

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Trunk)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a3) Minimal (n=489)	Low	118	3.4	0.89 (0.54,1.46)	0.632
	Medium	243	1.6		
	High	128	3.1		
b3) Maximal (n=704)	Low	181	1.7	1.00 (0.70,1.43)	0.999
	Medium	344	2.6		
	High	179	2.2		

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c3) Minimal (n=489)	1.01 (0.62,1.67)	0.954	AGE (p=0.033)
d3) Maximal (n=704)	1.08 (0.75,1.57)	0.684	AGE (p=0.012) SUNRPT (p<0.001)

<sup>a</sup>Relative risk for a twofold increase in dioxin.Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Upper Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a4) Minimal (n=489)	Low	118	0.8	0.45 (0.08,2.68)	0.305
	Medium	243	0.4		
	High	128	0.0		
b4) Maximal (n=704)	Low	181	1.1	0.62 (0.24,1.58)	0.264
	Medium	344	0.6		
	High	179	0.0		

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c4) Minimal (n=489)	--	--	AGE --; SUNBACK (p=0.092)
d4) Maximal (n=704)	0.62 (0.24,1.58)	0.264	ETHE --; AGE (p=0.012)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

--: Adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Lower Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.)	p-Value
a5) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b5) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.0	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c5) Minimal (n=489)	0.640 (18.2, 60.0) <0.1	--	Minimal (60 (985=n)
d5) Maximal (n=704)	0.770 (19.8, 78.0) <0.1	--	Maximal (78 (101=n)

--: Relative risk, confidence interval, and p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

AGE\*XRAY (p=0.020)

b1) Maximal (n=687)	<18.6	0.87 (0.63, 1.12)	0.725 <sup>a</sup>	ETHBACK (p=0.035)
	>18.6	0.95 (0.74, 1.21)	0.623 <sup>b</sup>	SUN2HR (p=0.118)

SUN2HR (p=0.118)

AGE\*XRAY (p=0.047)

SUNRPT\*XRAY(p=0.029)

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).Note: Minimal--Low: >10.14-6.0 ppt; Medium: >14.66-45.73 ppt; High: >45.73 ppt.Maximal--Low: >5.9-1 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Other Sites and NOS)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a6) Minimal (n=489)	Low	118	0.0	0.0	0.469
	Medium	243	0.0	1.2	
	High	128	0.0	0.8	
b6) Maximal (n=704)	Low	181	0.0	0.0	0.151
	Medium	344	0.0	0.6	
	High	179	0.0	1.1	

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c6) Minimal (n=489)	1.34 (0.64,2.81)	0.458	SUN2HR (p=0.101)
d6) Maximal (n=704)	1.62 (0.87,3.01)	0.143	SUN2HR (p=0.099)

<sup>a</sup>Relative risk for a twofold increase in dioxin.Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

**TABLE 7-7. (Continued)**  
**Analysis of Basal Cell Carcinoma**  
**(All Sites Combined)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e1) Minimal (n=489)	<18.6 (65)	9.2 (65)	9.1 (121)	5.6 (54)	0.71 (0.43,1.16)	0.942 <sup>b</sup> 0.167 <sup>c</sup>
	>18.6 (54)	13.0 (121)	5.8 (74)	5.4 (74)	0.69 (0.43,1.09)	0.110 <sup>c</sup>
f1) Maximal (n=704)	<18.6 (102)	8.8 (102)	10.6 (179)	3.7 (81)	0.84 (0.61,1.16)	0.999 <sup>b</sup> 0.291 <sup>c</sup>
	>18.6 (78)	6.4 (166)	9.0 (98)	4.1 (98)	0.84 (0.62,1.16)	0.289 <sup>c</sup>

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g1) Minimal (n=476)	<18.6	0.77 (0.46,1.28)	0.759 <sup>b</sup> 0.312 <sup>c</sup>	ETHBACK (p=0.068) SUN2HR (p=0.128)
	>18.6	0.86 (0.53,1.39)	0.526 <sup>c</sup>	SUNRPT (p=0.019) AGE*XRAY (p=0.020)
h1) Maximal (n=687)	<18.6	0.87 (0.68,1.12)	0.725 <sup>b</sup> 0.280 <sup>c</sup>	ETHBACK (p=0.035) SUN2HR (p=0.118)
	>18.6	0.95 (0.74,1.21)	0.623 <sup>c</sup>	AGE*XRAY (p=0.047) SUNRPT*XRAY(p=0.029)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Ear, Face, Head, and Neck)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e2) Minimal (n=489)	<18.6 (65)	6.2 (65)	5.8 (121)	1.9 (54)	0.58 (0.29,1.17)	0.282 <sup>b</sup> 0.127 <sup>c</sup>
	>18.6 (54)	13.0 (54)	3.3 (121)	1.4 (74)	0.31 (0.13,0.76)	0.011 <sup>c</sup>
f2) Maximal (n=704)	<18.6 (102)	5.9 (102)	7.3 (179)	1.2 (81)	0.74 (0.49,1.13)	0.755 <sup>b</sup> 0.159 <sup>c</sup>
	>18.6 (78)	2.6 (78)	7.2 (166)	1.0 (98)	0.67 (0.42,1.06)	0.087 <sup>c</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g2) Minimal (n=476)	<18.6	0.69 (0.34,1.39)	0.349 <sup>b</sup>	AGE (p=0.123)
	>18.6	0.41 (0.17,0.99)	0.296 <sup>c</sup>	SUN2HR (p=0.003)
h2) Maximal (n=687)	<18.6	0.82 (0.52,1.28)	0.047 <sup>c</sup>	ETHBACK (p=0.133)
	>18.6	0.74 (0.45,1.23)	0.776 <sup>b</sup>	AGE (p=0.009)
			0.375 <sup>c</sup>	SUN2HR (p=0.001)
			0.246 <sup>c</sup>	ETHBACK (p=0.084)

