (22.0)		
Enlisted Flyer	Ranch Hand	150	34 (22.7)	1.40 (0.82,2.40)	0.220
	Comparison	185	32 (17.3)		
Enlisted Groundcrew	Ranch Hand	374	95 (25.4)	1.21 (0.89,1.64)	0.229
	Comparison	568	125 (22.0)		

Table 10-5. Analysis of Benign Skin Neoplasms (Continued)

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.31 (1.07,1.61)*	*0.011*
Officer	1.41 (1.02,1.95)	0.035
Enlisted Flyer	1.41 (0.82,2.43)	0.220
Enlisted Groundcrew	1.20 (0.88,1.63)	0.257

(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	154	42 (27.3)	0.82 (0.69,0.98)	0.022
Medium	161	40 (24.8)		
High	160	27 (16.9)		

[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

n	Analysis Results for Log_2 (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
475	0.79 (0.64,0.97)	0.020

[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	1,202	258 (21.5)		
Background RH	378	115 (30.4)	1.64 (1.26,2.13)	<0.001
Low RH	233	58 (24.9)	1.21 (0.87,1.67)	0.261
High RH	242	51 (21.1)	0.96 (0.68,1.34)	0.802
Low plus High RH	475	109 (23.0)	1.07 (0.83,1.38)	0.592

[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 10-5. Analysis of Benign Skin Neoplasms (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	1,200		
Background RH	377	1.64 (1.25,2.15)	<0.001
Low RH	233	1.21 (0.87,1.69)	0.265
High RH	242	0.95 (0.67,1.36)	0.798
Low plus High RH	475	1.07 (0.82,1.39)	0.603

[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	286	87 (30.4)	0.85 (0.77,0.95)	0.003
Medium	280	79 (28.2)		
High	287	58 (20.2)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
853	0.84 (0.74,0.95)	0.005

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

Both the unadjusted and adjusted Model 2 analyses displayed a significant inverse association between initial dioxin and benign skin neoplasms (Table 10-5(c,d): Est. RR=0.82; p=0.022; Adj. RR=0.79, p=0.020, respectively). As initial dioxin in Ranch Hands increased, benign skin neoplasms decreased.

Significant results from the Model 3 unadjusted and adjusted analyses revealed more benign skin neoplasms for Ranch Hands in the background dioxin category than for Comparisons (Table 10-5(e,f): Est. RR=1.64, p<0.001; Adj. RR=1.64, p<0.001, respectively). All other Model 3 contrasts were nonsignificant (Table 10-5(e,f): p>0.26).

Results from the Model 4 analysis of benign skin neoplasms were similar in both the unadjusted and adjusted analyses. A significant inverse association was found between 1987 dioxin and benign skin neoplasms (Table 10-5(g,h): Est. RR=0.85, p=0.003; Adj. RR=0.84, p=0.005, respectively).

10.2.2.1.4 Skin Neoplasms of Uncertain Behavior or Unspecified Nature

All results from the Model 1 through 4 analyses of skin neoplasms of uncertain behavior or unspecified nature were nonsignificant (Table 10-6(a-h): p>0.11 for each analysis).

Table 10-6. Analysis of Skin Neoplasms of Uncertain Behavior or Unspecified Nature

(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	805	7 (0.9)	1.27 (0.46,3.52)	0.645
	Comparison	1,168	8 (0.7)		
Officer	Ranch Hand	329	0 (0.0)	--	0.397[a]
	Comparison	480	3 (0.6)		
Enlisted Flyer	Ranch Hand	140	0 (0.0)	--	0.999[a]
	Comparison	173	1 (0.6)		
Enlisted Groundcrew	Ranch Hand	336	7 (2.1)	2.72 (0.79,9.36)	0.113
	Comparison	515	4 (0.8)		

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.
--: Results not presented because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	1.18 (0.42,3.36)	0.755
Officer	--	--
Enlisted Flyer	--	--
Enlisted Groundcrew	2.57 (0.73,9.10)	0.144

--: Results not presented because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.

Note: Results are not adjusted for skin reaction to sun after repeated exposure because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.

Table 10-6. *Analysis of Skin Neoplasms of Uncertain Behavior or Unspecified Nature (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	138	1 (0.7)	0.87 (0.44,1.75)	0.696
Medium	150	3 (2.0)		
High	151	1 (0.7)		

[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
439	0.88 (0.42,1.85)	0.732

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

Note: Results are not adjusted for occupation, skin color, eye color, skin reaction to sun after first exposure, skin reaction to sun after repeated exposure, composite skin-reaction index, and industrial chemicals exposure because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.

(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	1,133	8 (0.7)		
Background RH	359	2 (0.6)	0.80 (0.17,3.80)	0.777
Low RH	210	3 (1.4)	2.03 (0.53,7.72)	0.300
High RH	229	2 (0.9)	1.22 (0.26,5.84)	0.800
Low plus High RH	439	5 (1.1)	1.56 (0.49,4.91)	0.449

[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 10-6. Analysis of Skin Neoplasms of Uncertain Behavior or Unspecified Nature (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	1,131		
Background RH	358	0.92 (0.18,4.75)	0.921
Low RH	210	1.91 (0.47,7.69)	0.363
High RH	229	0.89 (0.18,4.41)	0.889
Low plus High RH	439	1.28 (0.40,4.14)	0.675

[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.

Results are not adjusted for skin reaction to sun after repeated exposure because of the sparse number of participants with a skin neoplasm of uncertain behavior or unspecified nature.

(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	273	1 (0.4)	1.16 (0.72,1.86)	0.542
Medium	256	2 (0.8)		
High	269	4 (1.5)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
798	1.11 (0.69,1.81)	0.664

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

Note: Results are not adjusted for occupation, skin color, eye color, skin reaction to sun after first exposure, skin reaction to sun after repeated exposure, composite skin-reaction index, and industrial chemicals exposure because of the sparse number of Ranch Hands with a skin neoplasm of uncertain behavior or unspecified nature.

10.2.2.1.5 Basal Cell Carcinoma (All Sites Combined)

The difference in the history of any basal cell carcinoma within the enlisted flyer stratum was marginally significant and higher for Ranch Hands than for Comparisons in the Model 1 unadjusted analysis (Table 10-7(a,b): Est. RR=1.85, p=0.060). The result was significant after covariate adjustment (Table 10-7(b): Adj. RR=1.97, p=0.046). All other Model 1 contrasts were nonsignificant (Table 10-7(a,b): p>0.12).

Table 10-7. Analysis of Basal Cell Carcinoma (All Sites Combined)

(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	805	121 (15.0)	1.16 (0.89,1.49)	0.269
	Comparison	1,168	155 (13.3)		
Officer	Ranch Hand	329	67 (20.4)	1.28 (0.89,1.83)	0.181
	Comparison	480	80 (16.7)		
Enlisted Flyer	Ranch Hand	140	26 (18.6)	1.85 (0.98,3.50)	0.060
	Comparison	173	19 (11.0)		
Enlisted Groundcrew	Ranch Hand	336	28 (8.3)	0.75 (0.46,1.20)	0.226
	Comparison	515	56 (10.9)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	1.21 (0.92,1.59)	0.169
Officer	1.34 (0.92,1.96)	0.129
Enlisted Flyer	1.97 (1.01,3.85)	0.046
Enlisted Groundcrew	0.80 (0.49,1.30)	0.363

(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	138	28 (20.3)	0.67 (0.53,0.85)	<0.001
Medium	150	27 (18.0)		
High	151	10 (6.6)		

[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 10-7. Analysis of Basal Cell Carcinoma (All Sites Combined) (Continued)

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

n	Analysis Results for Log_2 (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
439	0.70 (0.53,0.94)	0.014

[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.)[a,b]	p-Value
Comparison	1,133	150 (13.2)		
Background RH	359	56 (15.6)	1.24 (0.89,1.73)	0.212
Low RH	210	42 (20.0)	1.62 (1.11,2.38)	0.012
High RH	229	23 (10.0)	0.72 (0.45,1.14)	0.160
Low plus High RH	439	65 (14.8)	1.06 (0.76,1.47)	0.727

[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	1,131		
Background RH	358	1.16 (0.81,1.65)	0.427
Low RH	210	1.59 (1.06,2.39)	0.026
High RH	229	0.99 (0.60,1.64)	0.979
Low plus High RH	439	1.24 (0.88,1.77)	0.223

[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	273	42 (15.4)	0.87 (0.76,0.99)	0.037
Medium	256	49 (19.1)		
High	269	30 (11.2)		

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

Note: Low = $\leq$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
797	0.99 (0.83,1.18)	0.924

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

An inverse association between initial dioxin and any basal cell carcinoma was significant in both the unadjusted and adjusted Model 2 analyses (Table 10-7(c,d): Est. RR=0.67, p<0.001; Adj. RR=0.70, p=0.014, respectively). As initial dioxin in Ranch Hands increased, the percentage of participants with a basal cell carcinoma decreased.