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

**TABLE 7-7. (Continued)**  
**Analysis of Basal Cell Carcinoma**  
**(Trunk)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e3) Minimal (n=489)	<18.6	3.1 (65)	2.5 (121)	3.7 (54)	0.88 (0.42,1.84)	0.997 <sup>b</sup> 0.730 <sup>c</sup>
	>18.6	3.7 (54)	0.8 (121)	2.7 (74)	0.88 (0.42,1.84)	0.729 <sup>c</sup>
f3) Maximal (n=704)	<18.6	2.9 (102)	2.8 (179)	2.5 (81)	0.99 (0.60,1.64)	0.906 <sup>b</sup> 0.964 <sup>c</sup>
	>18.6	1.3 (78)	1.8 (166)	2.0 (98)	1.03 (0.60,1.79)	0.905 <sup>c</sup>

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g3) Minimal (n=489)	<18.6	1.19 (0.57,2.50)	0.804 <sup>b</sup> 0.646 <sup>c</sup>	AGE (p=0.020) SUNRPT (p=0.001)
	>18.6	1.05 (0.51,2.17)	0.901 <sup>c</sup>	
h3) Maximal (n=704)	<18.6	1.19 (0.69,2.06)	0.887 <sup>b</sup> 0.526 <sup>c</sup>	AGE (p=0.007) SUNRPT (p<0.001)
	>18.6	1.13 (0.63,2.01)	0.687 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.

<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Upper Extremities)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e4) Minimal (n=489)	<18.6	0.0 (65)	0.8 (121)	0.0 (54)	--	--
	>18.6	1.9 (54)	0.0 (121)	0.0 (74)		
f4) Maximal (n=704)	<18.6	0.0 (102)	0.6 (179)	0.0 (81)	--	--
	>18.6	2.6 (78)	0.6 (166)	0.0 (98)	0.25 (0.04,1.59)	0.141 <sup>c</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g4) Minimal (n=489)	<18.6	--	--	--
	>18.6	--	--	
h4) Maximal (n=704)	<18.6	--	--	SUNRPT (p=0.111)
	>18.6	0.15 (0.01,1.81)	0.136 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Lower Extremities)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e5) Minimal (n=489)	<18.6	0.0 (65)	0.0 (121)	0.0 (54)	--	--
	>18.6	0.0 (54)	0.0 (121)	0.0 (74)	--	--
f5) Maximal (n=704)	<18.6	0.0 (102)	0.0 (179)	0.0 (81)	--	--
	>18.6	0.0 (78)	0.0 (166)	0.0 (98)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g5) Minimal (n=489)	<18.6	--	--	--
	>18.6	--	--	--
h5) Maximal (n=704)	<18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Minimal-Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal-Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-7. (Continued)

Analysis of Basal Cell Carcinoma  
(Other Sites and NOS)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e6) Minimal (n=489)	<18.6	0.0 (65)	0.8 (121)	0.0 (54)	1.29 (0.59,2.86)	0.523 <sup>c</sup>
	>18.6	0.0 (54)	1.7 (121)	1.4 (74)		
f6) Maximal (n=704)	<18.6	0.0 (102)	0.6 (179)	0.0 (81)	1.52 (0.77,2.98)	0.224 <sup>c</sup>
	>18.6	0.0 (78)	1.2 (166)	1.0 (98)		

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g6) Minimal (n=489)	<18.6	--	--	SUN2HR (p=0.092)
	>18.6	1.32 (0.58,2.99)	0.509 <sup>c</sup>	
h6) Maximal (n=704)	<18.6	--	--	SUN2HR (p=0.093)
	>18.6	1.57 (0.78,3.16)	0.209 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-7. (Continued)

**Analysis of Basal Cell Carcinoma  
(All Sites Combined)  
(Verified)**

**i1) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	6.6	All Categories		0.117
Unknown	333	9.0	Unknown vs. Background	1.39 (0.87,2.24)	0.171
Low	184	8.7	Low vs. Background	1.34 (0.74,2.42)	0.329
High	179	3.9	High vs. Background	0.57 (0.26,1.29)	0.177
Total	1,435				

**j1) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	718	All Categories		0.205	SUN2HR (p=0.011) SUNRPT (p=0.052)
Unknown	324	Unknown vs. Background	1.37 (0.84,2.26)	0.208	LAT (p=0.025)
Low	180	Low vs. Background	1.54 (0.84,2.82)	0.124	AGE*ETHBACK (p=0.025)
High	175	High vs. Background	0.71 (0.31,1.63)	0.478	HAIR*XRAY (p=0.039)
Total	1,397				

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

TABLE 7-7. (Continued)

**Analysis of Basal Cell Carcinoma  
(Ear, Face, Head, and Neck)  
(Verified)**

**j2) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	5.1	All Categories		0.019
Unknown	333	6.6	Unknown vs. Background	1.30 (0.76,2.24)	0.336
Low	184	5.4	Low vs. Background	1.06 (0.52,2.17)	0.873
High	179	1.1	High vs. Background	0.21 (0.05,0.87)	0.032
Total	1,435				

**j2) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	718	All Categories		0.087	AGE (p=0.037)
Unknown	324	Unknown vs. Background	1.19 (0.68,2.10)	0.541	ETHBACK (p=0.021)
Low	180	Low vs. Background	1.18 (0.57,2.45)	0.662	HAIR (p=0.092)
High	175	High vs. Background	0.26 (0.06,1.08)	0.063	SUN2HR (p=0.038)
Total	1,397				SUNRPT (p=0.041)

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

TABLE 7-7. (Continued)

**Analysis of Basal Cell Carcinoma  
(Trunk)  
(Verified)**

**i3) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	1.4	All Categories		0.765
Unknown	333	2.1	Unknown vs. Background	1.57 (0.59,4.15)	0.368
Low	184	1.6	Low vs. Background	1.21 (0.33,4.44)	0.776
High	179	2.2	High vs. Background	1.67 (0.52,5.38)	0.393
Total	1,435				

**j3) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	738	All Categories		0.641	AGE (p=0.041) SUNRPT (p=0.003)
Unknown	333	Unknown vs. Background	1.59 (0.60,4.25)	0.351	
Low	184	Low vs. Background	1.28 (0.35,4.75)	0.709	
High	179	High vs. Background	2.06 (0.62,6.83)	0.238	
Total	1,434				

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

TABLE 7-7. (Continued)

**Analysis of Basal Cell Carcinoma  
(Upper Extremities)  
(Verified)**

**i4) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.5	All Categories		0.633
Unknown	333	0.9	Unknown vs. Background	1.67 (0.37,7.51)	0.754
Low	184	0.5	Low vs. Background	1.00 (0.11,9.04)	0.999
High	179	0.0	High vs. Background	--	0.838
Total	1,435				

**j4) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	734	All Categories		0.567	AGE (p=0.083) LAT (p=0.124)
Unknown	332	Unknown vs. Background	1.78 (0.39,8.07)	0.455	
Low	184	Low vs. Background	1.10 (0.12,9.98)	0.934	
High	179	High vs. Background	--	--	
Total	1,429				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

**TABLE 7-7. (Continued)**

**Analysis of Basal Cell Carcinoma  
(Lower Extremities)  
(Verified)**

**i5) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.0	All Categories		--
Unknown	333	0.0	Unknown vs. Background	--	--
Low	184	0.0	Low vs. Background	--	--
High	179	0.0	High vs. Background	--	--
Total	1,435				

**j5) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	739	All Categories		--	--
Unknown	333	Unknown vs. Background	--	--	--
Low	184	Low vs. Background	--	--	--
High	179	High vs. Background	--	--	--
Total	1,435				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 10 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

Under the minimal assumptions, the adjusted analysis of the frequency of Ranch Hands with a basal cell carcinoma on the ear, face, head, and neck contained a nonsignificant interaction between current dioxin and time (Table 7-7 [g2]:  $p=0.569$ ). For Ranch Hands with time over 18.6 years, however, the relative risk was significant but less than 1 (Adj. RR=0.41,  $p=0.047$ ). Under the maximal assumption, the interaction of current dioxin and time was nonsignificant (Table 7-7 [h2]:  $p=0.776$ ) as were the relative risks for the individual time stratum after adjusting for age, sun reaction after at least 3 hours of sun exposure, and ethnic background.