Ranch Hands in the low dioxin category exhibited more basal cell carcinomas than did Comparisons in both the unadjusted and adjusted Model 3 analyses (Table 10-7(e,f): Est. RR=1.62, p=0.012; Adj. RR=1.59, p=0.026, respectively). All other Model 3 contrasts were nonsignificant (Table 10-7(e,f): p$\geq$0.16).

The Model 4 unadjusted analysis revealed a significant inverse association between any basal cell carcinoma and 1987 dioxin levels (Table 10-7(g): Est. RR=0.87, p=0.037). After adjustment for covariates, the association was nonsignificant (Table 10-7(h): p=0.924).

10.2.2.1.6 Basal Cell Carcinoma (Ear, Face, Head, and Neck)

The Model 1 adjusted analysis revealed a marginally significant result within the enlisted flyer stratum, indicating more basal cell carcinomas of the ear, face, head, and neck in Ranch Hands than in Comparisons (Table 10-8(b): Adj. RR=1.83, p=0.097). All other Model 1 contrasts were nonsignificant (Table 10-8(a,b): p$\geq$0.12).

Table 10-8. Analysis of Basal Cell Carcinoma (Ear, Face, Head, and Neck)

(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*	*805*	*93 (11.6)*	*1.14 (0.86,1.52)*	*0.370*
	Comparison	*1,168*	*120 (10.3)*		
Officer	Ranch Hand	329	49 (14.9)	1.23 (0.82,1.84)	0.328
	Comparison	480	60 (12.5)		
Enlisted Flyer	Ranch Hand	140	22 (15.7)	1.71 (0.87,3.37)	0.120
	Comparison	173	17 (9.8)		
Enlisted Groundcrew	Ranch Hand	336	22 (6.6)	0.77 (0.45,1.31)	0.334
	Comparison	515	43 (8.4)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.20 (0.89,1.62)*	*0.242*
Officer	1.29 (0.84,1.97)	0.244
Enlisted Flyer	1.83 (0.90,3.72)	0.097
Enlisted Groundcrew	0.84 (0.48,1.45)	0.527

(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	138	21 (15.2)	0.63 (0.48,0.83)	<0.001
Medium	150	24 (16.0)		
High	151	5 (3.3)		

[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
439	0.62 (0.44,0.87)	0.003

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

Table 10-8. Analysis of Basal Cell Carcinoma (Ear, Face, Head, and Neck) (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a,b]	p-Value
Comparison	1,133	115 (10.2)		
Background RH	359	43 (12.0)	1.21 (0.83,1.76)	0.316
Low RH	210	33 (15.7)	1.65 (1.08,2.50)	0.020
High RH	229	17 (7.4)	0.71 (0.41,1.20)	0.199
Low plus High RH	439	50 (11.4)	1.06 (0.73,1.53)	0.762

[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	1,131		
Background RH	358	1.19 (0.80,1.77)	0.386
Low RH	210	1.54 (0.98,2.42)	0.061
High RH	229	0.95 (0.54,1.67)	0.846
Low plus High RH	439	1.19 (0.80,1.77)	0.379

[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	273	32 (11.7)	0.84 (0.72,0.98)	0.021
Medium	256	37 (14.5)		
High	269	24 (8.9)		

[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.

Table 10-8. Analysis of Basal Cell Carcinoma (Ear, Face, Head, and Neck) (Continued)

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

	Analysis Results for Log₂ (1987 Dioxin + 1) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	0.89 (0.74,1.09)	0.257

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

A significant inverse relation between initial dioxin and basal cell carcinomas of the ear, face, head, and neck was found in both the Model 2 unadjusted and adjusted analyses (Table 10-8(c,d): Est. RR=0.63, p<0.001; Adj. RR=0.62, p=0.003, respectively). As initial dioxin in Ranch Hands increased, basal cell carcinomas of the ear, face, head, and neck decreased.

The Model 3 unadjusted analysis indicated more basal cell carcinomas of the ear, face, head, and neck for Ranch Hands in the low dioxin category than for Comparisons (Table 10-8(e): Est. RR=1.65, p=0.020). Results were marginally significant after adjustment for covariates (Table 10-8(f): Adj. RR=1.54, p=0.061). All other Model 3 contrasts were nonsignificant (Table 10-8 (e,f): p>0.19).

The Model 4 unadjusted analysis displayed a significant inverse relation between 1987 dioxin levels and basal cell carcinomas of the ear, face, head, and neck (Table 10-8(g): Est. RR=0.84, p=0.021). After adjustment for covariates, the result was nonsignificant (Table 10-8(h): p=0.257).

10.2.2.1.7 Basal Cell Carcinoma (Trunk)

All results from the analyses of basal cell carcinoma of the trunk from Models 1 through 3 and from the unadjusted analysis of Model 4 were nonsignificant (Table 10-9(a-g): p>0.10 for each analysis). After adjustment for covariates in Model 4, the result was significant, indicating an increase in basal cell carcinomas of the trunk as 1987 dioxin levels increased (Table 10-9(h): Adj. RR=1.51, p=0.016).

Table 10-9. Analysis of Basal Cell Carcinoma (Trunk)

(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*	*805*	*40 (5.0)*	*1.25 (0.81,1.92)*	*0.318*
	Comparison	*1,168*	*47 (4.0)*		
Officer	Ranch Hand	329	29 (8.8)	1.50 (0.88,2.57)	0.135
	Comparison	480	29 (6.0)		
Enlisted Flyer	Ranch Hand	140	6 (4.3)	2.54 (0.62,10.33)	0.194
	Comparison	173	3 (1.7)		
Enlisted Groundcrew	Ranch Hand	336	5 (1.5)	0.50 (0.18,1.40)	0.188
	Comparison	515	15 (2.9)		

Table 10-9. Analysis of Basal Cell Carcinoma (Trunk) (Continued)

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.24 (0.79,1.94)*	*0.357*
Officer	1.47 (0.85,2.57)	0.170
Enlisted Flyer	2.47 (0.59,10.26)	0.214
Enlisted Groundcrew	0.52 (0.19,1.48)	0.222

(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	138	9 (6.5)	0.79 (0.56,1.13)	0.184
Medium	150	7 (4.7)		
High	151	6 (4.0)		

[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

n	Analysis Results for Log$_2$ (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
439	1.18 (0.75,1.86)	0.470

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

Note: Results are not adjusted for skin reaction to sun after first exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the trunk.