TABLE 7-7. (Continued)

**Analysis of Basal Cell Carcinoma  
(Other Sites and NOS)  
(Verified)**

**i6) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.1	All Categories		0.011
Unknown	333	0.0	Unknown vs. Background	--	0.999
Low	184	1.6	Low vs. Background	12.23 (1.27,118.3)	0.053
High	179	0.6	High vs. Background	4.15 (0.26,66.61)	0.704
Total	1,435				

**j6) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	739	All Categories		0.035	SUN2HR (p=0.070)
Low	184	Low vs. Background	13.34 (1.40,127.1)	0.024	
High	179	High vs. Background	3.93 (0.25,62.34)	0.332	
Total	1,435				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin <10 ppt.

Unknown (Ranch Hands): Current Dioxin <10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin <33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

Under the minimal assumption, there were two Ranch Hands with a verified basal cell carcinoma on the upper extremities. Under the maximal assumption, there were four Ranch Hands with a verified basal cell carcinoma on the upper extremities. Both unadjusted analyses were nonsignificant with relative risks less than 1 for an association with initial dioxin (Table 7-7 [a4] and [b4]:  $p=0.305$  and  $p=0.264$ , respectively). Because of the sparse number of neoplasms under the minimal assumption, adjusted analyses were not performed. Under the maximal assumption, no covariates were retained in the adjusted model; therefore, the results of the unadjusted and the adjusted analyses were identical.

Under the minimal and maximal assumptions, there were no Ranch Hands with a verified basal cell carcinoma on the lower extremities (Table 7-7 [a5] and [b5]).

Under the minimal and maximal assumptions, four Ranch Hands had a verified basal cell carcinoma for other sites and sites NOS. The unadjusted analysis produced relative risks greater than 1 but the risks were not significant (Table 7-7 [a6] and [b6]:  $p=0.469$  and  $p=0.151$ , respectively). Adjusted analyses also produced nonsignificant relative risks (Table 7-7 [c6] and [d6]:  $p=0.458$  and  $p=0.143$ , respectively).

#### ***Model 2: Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time***

Under both assumptions, the unadjusted analysis of the frequency of Ranch Hands with a verified basal cell carcinoma for all sites combined exhibited a nonsignificant interaction between current dioxin and time since tour (Table 7-7 [e1] and [f1]:  $p=0.942$  and  $p=0.999$ ). Under the minimal and the maximal assumptions, the adjusted analyses also had nonsignificant current dioxin-by-time interactions (Table 7-7 [g1] and [h1]:  $p=0.759$  and  $p=0.725$ ). For each of these analyses, the relative risk within each individual time stratum was nonsignificant and less than 1.

Under both assumptions, the unadjusted analysis of Ranch Hands with a verified basal cell carcinoma on the ear, face, head, and neck displayed a nonsignificant current dioxin-by-time interaction (Table 7-7 [e2] and [f2]:  $p=0.282$  and  $p=0.755$ ); thus, the relative risks within each time stratum did not differ significantly. However, in the minimal analysis, there was a significant relative risk less than 1 for Ranch Hands with tours over 18.6 years (Table 7-7 [e2]: Est. RR=0.31,  $p=0.011$ ). In the maximal analysis, there was a marginally significant relative risk (Table 7-7 [f2]: Est. RR=0.67,  $p=0.087$ ) also less than 1 for the same time stratum. In the former analysis, the relative frequencies of Ranch Hands with a verified basal cell carcinoma on the ear, face, head, and neck were 13.0, 3.3, and 1.4 percent within the low, medium, and high current dioxin categories for Ranch Hands with earlier tours. In the maximal analysis, the corresponding relative frequencies were 2.6, 7.2, and 1.0 percent.

Under the minimal assumption, the adjusted analysis of the frequency of Ranch Hands with a basal cell carcinoma on the ear, face, head, and neck contained a nonsignificant interaction between current dioxin and time (Table 7-7 [g2]:  $p=0.349$ ). For Ranch Hands with time over 18.6 years, however, the relative risk was significant but less than 1 (Adj. RR=0.41,  $p=0.047$ ). Under the maximal assumption, the interaction of current dioxin and time was nonsignificant (Table 7-7 [h2]:  $p=0.776$ ) as were the relative risks for the individual time stratum after adjusting for age, skin reaction after at least 2 hours of sun exposure, and ethnic background.

In the unadjusted analysis of Ranch Hands with a verified basal cell carcinoma on the trunk, the interaction of current dioxin and time since tour was nonsignificant for both assumptions (Table 7-7 [e3] and [f3]:  $p=0.997$  and  $p=0.906$ ). The adjusted analysis also contained nonsignificant interactions between current dioxin and time (Table 7-7 [g3] and [h3]:  $p=0.804$  and  $p=0.887$ ). In the adjusted analysis, the relative risks associated for each time stratum were greater than 1 but nonsignificant.