(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	1,133	46 (4.1)		
Background RH	359	18 (5.0)	1.28 (0.73,2.25)	0.383
Low RH	210	14 (6.7)	1.67 (0.90,3.10)	0.105
High RH	229	8 (3.5)	0.83 (0.39,1.79)	0.638
Low plus High RH	439	22 (5.0)	1.16 (0.68,1.99)	0.589

[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 10-9. Analysis of Basal Cell Carcinoma (Trunk) (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	1,131		
Background RH	358	0.99 (0.55,1.79)	0.984
Low RH	210	1.60 (0.83,3.11)	0.161
High RH	229	1.46 (0.63,3.36)	0.374
Low plus High RH	439	1.53 (0.85,2.73)	0.153

[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	273	14 (5.1)	0.96 (0.77,1.19)	0.695
Medium	256	15 (5.9)		
High	269	11 (4.1)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	1.51 (1.07,2.13)	0.016

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

Note: Results are not adjusted for skin reaction to sun after first exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the trunk.

10.2.2.1.8 Basal Cell Carcinoma (Upper Extremities)

Results from the analysis of basal cell carcinoma of the upper extremities were nonsignificant for Models 1, 3, and 4 (Table 10-10(a-b,e-h): p>0.10 for each analysis). The unadjusted Model 2 analysis revealed a significant inverse association between initial dioxin and basal cell carcinoma of the upper extremities (Table 10-10(c): Est. RR=0.51, p=0.024). After adjustment for covariates, the association was nonsignificant (Table 10-10(d): p=0.219).

Table 10-10. Analysis of Basal Cell Carcinoma (Upper Extremities)

(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*	*805*	*21 (2.6)*	*0.80 (0.46,1.37)*	*0.405*
	Comparison	*1,168*	*38 (3.3)*		
Officer	Ranch Hand	329	17 (5.2)	1.04 (0.55,1.96)	0.915
	Comparison	480	24 (5.0)		
Enlisted Flyer	Ranch Hand	140	1 (0.7)	0.62 (0.06,6.85)	0.693
	Comparison	173	2 (1.2)		
Enlisted Groundcrew	Ranch Hand	336	3 (0.9)	0.38 (0.11,1.35)	0.134
	Comparison	515	12 (2.3)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.76 (0.44,1.34)*	*0.340*
Officer	0.98 (0.51,1.89)	0.947
Enlisted Flyer	0.56 (0.05,6.30)	0.635
Enlisted Groundcrew	0.38 (0.11,1.37)	0.139

(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	138	5 (3.6)	0.51 (0.26,0.99)	0.024
Medium	150	5 (3.3)		
High	151	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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
439	0.56 (0.21,1.51)	0.219

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

Note: Results are not adjusted for eye color, ionizing radiation exposure, and skin reaction to sun after first exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the upper extremities.

Table 10-10. Analysis of Basal Cell Carcinoma (Upper Extremities) (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.L.)[a,b]	p-Value
Comparison	1,133	37 (3.3)		
Background RH	359	11 (3.1)	0.99 (0.50,1.97)	0.981
Low RH	210	7 (3.3)	1.00 (0.44,2.27)	0.993
High RH	229	3 (1.3)	0.37 (0.11,1.22)	0.102
Low plus High RH	439	10 (2.3)	0.60 (0.28,1.29)	0.188

[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.L.)[a]	p-Value
Comparison	1,131		
Background RH	358	0.74 (0.36,1.52)	0.416
Low RH	210	0.93 (0.39,2.21)	0.876
High RH	229	0.64 (0.18,2.23)	0.484
Low plus High RH	439	0.77 (0.34,1.71)	0.518

[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.L.)[a]	p-Value
Low	273	9 (3.3)	0.77 (0.56,1.07)	0.107
Medium	256	8 (3.1)		
High	269	4 (1.5)		

[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)	
	Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	1.00 (0.63,1.57)	0.987

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

Note: Results are not adjusted for eye color and skin reaction to sun after first exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the upper extremities.

10.2.2.1.9 Basal Cell Carcinoma (Lower Extremities)

All results from Models 1 through 4 of the analysis of basal cell carcinoma of the lower extremities were nonsignificant (Table 10-11(a-h): p>0.32 for each analysis).

Table 10-11. Analysis of Basal Cell Carcinoma (Lower Extremities)

(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*	*805*	*5 (0.6)*	*1.45 (0.42,5.04)*	*0.556*
	Comparison	*1,168*	*5 (0.4)*		
Officer	Ranch Hand	329	4 (1.2)	1.96 (0.44,8.80)	0.381
	Comparison	480	3 (0.6)		
Enlisted Flyer	Ranch Hand	140	0 (0.0)	--	--
	Comparison	173	0 (0.0)		
Enlisted Groundcrew	Ranch Hand	336	1 (0.3)	0.77 (0.07,8.48)	0.828
	Comparison	515	2 (0.4)		

--: Results not presented because of the sparse number of participants with a basal cell carcinoma on the lower extremities.

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.38 (0.39,4.85)*	*0.616*
Officer	1.83 (0.40,8.33)	0.436
Enlisted Flyer	--	--
Enlisted Groundcrew	0.78 (0.07,8.71)	0.839

--: Results not presented because of the sparse number of participants with a basal cell carcinoma on the lower extremities.

Note: Results are not adjusted for skin reaction to sun after first exposure or skin reaction to sun after repeated exposure because of the sparse number of participants with a basal cell carcinoma on the lower extremities. Results for all occupations combined also are not adjusted for occupation because of the sparse number of participants with a basal cell carcinoma on the lower extremities.

Table 10-11. Analysis of Basal Cell Carcinoma (Lower Extremities) (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	138	1 (0.7)	1.09 (0.39,3.02)	0.867
Medium	150	0 (0.0)		
High	151	1 (0.7)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
439	1.46 (0.50,4.26)	0.511

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

Note: Results are not adjusted for occupation, skin color, hair color, eye color, skin reaction to sun after first exposure, skin reaction to sun after repeated exposure, composite skin-reaction index, and ionizing radiation exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the lower extremities.

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a,b]	p-Value
Comparison	1,133	5 (0.4)		
Background RH	359	3 (0.8)	2.07 (0.48,8.80)	0.327
Low RH	210	1 (0.5)	1.04 (0.12,8.97)	0.972
High RH	229	1 (0.4)	0.91 (0.10,7.91)	0.932
Low plus High RH	439	2 (0.5)	0.97 (0.19,5.06)	0.971

[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 10-11. Analysis of Basal Cell Carcinoma (Lower Extremities) (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	1,131		
Background RH	358	1.89 (0.43,8.34)	0.398
Low RH	210	0.90 (0.10,8.17)	0.928
High RH	229	1.03 (0.12,9.27)	0.976
Low plus High RH	439	0.97 (0.18,5.16)	0.971

[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.

   Results are not adjusted for occupation and skin reaction to sun after first exposure because of the sparse number of participants with a basal cell carcinoma on the lower extremities.

(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	273	3 (1.1)	0.85 (0.45,1.59)	0.597
Medium	256	1 (0.4)		
High	269	1 (0.4)		

[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

n	Analysis Results for Log_2 (1987 Dioxin + 1) Adjusted Relative Risk (95% C.I.)[a]	p-Value
797	0.91 (0.42,1.98)	0.803

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

Note: Results are not adjusted for occupation, skin reaction to sun after first exposure, and skin reaction to sun after repeated exposure because of the sparse number of Ranch Hands with a basal cell carcinoma on the lower extremities.

10.2.2.1.10 Squamous Cell Carcinoma

All results were nonsignificant from the Model 1 through 4 analyses of squamous cell carcinoma (Table 10-12(a-h): p>0.13 for each analysis).

Table 10-12. Analysis of Squamous Cell Carcinoma

(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*	*805*	*20 (2.5)*	*1.33 (0.72,2.45)*	*0.367*
	Comparison	*1,168*	*22 (1.9)*		
Officer	Ranch Hand	329	11 (3.3)	1.00 (0.46,2.19)	0.994
	Comparison	480	16 (3.3)		
Enlisted Flyer	Ranch Hand	140	3 (2.1)	1.87 (0.31,11.36)	0.495
	Comparison	173	2 (1.2)		
Enlisted Groundcrew	Ranch Hand	336	6 (1.8)	2.32 (0.65,8.29)	0.194
	Comparison	515	4 (0.8)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.46 (0.77,2.78)*	*0.250*
Officer	1.10 (0.49,2.49)	0.813
Enlisted Flyer	1.86 (0.29,11.86)	0.514
Enlisted Groundcrew	2.67 (0.73,9.76)	0.139

(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	138	3 (2.2)	0.95 (0.58,1.55)	0.821
Medium	150	3 (2.0)		
High	151	4 (2.7)		

[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
439	0.98 (0.52,1.85)	0.944

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

Note: Results are not adjusted for skin reaction to sun after repeated exposure because of the sparse number of Ranch Hands with a squamous cell carcinoma.

Table 10-12. Analysis of Squamous Cell Carcinoma (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a,b]	p-Value
Comparison	1,133	20 (1.8)		
Background RH	359	10 (2.8)	1.69 (0.78,3.66)	0.187
Low RH	210	6 (2.9)	1.60 (0.63,4.04)	0.320
High RH	229	4 (1.8)	0.94 (0.32,2.78)	0.907
Low plus High RH	439	10 (2.3)	1.21 (0.55,2.66)	0.634

[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	1,131		
Background RH	358	1.53 (0.68,3.45)	0.306
Low RH	210	1.52 (0.56,4.10)	0.408
High RH	229	1.74 (0.53,5.69)	0.363
Low plus High RH	439	1.63 (0.69,3.82)	0.262

[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	273	8 (2.9)	0.95 (0.70,1.29)	0.744
Medium	256	6 (2.3)		
High	269	6 (2.2)		

[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.

Table 10-12. Analysis of Squamous Cell Carcinoma (Continued)

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

	Analysis Results for Log$_2$ (1987 Dioxin + 1)	
	Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	1.07 (0.70,1.63)	0.749

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

10.2.2.1.11 Nonmelanoma

Both the unadjusted and adjusted Model 1 analyses of nonmelanoma revealed a significant difference between Ranch Hand and Comparison enlisted flyers (Table 10-13(a,b): Est. RR=1.89, p=0.042; Adj. RR=2.00, p=0.035, respectively). Nonmelanoma was higher in Ranch Hands than in Comparisons. All other Model 1 contrasts were nonsignificant (Table 10-13(a,b): p>0.14).

The Model 2 unadjusted analysis revealed a significant inverse association between initial dioxin and nonmelanoma (Table 10-13(c): Est. RR=0.73, p=0.003). After adjustment for covariates, the association was marginally significant (Table 10-13(d): Adj. RR=0.79, p=0.075).

The Model 3 unadjusted analysis revealed that Ranch Hands in the low dioxin category had a greater history of nonmelanoma than Comparisons (Table 10-13(e): Est. RR=1.49, p=0.034). The result was marginally significant after adjustment for covariates (Table 10-13(f): Adj. RR=1.43, p=0.081). All other Model 3 contrasts were nonsignificant (Table 10-13(e,f): p>0.20).

Table 10-13. Analysis of Nonmelanoma

(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*	*805*	*134 (16.7)*	*1.13 (0.88,1.44)*	*0.345*
	Comparison	*1,168*	*176 (15.1)*		
Officer	Ranch Hand	329	73 (22.2)	1.25 (0.89,1.77)	0.203
	Comparison	480	89 (18.5)		
Enlisted Flyer	Ranch Hand	140	29 (20.7)	1.89 (1.02,3.49)	0.042
	Comparison	173	21 (12.1)		
Enlisted Groundcrew	Ranch Hand	336	32 (9.5)	0.72 (0.46,1.12)	0.143
	Comparison	515	66 (12.8)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.18 (0.91,1.53)*	*0.219*
Officer	1.31 (0.91,1.90)	0.144
Enlisted Flyer	2.00 (1.05,3.81)	0.035
Enlisted Groundcrew	0.76 (0.48,1.22)	0.258

Table 10-13. Analysis of Nonmelanoma (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	138	29 (21.0)	0.73 (0.59,0.90)	0.003
Medium	150	29 (19.3)		
High	151	14 (9.3)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
439	0.79 (0.60,1.03)	0.075

[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	1,133	169 (14.9)		
Background RH	359	62 (17.3)	1.23 (0.89,1.70)	0.203
Low RH	210	44 (21.0)	1.49 (1.03,2.16)	0.034
High RH	229	28 (12.2)	0.77 (0.50,1.18)	0.231
Low plus High RH	439	72 (16.4)	1.06 (0.78,1.44)	0.729

[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 10-13. Analysis of Nonmelanoma (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	1,131		
Background RH	358	1.16 (0.82,1.64)	0.398
Low RH	210	1.43 (0.96,2.13)	0.081
High RH	229	1.06 (0.67,1.69)	0.803
Low plus High RH	439	1.22 (0.88,1.71)	0.235

[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 Log₂ (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[a]	p-Value
Low	273	46 (16.9)	0.89 (0.78,1.01)	0.074
Medium	256	52 (20.3)		
High	269	36 (13.4)		

[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

n	Analysis Results for Log₂ (1987 Dioxin + 1) Adjusted Relative Risk (95% C.I.)[a]	p-Value
797	1.02 (0.86,1.21)	0.786

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

A marginally significant association between 1987 dioxin levels and nonmelanoma was revealed from the Model 4 unadjusted analysis (Table 10-13(g): Est. RR=0.89, p=0.074). After adjustment for covariates, the result was nonsignificant (Table 10-13(h): p=0.786).

10.2.2.1.12   Melanoma

All analyses of melanoma in Models 1, 2, and 4 were nonsignificant (Table 10-14(a-d,g-h): p>0.11 for each analysis). All contrasts from the unadjusted analysis of Model 3 were nonsignificant (Table 10-14(e): p>0.11 for each contrast). After adjustment for covariates, a marginally significant difference was found between Ranch Hands in the low plus high dioxin category and Comparisons (Table 10-14(f): Adj. RR=2.44, p=0.062). Melanoma was higher for Ranch Hands than for Comparisons. All other adjusted Model 3 contrasts were nonsignificant (Table 10-14(f): p>0.12).

Table 10-14. Analysis of Melanoma

(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*	*805*	*16 (2.0)*	*1.80 (0.86,3.77)*	*0.117*
	Comparison	*1,168*	*13 (1.1)*		
Officer	Ranch Hand	329	9 (2.7)	1.90 (0.70,5.16)	0.207
	Comparison	480	7 (1.5)		
Enlisted Flyer	Ranch Hand	140	0 (0.0)	--	0.999[a]
	Comparison	173	1 (0.6)		
Enlisted Groundcrew	Ranch Hand	336	7 (2.1)	2.17 (0.68,6.90)	0.189
	Comparison	515	5 (1.0)		

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of Ranch Hands with a melanoma.

--: Results not presented because of the sparse number of Ranch Hands with a melanoma.

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.78 (0.83,3.79)*	*0.136*
Officer	1.92 (0.69,5.30)	0.211
Enlisted Flyer	--	--
Enlisted Groundcrew	2.01 (0.62,6.50)	0.246

--: Results not presented because of the sparse number of Ranch Hands with a melanoma.

Note: Results are not adjusted for skin reaction to sun after first exposure because of the sparse number of Ranch Hands with a melanoma.

(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	138	4 (2.9)	1.12 (0.69,1.80)	0.660
Medium	150	1 (0.7)		
High	151	4 (2.7)		

[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.

Table 10-14. Analysis of Melanoma (Continued)

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

n	Analysis Results for Log_2 (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
439	1.28 (0.76, 2.16)	0.366

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

Note: Results are not adjusted for occupation, skin color, skin reaction to sun after first exposure, and skin reaction to sun after repeated exposure because of the sparse number of Ranch Hands with a melanoma.