In the unadjusted analysis of verified basal cell carcinoma on the upper extremities under the minimal assumption, each time since tour stratum contained only one Ranch Hand with the neoplasm of interest. Because of the sparse number of Ranch Hands with a basal cell carcinoma on the upper extremities, the relative risks, confidence intervals, and p-values were not reported for both the unadjusted and the adjusted analyses under the minimal assumption. Under the maximal assumption, one Ranch Hand with time of 18.6 years or less had a verified basal cell carcinoma on the upper extremities; three Ranch Hands had this particular skin neoplasm for time over 18.6 years. Due to the sparse number of basal cell carcinomas on the upper extremities for Ranch Hands with later tours, the relative risk, confidence interval, and p-value were not reported for that time stratum, as well as the p-value associated with the interaction of current dioxin and time. For the other time stratum, the relative risk was nonsignificant and less than 1 (Table 7-7 [f4]:  $p=0.141$ ). Under the maximal assumption, an adjusted model also yielded a nonsignificant relative risk for time over 18.6 years (Table 7-7 [h4]:  $p=0.136$ ).

No Ranch Hands had a verified basal cell carcinoma on the lower extremities (Table 7-7 [e5] and [f5]).

In the unadjusted analysis under each assumption, one Ranch Hand had a verified basal cell carcinoma for other sites and sites NOS with time of 18.6 years or less and three Ranch Hands had a verified basal cell carcinoma for other sites and sites NOS with time over 18.6 years. Due to the sparse number of Ranch Hands with later tours, the relative risk, confidence interval, and p-value were not reported for that time stratum, as well as the p-value associated with the interaction of current dioxin and time. For the earlier time stratum (over 18.6 years), the relative risk for verified basal cell carcinoma was nonsignificant in each unadjusted analysis (Table 7-7 [e6] and [f6]:  $p=0.523$  and  $p=0.224$ ). Corresponding adjusted analyses for time over 18.6 years also contained nonsignificant relative risks (Table 7-7 [g6] and [h6]:  $p=0.509$  and  $p=0.209$ ).

#### ***Model 3: Ranch Hands and Comparisons by Current Dioxin Category***

In the unadjusted analysis of verified basal cell carcinoma for all sites combined, the relative frequencies of participants with disease were not significantly different among Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background current dioxin category (Table 7-7 [i1]:  $p=0.117$ ). The overall contrast for the corresponding adjusted analysis was also nonsignificant (Table 7-7 [j1]:  $p=0.205$ ). There were no participants with suspected basal cell carcinoma.

In the unadjusted analysis for verified basal cell carcinoma on the ear, face, head, and neck, the relative frequencies differed significantly among Ranch Hands with unknown, low, and high current dioxin and Comparisons with background current dioxin (Table 7-7 [i2]:

$p=0.019$ ). The relative frequencies for background, unknown, low, and high current dioxin were 5.1, 6.6, 5.4, and 1.1 percent. The high versus background contrast was significant ( $p=0.032$ ) but the relative risk was less than 1 (Est.  $RR=0.21$ , 95% C.I.: [0.05,0.87]). The unknown versus background and low versus background contrasts had relative risks greater than 1 but they were nonsignificant ( $p=0.336$  and  $p=0.873$ , respectively). An adjusted model that retained six covariates (age, ethnic background, the two skin reaction to sun exposure variables, hair color, and average lifetime residential latitude) exhibited a marginally significant overall contrast (Table 7-7 [j2]:  $p=0.087$ ). The high versus background contrast was also marginally significant ( $p=0.063$ ) but the relative risk was less than 1 (Adj.  $RR=0.26$ , 95% C.I.: [0.06,1.08]). The unknown versus background and low versus background contrasts had relative risks greater than 1 but were nonsignificant ( $p=0.541$  and  $p=0.662$ , respectively).

The unadjusted and the adjusted analyses for verified basal cell carcinoma on the trunk contained nonsignificant overall contrasts for the three current dioxin categories of the Ranch Hands and the background current dioxin category of the Comparisons (Table 7-7 [i3] and [j3]:  $p=0.765$  and  $p=0.641$ , respectively). The individual contrasts had associated relative risks greater than 1 but were nonsignificant.

Four Ranch Hands and four Comparisons had a verified basal cell carcinoma on the upper extremities. Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background category exhibited nonsignificant overall unadjusted and adjusted contrasts for verified basal cell carcinomas on the upper extremities (Table 7-7 [i4] and [j4]:  $p=0.633$  and  $p=0.567$ , respectively).

No participants had a verified basal cell carcinoma on the lower extremities (Table 7-7 [i5]).