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a][b]	p-Value
Comparison	1,133	12 (1.1)		
Background RH	359	7 (2.0)	1.76 (0.68, 4.54)	0.240
Low RH	210	5 (2.4)	2.32 (0.81, 6.68)	0.117
High RH	229	4 (1.8)	1.74 (0.55, 5.49)	0.341
Low plus High RH	439	9 (2.1)	2.00 (0.83, 4.83)	0.122

[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 $\leq$ 10 ppt.
Background (Ranch Hand): 1987 Dioxin $\leq$ 10 ppt.
Low (Ranch Hand): 1987 Dioxin > 10 ppt, 10 ppt < Initial Dioxin $\leq$ 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	1,131		
Background RH	358	1.56 (0.59, 4.16)	0.373
Low RH	210	2.17 (0.73, 6.48)	0.164
High RH	229	2.71 (0.76, 9.67)	0.124
Low plus High RH	439	2.44 (0.96, 6.23)	0.062

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

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

Results are not adjusted for skin reaction to sun after first exposure because of the sparse number of participants with a melanoma.

Table 10-14. Analysis of Melanoma (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	273	5 (1.8)	1.05 (0.76,1.46)	0.761
Medium	256	7 (2.7)		
High	269	4 (1.5)		

[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) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
797	1.18 (0.81,1.71)	0.399

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

Note: Results are not adjusted for occupation and skin reaction to sun after repeated exposure because of the sparse number of Ranch Hands with a melanoma.

10.2.2.1.13 Systemic Neoplasms (All Sites Combined)

Results from the analyses of a history of all systemic neoplasms in Models 1, 2, and 4 were nonsignificant (Table 10-15(a-d,g-h): p>0.12 for each analysis). In the unadjusted analysis of Model 3, a marginally significant difference in the percentage of participants with any systemic neoplasm was found between Ranch Hands in the low dioxin category and Comparisons (Table 10-15(e): Est. RR=1.31, p=0.072). The occurrence of any systemic neoplasm was higher for Ranch Hands in the low dioxin category than for Comparisons. After adjustment for covariates, the contrast was nonsignificant (Table 10-15(f): p=0.927). The contrast of Ranch Hands in the background dioxin category and Comparisons was marginally significant in the adjusted Model 3 analysis (Table 10-15(f): Adj. RR=0.76, p=0.076). A greater percentage of Comparisons than Ranch Hands in the background dioxin category had a systemic neoplasm. All other Model 3 contrasts were nonsignificant (Table 10-15(e,f): p>0.25).

Table 10-15. Analysis of Systemic Neoplasms (All Sites Combined)

(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	855	267 (31.2)	1.07 (0.89,1.29)	0.462
	Comparison	1,242	370 (29.8)		
Officer	Ranch Hand	332	110 (33.1)	0.95 (0.70,1.27)	0.716
	Comparison	489	168 (34.4)		
Enlisted Flyer	Ranch Hand	147	49 (33.3)	1.20 (0.75,1.91)	0.443
	Comparison	187	55 (29.4)		
Enlisted Groundcrew	Ranch Hand	376	108 (28.7)	1.15 (0.86,1.54)	0.352
	Comparison	566	147 (26.0)		

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Table 10-15. Analysis of Systemic Neoplasms (All Sites Combined) (Continued)

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.88 (0.70,1.12)*	*0.307*
Officer	0.77 (0.56,1.07)	0.125
Enlisted Flyer	0.98 (0.60,1.61)	0.937
Enlisted Groundcrew	0.98 (0.70,1.36)	0.888

(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	155	57 (36.8)	0.93 (0.80,1.07)	0.308
Medium	160	52 (32.5)		
High	157	46 (29.3)		

[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

n	Analysis Results for Log$_2$ (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
469	1.00 (0.84,1.20)	0.980

[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	1,204	358 (29.7)		
Background RH	376	109 (29.0)	0.98 (0.76,1.26)	0.864
Low RH	232	83 (35.8)	1.31 (0.98,1.76)	0.072
High RH	240	72 (30.0)	1.00 (0.74,1.36)	0.995
Low plus High RH	472	155 (32.8)	1.14 (0.91,1.44)	0.253

[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	1,202		
Background RH	373	0.76 (0.57,1.03)	0.076
Low RH	230	0.98 (0.70,1.38)	0.927
High RH	239	0.95 (0.67,1.36)	0.794
Low plus High RH	469	0.97 (0.73,1.28)	0.823

[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	284	83 (29.2)	1.02 (0.92,1.12)	0.734
Medium	281	94 (33.5)		
High	283	87 (30.7)		

[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) Adjusted Relative Risk (95% C.I.)[a]	
n		p-Value
842	1.05 (0.93,1.18)	0.399

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

10.2.2.1.14 Malignant Systemic Neoplasms

The unadjusted Model 1 analysis within the enlisted flyer stratum revealed significantly more Ranch Hands than Comparisons with a malignant systemic neoplasm (Table 10-16(a): Est. RR=2.20, p=0.049). After adjustment for covariates the contrast was nonsignificant (Table 10-16(b): p=0.132). All other Model 1 contrasts were nonsignificant (Table 10-16(a,b): p>0.11).

Table 10-16. Analysis of Malignant Systemic Neoplasms

(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*	*861*	*67 (7.8)*	*1.32 (0.94,1.86)*	*0.112*
	Comparison	*1,249*	*75 (6.0)*		
Officer	Ranch Hand	335	32 (9.6)	1.23 (0.76,2.01)	0.403
	Comparison	494	39 (7.9)		
Enlisted Flyer	Ranch Hand	149	18 (12.1)	2.20 (1.00,4.81)	0.049
	Comparison	187	11 (5.9)		
Enlisted Groundcrew	Ranch Hand	377	17 (4.5)	1.03 (0.55,1.93)	0.937
	Comparison	568	25 (4.4)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.12 (0.74,1.70)*	*0.592*
Officer	1.09 (0.63,1.88)	0.766
Enlisted Flyer	1.91 (0.82,4.43)	0.132
Enlisted Groundcrew	0.82 (0.41,1.67)	0.589

(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	19 (12.2)	0.62 (0.46,0.84)	0.001
Medium	161	20 (12.4)		
High	159	6 (3.8)		

[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

n	Analysis Results for Log$_2$ (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
472	0.82 (0.57,1.18)	0.272

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

Note: Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

Table 10-16. Analysis of Malignant Systemic Neoplasms (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a][b]	p-Value
Comparison	1,211	73 (6.0)		
Background RH	378	21 (5.6)	0.91 (0.55,1.51)	0.727
Low RH	234	34 (14.5)	2.65 (1.72,4.09)	<0.001
High RH	242	11 (4.6)	0.74 (0.39,1.43)	0.374
Low plus High RH	476	45 (9.5)	1.39 (0.91,2.13)	0.132

[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	1,209		
Background RH	375	0.73 (0.42,1.29)	0.279
Low RH	232	1.94 (1.16,3.24)	0.012
High RH	240	0.86 (0.41,1.78)	0.680
Low plus High RH	472	1.28 (0.77,2.13)	0.345

[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	286	15 (5.2)	0.96 (0.81,1.14)	0.641
Medium	282	32 (11.4)		
High	286	19 (6.6)		

[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 10-16. Analysis of Malignant Systemic Neoplasms (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	1.06 (0.84,1.34)	0.599

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

Note: Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

The unadjusted analysis of malignant systemic neoplasms revealed a significant inverse relation with initial dioxin (Table 10-16(a): Est. RR=0.62, p=0.001). The association was nonsignificant after adjustment for covariates (Table 10-16(d): p=0.272).

The Model 3 contrast between Ranch Hands in the low dioxin category and Comparisons was significant in both the unadjusted and adjusted analyses. A greater percentage of participants with malignant systemic neoplasms was observed in Ranch Hands than in Comparisons (Table 10-16(e,f): Est. RR=2.65, p<0.001; Adj. RR=1.94, p=0.012, respectively). All other Model 3 contrasts, as well as the Model 4 analyses, were nonsignificant (Table 10-16(e-h): p>0.13 for all remaining analyses).

10.2.2.1.15 Benign Systemic Neoplasms

Results from each of the analyses of benign systemic neoplasms in Models 1 through 4 were nonsignificant (Table 10-17(a-h): p>0.15 for each analysis).

Table 10-17. Analysis of Benign Systemic Neoplasms

(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*	*855*	*217 (25.4)*	*1.07 (0.88,1.31)*	*0.495*
	Comparison	*1,242*	*299 (24.1)*		
Officer	Ranch Hand	332	82 (24.7)	0.91 (0.66,1.25)	0.545
	Comparison	489	130 (26.6)		
Enlisted Flyer	Ranch Hand	147	40 (27.2)	1.11 (0.68,1.82)	0.668
	Comparison	187	47 (25.1)		
Enlisted Groundcrew	Ranch Hand	376	95 (25.3)	1.23 (0.91,1.67)	0.186
	Comparison	566	122 (21.6)		

Table 10-17. Analysis of Benign Systemic Neoplasms (Continued)

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.93 (0.73,1.19)*	*0.574*
Officer	0.78 (0.55,1.10)	0.155
Enlisted Flyer	0.95 (0.56,1.59)	0.831
Enlisted Groundcrew	1.11 (0.79,1.57)	0.548

(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	155	43 (27.7)	1.03 (0.88,1.20)	0.718
Medium	160	37 (23.1)		
High	157	41 (26.1)		

[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
469	0.99 (0.82,1.19)	0.903

[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.)[a,b]	p-Value
Comparison	1,204	289 (24.0)		
Background RH	376	93 (24.7)	1.05 (0.80,1.38)	0.710
Low RH	232	58 (25.0)	1.05 (0.76,1.46)	0.760
High RH	240	63 (26.3)	1.12 (0.81,1.53)	0.500
Low plus High RH	472	121 (25.6)	1.08 (0.85,1.39)	0.521

[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 10-17. Analysis of Benign Systemic Neoplasms (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	1,202		
Background RH	373	0.89 (0.66,1.22)	0.479
Low RH	230	0.86 (0.60,1.23)	0.400
High RH	239	1.00 (0.69,1.45)	0.996
Low plus High RH	469	0.93 (0.69,1.24)	0.613

[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	284	70 (24.7)	1.03 (0.93,1.14)	0.582
Medium	281	72 (25.6)		
High	283	72 (25.4)		

[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
842	1.01 (0.89,1.14)	0.905

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

10.2.2.1.16 Systemic Neoplasms of Uncertain Behavior or Unspecified Nature

Results from each of the analyses of systemic neoplasms of uncertain behavior or unspecified nature from Models 1 through 4 were nonsignificant (Table 10-18(a-h): p>0.18 for each analysis).

Table 10-18. Analysis of Systemic Neoplasms of Uncertain Behavior or Unspecified Nature

(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*	*861*	*16 (1.9)*	*0.93 (0.49,1.75)*	*0.814*
	Comparison	*1,249*	*25 (2.0)*		
Officer	Ranch Hand	335	11 (3.3)	1.26 (0.56,2.84)	0.583
	Comparison	494	13 (2.6)		
Enlisted Flyer	Ranch Hand	149	1 (0.7)	0.63 (0.06,6.96)	0.702
	Comparison	187	2 (1.1)		
Enlisted Groundcrew	Ranch Hand	377	4 (1.1)	0.60 (0.19,1.92)	0.388
	Comparison	568	10 (1.8)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.71 (0.34,1.47)*	*0.355*
Officer	0.96 (0.40,2.31)	0.925
Enlisted Flyer	0.45 (0.04,5.19)	0.523
Enlisted Groundcrew	0.44 (0.13,1.50)	0.190

(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	5 (3.2)	0.84 (0.49,1.47)	0.534
Medium	161	1 (0.6)		
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

n	Analysis Results for Log_2 (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
472	1.16 (0.58,2.31)	0.678

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

Note: Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

Table 10-18.   Analysis of Systemic Neoplasms of Uncertain Behavior or Unspecified Nature (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a,b]	p-Value
Comparison	1,211	25 (2.1)		
Background RH	378	8 (2.1)	1.08 (0.48,2.44)	0.845
Low RH	234	6 (2.6)	1.23 (0.50,3.03)	0.657
High RH	242	2 (0.8)	0.38 (0.09,1.61)	0.187
Low plus High RH	476	8 (1.7)	0.67 (0.27,1.67)	0.392

[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	1,209		
Background RH	375	0.72 (0.30,1.76)	0.475
Low RH	232	0.85 (0.32,2.26)	0.744
High RH	240	0.40 (0.09,1.89)	0.250
Low plus High RH	472	0.58 (0.22,1.58)	0.288

[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	286	8 (2.8)	0.84 (0.59,1.20)	0.329
Medium	282	5 (1.8)		
High	286	3 (1.1)		

[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 10-18. **Analysis of Systemic Neoplasms of Uncertain Behavior or Unspecified Nature (Continued)**

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

	Analysis Results for Log₂ (1987 Dioxin + 1) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
847	1.07 (0.67,1.72)	0.767

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

Note: Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

10.2.2.1.17 Malignant Systemic Neoplasms (Eye, Ear, Face, Head, and Neck)

Results from each of the analyses of malignant systemic neoplasms of the eye, ear, face, head, and neck in Models 1, 3, and 4 were nonsignificant (Table 10-19(a-b,e-h): p>0.13 for each analysis). The unadjusted analysis of Model 2 revealed a marginally significant association between initial dioxin and malignant systemic neoplasms of the eye, ear, face, head, and neck (Table 10-19(c): Est. RR=0.50, p=0.081). After adjustment for covariates, the Model 2 result was nonsignificant (Table 10-19(d): p=0.666).

Table 10-19. Analysis of Malignant Systemic Neoplasms (Eye, Ear, Face, Head, and Neck)

(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*	*861*	*9 (1.1)*	*1.09 (0.46,2.60)*	*0.848*
	Comparison	*1,249*	*12 (1.0)*		
Officer	Ranch Hand	335	6 (1.8)	2.23 (0.63,7.98)	0.216
	Comparison	494	4 (0.8)		
Enlisted Flyer	Ranch Hand	149	1 (0.7)	0.41 (0.04,4.03)	0.448
	Comparison	187	3 (1.6)		
Enlisted Groundcrew	Ranch Hand	377	2 (0.5)	0.60 (0.12,3.11)	0.543
	Comparison	568	5 (0.9)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.98 (0.35,2.75)*	*0.974*
Officer	2.07 (0.53,8.16)	0.298
Enlisted Flyer	0.38 (0.04,4.02)	0.424
Enlisted Groundcrew	0.49 (0.08,2.87)	0.429

Table 10-19. *Analysis of Malignant Systemic Neoplasms (Eye, Ear, Face, Head and Neck) (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	156	4 (2.6)	0.50 (0.20,1.23)	0.081
Medium	161	1 (0.6)		
High	159	1 (0.6)		

[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
472	0.79 (0.27,2.33)	0.666

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

Note: Results are not adjusted for race because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the eye, ear, face, head, and neck. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

(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	12 (1.0)		
Background RH	378	3 (0.8)	0.72 (0.20,2.58)	0.612
Low RH	234	5 (2.1)	2.24 (0.78,6.43)	0.134
High RH	242	1 (0.4)	0.46 (0.06,3.53)	0.451
Low plus High RH	476	6 (1.3)	1.00 (0.29,3.41)	0.995

[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	1,209		
Background RH	375	0.64 (0.16,2.59)	0.533
Low RH	232	1.94 (0.58,6.44)	0.281
High RH	240	0.49 (0.06,4.31)	0.520
Low plus High RH	472	0.96 (0.24,3.82)	0.956

[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	286	2 (0.7)	0.85 (0.53,1.36)	0.494
Medium	282	5 (1.8)		
High	286	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) Adjusted Relative Risk (95% C.I.)[a]	
n		p-Value
847	1.04 (0.57,1.91)	0.897

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

Note: Results are not adjusted for race because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the eye, ear, face, head, and neck. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

10.2.2.1.18 Malignant Systemic Neoplasms (Oral Cavity, Pharynx, and Larynx)

Results from each of the analyses of malignant systemic neoplasms of the oral cavity, pharynx, and larynx from Models 1 through 4 were nonsignificant (Table 10-20(a-h): p>0.29 for each analysis).