Four Ranch Hands (three in the low category, one in the high category) and one Comparison had a verified basal cell carcinoma for other sites and sites NOS. In the unadjusted analysis, the overall contrast of the relative frequencies of Ranch Hands with unknown, low, and high current dioxin and Comparisons with background current dioxin was significant (Table 7-7 [i6]:  $p=0.011$ ). The relative frequencies for the background, unknown, low, and high current dioxin categories were 0.1, 0.0, 1.6, and 0.6 percent. The contrast of Ranch Hands in the unknown current dioxin category with Comparisons in the background category was nonsignificant ( $p=0.999$ ). The contrast using Ranch Hands in the low current dioxin category was marginally significant (Est.  $RR=12.23$ , 95% C.I.: [1.27,118.23],  $p=0.053$ ). The high versus background contrast also had a relative risk over 1 but it was nonsignificant ( $p=0.704$ ) and lower than the relative risk of the low versus background contrast. After adjusting for skin reaction after at least 2 hours of sun exposure, the overall contrast remained significant (Table 7-7 [j6]:  $p=0.035$ ). The low versus background contrast became significant (Adj.  $RR=13.34$ , 95% C.I.: [1.40,127.1],  $p=0.024$ ) and the high versus background contrast remained nonsignificant ( $p=0.332$ ).

## Sun Exposure-Related Malignant Skin Neoplasms—All Sites and by Location/Site

### ***Model 1: Ranch Hands - Log<sub>2</sub> (Initial Dioxin)***

Under the minimal assumption, the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm for all sites combined contained a significant relative risk with respect to initial dioxin (Table 7-8 [a1]: Est. RR=0.70, p=0.014) but it was less than 1. The relative frequencies were 13.6, 7.8, and 6.3 percent for the low, medium, and high initial dioxin categories. The corresponding unadjusted analysis under the maximal assumption was nonsignificant with a relative risk less than 1 (Table 7-8 [b1]: p=0.103).

Under the minimal assumption, the adjusted analysis contained a significant interaction between initial dioxin and ionizing radiation (Table 7-8 [c1]: p=0.020). To investigate the interaction, the association with initial dioxin was examined separately for Ranch Hands who reported being exposed and not being exposed to ionizing radiation (Appendix Table F-1). For those Ranch Hands who had not reported exposure to ionizing radiation, the relative risk was nonsignificant (p=0.960); for Ranch Hands who reported exposure to ionizing radiation, the relative risk was significant but less than 1 (Adj. RR=0.36, p=0.029). A model without the interaction between initial dioxin and ionizing radiation displayed a nonsignificant relative risk (p=0.212). Under the maximal assumption, the adjusted analysis of the frequency of Ranch Hands with a sun exposure-related malignant skin neoplasm was nonsignificant (Table 7-8 [d1]: p=0.235).

The unadjusted analyses for a verified sun exposure-related malignant skin neoplasm on the ear, face, head, and neck displayed significant relative risks less than 1 under each assumption (Table 7-8 [a2] and [b2]: Est. RR=0.56, p=0.003 and Est. RR=0.75, p=0.031). Under the minimal assumption, the relative frequencies of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the ear, face, head, and neck were 9.3, 5.3, and 2.3 percent for the low, medium, and high initial dioxin categories. In the maximal analysis, the corresponding relative frequencies for low, medium, and high initial dioxin were 5.5, 7.3, and 2.2 percent. Under the minimal assumption, the adjusted analysis contained a significant relative risk but it remained less than 1 (Table 7-8 [c2]: Adj. RR=0.65, p=0.047). Under the maximal assumption, adjustment for age, ethnic background, hair color, skin reaction after at least 2 hours of sun exposure, and average lifetime residential latitude produced a nonsignificant relative risk that also was less than 1 (Table 7-8 [d2]: p=0.197).

In the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the trunk, the estimated relative risks were nonsignificant and less than 1 under both assumptions (Table 7-8 [a3] and [b3]: p=0.132 and p=0.648). In addition, both adjusted analyses produced nonsignificant relative risks (Table 7-8 [c3] and [d3]: p=0.389 and p=0.967).

For verified sun exposure-related malignant skin neoplasms on the upper extremities, the minimal analysis contained three Ranch Hands and the maximal analysis contained five Ranch Hands with these skin neoplasms. Under both assumptions, the relative risks were nonsignificant for the unadjusted analyses using initial dioxin (Table 7-8 [a4] and [b4]: p=0.908 and p=0.890). Due to the small number of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the upper extremities, adjusted analyses were

**TABLE 7-8.**  
**Analysis of Sun Exposure-Related Malignant Skin Neoplasms**  
**(All Sites Combined)**

<b>Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted</b>						
Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	
a1) Minimal (n=489)	Low	118	13.6	0.70 (0.51,0.95)	0.014	
	Medium	243	7.8			
	High	128	6.3			
b1) Maximal (n=704)	Low	181	8.3	0.85 (0.69,1.04)	0.103	
	Medium	344	10.5			
	High	179	5.6			
<b>Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted</b>						
Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value		Covariate Remarks		
c1) Minimal (n=476)	0.82 (0.59,1.13)**	0.212**		INIT*XRAY (p=0.020) ETHBACK (p=0.047) SUN2HR (p=0.005) SUNRPT (p=0.008) AGE*XRAY (p=0.015)		
d1) Maximal (n=687)	0.87 (0.69,1.10)	0.235		AGE (p=0.002) ETHBACK (p=0.032) SUN2HR (p=0.017) SUNRPT*LAT (p=0.008) SUNRPT*XRAY (p=0.029)		

<sup>a</sup>Relative risk for a twofold increase in dioxin.

\*\*Log<sub>2</sub> (initial dioxin)-by-covariate interaction (0.01<p≤0.05); adjusted relative risk, confidence interval, and p-value derived from a model fitted after deletion of this interaction.

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

TABLE 7-8. (Continued)

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Ear, Face, Head, and Neck)**

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted**

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a2) Minimal (n=489)	Low	118	9.3	0.56 (0.36,0.86)	0.003
	Medium	243	5.3		
	High	128	2.3		
b2) Maximal (n=704)	Low	181	5.5	0.75 (0.58,0.99)	0.031
	Medium	344	7.3		
	High	179	2.2		

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted**

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c2) Minimal (n=476)	0.65 (0.41,1.03)	0.047	AGE (p=0.042) SUN2HR (p<0.001) ETHBACK (p=0.097)
d2) Maximal (n=687)	0.83 (0.61,1.11)	0.197	AGE (p=0.021) ETHBACK (p=0.083) HAIR (p=0.099) SUN2HR (p<0.001) LAT (p=0.072)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

For verified sun exposure-related malignant skin neoplasms on the upper extremities, the minimal analysis contained three Ranch Hands and the maximal analysis contained five Ranch Hands with these skin neoplasms. Under both assumptions, the relative risks were nonsignificant for the unadjusted analyses using initial dioxin (Table 7-8 [a4] and [b4]: p=0.908 and p=0.890). Due to the small number of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the upper extremities, adjusted analyses were

**TABLE 7-8. (Continued)**  
**Analysis of Sun Exposure-Related Malignant Skin Neoplasms**  
**(Trunk)**

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted**

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a3) Minimal (n=489)	Low	118	5.9	0.69 (0.41,1.16)	0.132
	Medium	243	1.6		
	High	128	3.1		
b3) Maximal (n=704)	Low	181	1.7	0.92 (0.66,1.30)	0.648
	Medium	344	3.5		
	High	179	2.2		

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted**

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c3) Minimal (n=489)	0.81 (0.48,1.34)	0.389	AGE (p=0.016) SUNRPT (p<0.001)
d3) Maximal (n=704)	0.99 (0.69,1.43)	0.967	AGE (p=0.004) SUNRPT (p<0.001)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

Note: Minimal-Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal-Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Upper Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a4) Minimal (n=489)	Low	118	0.8	1.06 (0.43,2.62)	0.908
	Medium	243	0.4		
	High	128	0.8		
b4) Maximal (n=704)	Low	181	1.1	0.96 (0.50,1.83)	0.890
	Medium	344	0.6		
	High	179	0.6		

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c4) Minimal (n=489)	--	--	--
d4) Maximal (n=704)	0.95 (0.49,1.86)	0.889	SUN2HR (p=0.131)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

--: Adjusted analysis not performed due to the sparse number of abnormalities.

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

Relative risk for a twofold increase in dioxin.

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

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Lower Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a5) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b5) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.0	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c5) Minimal (n=489)	--	--	
d5) Maximal (n=704)	--	--	

<sup>a</sup>Relative risk for a twofold increase in dioxin.

--: Relative risk, confidence interval, and p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

h1) Maximal (n=687)	≤18.6	0.96 (0.69, 1.33)	0.386	AOB (p<0.001)
	>18.6	0.96 (0.69, 1.33)	0.386	ETHBACK (p=0.027)

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin, previous dioxin, time categorized).<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin, previous dioxin, time categorized).Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-43.75 ppt; High: >43.75 ppt.  
Maximal--Low: >5-9.01 ppt; Medium: >9.01-31.5 ppt; High: >31.5 ppt.

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Other Sites and NOS)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a6) Minimal (n=489)	Low	118	0.0	1.32 (0.64,2.69)	0.469
	Medium	243	1.2		
	High	128	0.8		
b6) Maximal (n=704)	Low	181	0.0	1.58 (0.87,2.86)	0.151
	Medium	344	0.6		
	High	179	1.1		

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c6) Minimal (n=489)	1.34 (0.64,2.81)	0.458	SUN2HR (p=0.101)
d6) Maximal (n=704)	1.62 (0.87,3.01)	0.143	SUN2HR (p=0.099)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

Note: Minimal--Low: 52-93 ppt; Medium: &gt;93-292 ppt; High: &gt;292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: &gt;56.9-218 ppt; High: &gt;218 ppt.