Table 10-20. Analysis of Malignant Systemic Neoplasms (Oral Cavity, Pharynx, and Larynx)

(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*	*861*	*4 (0.5)*	*0.83 (0.24,2.84)*	*0.762*
	Comparison	*1,249*	*7 (0.6)*		
Officer	Ranch Hand	335	2 (0.6)	1.48 (0.21,10.54)	0.697
	Comparison	494	2 (0.4)		
Enlisted Flyer	Ranch Hand	149	1 (0.7)	0.63 (0.06,6.96)	0.702
	Comparison	187	2 (1.1)		
Enlisted Groundcrew	Ranch Hand	377	1 (0.3)	0.50 (0.05,4.83)	0.550
	Comparison	568	3 (0.5)		

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*0.63 (0.16,2.44)*	*0.501*
Officer	1.35 (0.17,10.61)	0.777
Enlisted Flyer	0.52 (0.04,6.28)	0.603
Enlisted Groundcrew	0.31 (0.03,3.40)	0.336

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

Initial Dioxin	Initial Dioxin Category Summary Statistics n	Number (%) Yes	Analysis Results for Log_2 (Initial Dioxin)[a] Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	156	1 (0.6)	0.97 (0.39,2.41)	0.953
Medium	161	1 (0.6)		
High	159	1 (0.6)		

[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

n	Analysis Results for Log_2 (Initial Dioxin) Adjusted Relative Risk (95% C.I.)[a]	p-Value
472	1.15 (0.34,3.88)	0.822

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

Note: Results are not adjusted for race because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the oral cavity, pharynx, and larynx. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

Table 10-20. Analysis of Malignant Systemic Neoplasms (Oral Cavity, Pharynx, and Larynx) (Continued)

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)[a][b]	p-Value
Comparison	1,211	7 (0.6)		
Background RH	378	1 (0.3)	0.43 (0.05,3.52)	0.431
Low RH	234	2 (0.9)	1.51 (0.31,7.30)	0.612
High RH	242	1 (0.4)	0.75 (0.09,6.18)	0.791
Low plus High RH	476	3 (0.6)	1.06 (0.25,4.39)	0.938

[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	1,209		
Background RH	375	0.39 (0.04,3.56)	0.401
Low RH	232	1.01 (0.18,5.59)	0.987
High RH	240	0.56 (0.06,5.33)	0.614
Low plus High RH	472	0.75 (0.16,3.59)	0.719

[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	286	0 (0.0)	1.23 (0.66,2.29)	0.526
Medium	282	2 (0.7)		
High	286	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.

Table 10-20.   Analysis of Malignant Systemic Neoplasms (Oral Cavity, Pharynx, and Larynx) (Continued)

(h) MODEL 4: RANCH HANDS – 1987 DIOXIN – ADJUSTED		
	Analysis Results for Log$_2$ (1987 Dioxin + 1) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
847	1.60 (0.65,3.97)	0.296

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

Note: Results are not adjusted for race because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the oral cavity, pharynx, and larynx. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

10.2.2.1.19   Malignant Systemic Neoplasms (Esophagus)

Because of the absence of malignant systemic neoplasms of the esophagus in Ranch Hands, statistical analysis was not performed. A malignant systemic neoplasm of the esophagus was observed in two Comparisons. One Comparison was a non-Black enlisted flyer, and the other Comparison was a non-Black enlisted groundcrew.

10.2.2.1.20   Malignant Systemic Neoplasms (Brain)

Because of the presence of a malignant systemic neoplasm of the brain in only one Ranch Hand, statistical analysis was not performed. This participant was a non-Black officer.

10.2.2.1.21   Malignant Systemic Neoplasms (Thymus, Heart, and Mediastinum)

A sparse number of participants exhibited a malignant systemic neoplasm of the thymus, heart, or mediastinum, which limited the analyses. The unadjusted contrasts analyzed from Model 1 were nonsignificant (Table 10-21(a): p>0.32 for each contrast). Model 2 analysis was not performed because no Ranch Hands with a malignant neoplasm of the thymus, heart, or mediastinum had an initial dioxin estimate. The Model 3 unadjusted analysis revealed a marginally significant difference between Ranch Hands in the background dioxin category and Comparisons (Table 10-21(e): p=0.089). Two Ranch Hands in the background category had a malignant systemic neoplasm of the thymus, heart, or mediastinum (0.5%), contrasted with zero Comparisons. The Model 4 unadjusted and adjusted analyses showed a significant inverse association between 1987 dioxin levels and a malignant systemic neoplasm of the thymus, heart, or mediastinum (Table 10-21(g,h): Est. RR=0.33; p=0.038; Adj. RR=0.31, p=0.017, respectively). As 1987 dioxin levels increased, the percentage of Ranch Hands with a malignant systemic neoplasm of the thymus, heart, or mediastinum decreased.

Table 10-21. Analysis of Malignant Systemic Neoplasms (Thymus, Heart, and Mediastinum)

(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*	*861*	*2 (0.2)*	--	*0.325[a]*
	Comparison	*1,249*	*0 (0.0)*		
Officer	Ranch Hand	335	1 (0.3)	--	0.845[a]
	Comparison	494	0 (0.0)		
Enlisted Flyer	Ranch Hand	149	0 (0.0)	--	--
	Comparison	187	0 (0.0)		
Enlisted Groundcrew	Ranch Hand	377	1 (0.3)	--	0.836[a]
	Comparison	568	0 (0.0)		

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	--	--
Officer	--	--
Enlisted Flyer	--	--
Enlisted Groundcrew	--	--

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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

Initial Dioxin Category Summary Statistics			Analysis Results for Log₂ (Initial Dioxin)	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)	p-Value
Low	156	0 (0.0)	--	--
Medium	161	0 (0.0)		
High	159	0 (0.0)		

--: Results not presented because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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

Table 10-21. Analysis of Malignant Systemic Neoplasms (Thymus, Heart, and Mediastinum) (Continued)

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

	Analysis Results for Log₂ (Initial Dioxin) Adjusted Relative Risk	
n	(95% C.I.)	p-Value
--	--	--

--: Results not presented because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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

Dioxin Category	n	Number (%) Yes	Est. Relative Risk (95% C.I.)	p-Value
Comparison	1,211	0 (0.0)		
Background RH	378	2 (0.5)	--	0.089[a]
Low RH	234	0 (0.0)	--	--
High RH	242	0 (0.0)	--	--
Low plus High RH	476	0 (0.0)	--	--

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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.)	p-Value
Comparison	--		
Background RH	--	--	--
Low RH	--	--	--
High RH	--	--	--
Low plus High RH	--	--	--

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thymus, heart, and mediastinum.

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 10-21. Analysis of Malignant Systemic Neoplasms (Thymus, Heart, and Mediaetinum) (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	286	2 (0.7)	0.33 (0.12,0.92)	0.038
Medium	282	0 (0.0)		
High	286	0 (0.0)		

[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	0.31 (0.09,1.04)	0.017

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

Note: Results are not adjusted for race and occupation because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thymus, heart, and mediastinum. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

10.2.2.1.22 Malignant Systemic Neoplasms (Thyroid Gland)

Because of the sparse number of participants with a history of a malignant systemic neoplasm of the thyroid gland, analysis was limited. The Model 1 contrasts revealed nonsignificant differences between Ranch Hands and Comparisons (Table 10-22(a,b): p>0.37 for each).

Table 10-22. Analysis of Malignant Systemic Neoplasms (Thyroid Gland)

(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*	*861*	*2 (0.2)*	*1.45 (0.20,10.33)*	*0.710*
	Comparison	*1,249*	*2 (0.2)*		
Officer	Ranch Hand	335	2 (0.6)	2.96 (0.27,32.79)	0.376
	Comparison	494	1 (0.2)		
Enlisted Flyer	Ranch Hand	149	0 (0.0)	--	--
	Comparison	187	0 (0.0)		
Enlisted Groundcrew	Ranch Hand	377	0 (0.0)	--	0.999[a]
	Comparison	568	1 (0.2)		

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of participants with a malignant systemic neoplasm of the thyroid gland.

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thyroid gland.

Table 10-22. Analysis of Malignant Systemic Neoplasms (Thyroid Gland) (Continued)

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*1.46 (0.20,10.39)*	*0.708*
Officer	3.08 (0.28,34.40)	0.362
Enlisted Flyer	--	--
Enlisted Groundcrew	--	--

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the thyroid gland.

Note: Results are not adjusted for race and ionizing radiation exposure because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland. Results for all occupations combined also are not adjusted for occupation because of the sparse number of participants with a malignant systemic neoplasm of the thyroid gland. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

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

Initial Dioxin Category Summary Statistics			Analysis Results for Log₂ (Initial Dioxin)[a]	
Initial Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)[b]	p-Value
Low	156	2 (1.3)	0.12 (0.01,2.59)	0.046
Medium	161	0 (0.0)		
High	159	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 Log₂ (Initial Dioxin) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
473	0.12 (0.01,2.84)	0.059

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

Note: Results are not adjusted for race, occupation, ionizing radiation exposure, and lifetime cigarette smoking history because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

Table 10-22. Analysis of Malignant Systemic Neoplasms (Thyroid Gland) (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	1,211	2 (0.2)		
Background RH	378	0 (0.0)	--	0.999[c]
Low RH	234	2 (0.9)	5.42 (0.76,38.74)	0.092
High RH	242	0 (0.0)	--	0.999[c]
Low plus High RH	476	2 (0.4)	--	0.680[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 participants with a malignant systemic neoplasm of the thyroid gland.
--: Results not presented because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland.

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	1,209		
Background RH	375	--	--
Low RH	232	5.18 (0.71,37.60)	0.104
High RH	240	--	--
Low plus High RH	472	--	--

[a] Relative risk and confidence interval relative to Comparisons.
--: Results not presented because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland.

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 race, occupation, and ionizing radiation exposure because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

Table 10-22. Analysis of Malignant Systemic Neoplasms (Thyroid Gland) (Continued)

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

1987 Dioxin Category Summary Statistics			Analysis Results for Log₂ (1987 Dioxin + 1)	
1987 Dioxin	n	Number (%) Yes	Estimated Relative Risk (95% C.I.)ᵃ	p-Value
Low	286	0 (0.0)	0.90 (0.34, 2.40)	0.832
Medium	282	2 (0.7)		
High	286	0 (0.0)		

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 Log₂ (1987 Dioxin + 1)	
n	Adjusted Relative Risk (95% C.I.)ᵃ	p-Value
848	0.95 (0.34, 2.70)	0.925

ᵃ Relative risk for a twofold increase in 1987 dioxin.

Note: Results are not adjusted for race, occupation, ionizing radiation exposure, and lifetime cigarette smoking history because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the thyroid gland. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

A significant inverse association between initial dioxin and a malignant systemic neoplasm of the thyroid gland was found from the Model 2 unadjusted analysis (Table 10-22(c): Est. RR=0.12, p=0.046). After adjustment for covariates, the result was marginally significant (Table 10-22(d): Adj. RR=0.12, p=0.059).

A marginally significant difference between Ranch Hands in the low dioxin category and Comparisons was observed in the unadjusted Model 3 analyses (Table 10-22(e): Est. RR=5.42, p=0.092). The occurrence of a malignant systemic neoplasm of the thyroid gland was higher for Ranch Hands in the low dioxin category than for Comparisons. The difference was nonsignificant after adjustment for covariates (Table 10-22(f): p=0.104). All other Model 3 contrasts, as well as the Model 4 analyses, were nonsignificant (Table 10-22(e,g-h): p≥0.68 for all remaining analyses).

10.2.2.1.23 Malignant Systemic Neoplasms (Bronchus and Lung)

Because of the sparse number of participants with a malignant systemic neoplasm of the bronchus or lung, analysis was limited. The unadjusted Model 1 analysis revealed a significant difference between Ranch Hands and Comparisons when examined across all occupations (Table 10-23(a): Est. RR=4.88, p=0.008). The results were marginally significant after adjustment for covariates (Table 10-23(b): Adj. RR=3.66, p=0.070). All other Model 1 contrasts were nonsignificant (Table 10-23(a,b): p>0.11).

Table 10-23. Analysis of Malignant Systemic Neoplasms (Bronchus and Lung)

(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*	*861*	*10 (1.2)*	*4.88 (1.34,17.79)*	*0.008*
	Comparison	*1,249*	*3 (0.2)*		
Officer	Ranch Hand	335	5 (1.5)	3.73 (0.72,19.33)	0.117
	Comparison	494	2 (0.4)		
Enlisted Flyer	Ranch Hand	149	3 (2.0)	3.82 (0.39,37.13)	0.248
	Comparison	187	1 (0.5)		
Enlisted Groundcrew	Ranch Hand	377	2 (0.5)	--	0.310[a]
	Comparison	568	0 (0.0)		

[a] P-value determined using a chi-square test with continuity correction because of the sparse number of participants with a malignant systemic neoplasm of the bronchus and lung.

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the bronchus and lung.

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

Occupational Category	Adjusted Relative Risk (95% C.I.)	p-Value
All	*3.66 (0.78,17.13)*	*0.070*
Officer	3.51 (0.57,21.64)	0.176
Enlisted Flyer	2.58 (0.21,31.26)	0.456
Enlisted Groundcrew	--	--

--: Results not presented because of the sparse number of participants with a malignant systemic neoplasm of the bronchus and lung.

Note: Results are not adjusted for race because of the sparse number of participants with a malignant systemic neoplasm of the bronchus and lung.

(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)	0.46 (0.20,1.04)	0.030
Medium	161	4 (2.5)		
High	159	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.

Table 10-23. Analysis of Malignant Systemic Neoplasms (Bronchus and Lung)
       (Continued)

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

	Analysis Results for Log$_2$ (Initial Dioxin) Adjusted Relative Risk	
n	(95% C.I.)[a]	p-Value
472	0.53 (0.21,1.34)	0.144

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

Note: Results are not adjusted for race because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the bronchus and lung. Results are not adjusted for herbicide exposure because of the sparse number of Ranch Hands who did not report herbicide exposure.

(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	3 (0.3)		
Background RH	378	2 (0.5)	2.14 (0.35,12.94)	0.408
Low RH	234	8 (3.4)	14.26 (3.75,54.20)	<0.001
High RH	242	0 (0.0)	--	0.999[c]
Low plus High RH	476	8 (1.7)	--	0.003[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 participants with a malignant systemic neoplasm of the bronchus and lung.

--: Results not presented because of the sparse number of Ranch Hands with a malignant systemic neoplasm of the bronchus and lung.

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.