TABLE 7-8. (Continued)

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(All Sites Combined)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e1) Minimal (n=489)	≤18.6	12.3 (65)	9.9 (121)	5.6 (54)	0.63 (0.38,1.03)	0.694 <sup>b</sup> 0.065 <sup>c</sup>
	>18.6	14.8 (54)	5.8 (121)	6.8 (74)	0.72 (0.47,1.10)	0.125 <sup>c</sup>
f1) Maximal (n=704)	≤18.6	8.8 (102)	12.3 (179)	3.7 (81)	0.84 (0.62,1.14)	0.910 <sup>b</sup> 0.253 <sup>c</sup>
	>18.6	7.7 (78)	9.6 (166)	5.1 (98)	0.86 (0.64,1.15)	0.305 <sup>c</sup>

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g1) Minimal (n=476)	≤18.6	0.72 (0.43,1.20)	0.452 <sup>b</sup> 0.207 <sup>c</sup>	ETHBACK (p=0.052) SUN2HR (p=0.010)
	>18.6	0.93 (0.59,1.45)	0.739 <sup>c</sup>	SUNRPT (p=0.010) AGE*XRAY (p=0.034)
h1) Maximal (n=687)	≤18.6	0.96 (0.69,1.33)	0.992 <sup>b</sup> 0.784 <sup>c</sup>	AGE (p<0.001) ETHBACK (p=0.027)
	>18.6	0.96 (0.69,1.32)	0.782 <sup>c</sup>	SUN2HR (p=0.027) SUNRPT (p=0.004)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-8. (Continued)

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Ear, Face, Head, and Neck)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e2) Minimal (n=489)	≤18.6	7.7 (65)	6.6 (121)	1.9 (54)	0.54 (0.28,1.06)	0.759 <sup>b</sup> 0.075 <sup>c</sup>
	>18.6	13.0 (54)	3.3 (121)	2.7 (74)	0.47 (0.24,0.92)	0.029 <sup>c</sup>
f2) Maximal (n=704)	≤18.6	5.9 (102)	8.4 (179)	1.2 (81)	0.76 (0.51,1.12)	0.941 <sup>b</sup> 0.166 <sup>c</sup>
	>18.6	3.8 (78)	7.2 (166)	2.0 (98)	0.74 (0.49,1.11)	0.143 <sup>c</sup>

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g2) Minimal (n=476)	≤18.6	0.65 (0.33,1.29)	0.854 <sup>b</sup>	AGE (p=0.057)
	>18.6	0.60 (0.30,1.18)	0.223 <sup>c</sup>	SUN2HR (p<0.001)
h2) Maximal (n=687)	≤18.6	0.86 (0.56,1.31)	0.140 <sup>c</sup>	ETHBACK (p=0.101)
	>18.6	0.84 (0.54,1.32)	0.954 <sup>b</sup> 0.479 <sup>c</sup> 0.455 <sup>c</sup>	AGE (p=0.017) SUN2HR (p<0.001) ETHBACK (p=0.076) LAT (p=0.078) HAIR (p=0.100)

<sup>a</sup>Relative risk for a twofold increase in dioxin.

<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

Note: Minimal-Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal-Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Trunk)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e3) Minimal (n=489)	≤18.6	6.2 (65)	2.5 (121)	3.7 (54)	0.66 (0.31,1.40)	0.872 <sup>b</sup> 0.277 <sup>c</sup>
	>18.6	5.6 (54)	0.8 (121)	2.7 (74)	0.72 (0.33,1.54)	0.397 <sup>c</sup>
f3) Maximal (n=704)	≤18.6	2.9 (102)	3.9 (179)	2.5 (81)	0.92 (0.57,1.49)	0.927 <sup>b</sup> 0.738 <sup>c</sup>
	>18.6	1.3 (78)	2.4 (166)	2.0 (98)	0.95 (0.56,1.62)	0.858 <sup>c</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g3) Minimal (n=489)	≤18.6	0.92 (0.42,2.00)	0.927 <sup>b</sup>	AGE (p=0.009)
	>18.6		0.833 <sup>c</sup>	SUNRPT (p<0.001)
h3) Maximal (n=704)	≤18.6	1.13 (0.67,1.91)	0.727 <sup>c</sup>	AGE (p=0.002)
	>18.6		0.649 <sup>c</sup>	SUNRPT (p<0.001)

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Upper Extremities)

## Ranch Hands - Log2 (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e4) Minimal (n=489)	≤18.6	0.0 (65)	0.8 (121)	0.0 (54)	--	--
	>18.6	1.9 (54)	0.0 (121)	1.4 (74)	1.05 (0.36,3.02)	0.929 <sup>c</sup>
f4) Maximal (n=704)	≤18.6	0.0 (102)	0.6 (179)	0.0 (81)	--	--
	>18.6	2.6 (78)	0.6 (166)	1.0 (98)	0.77 (0.35,1.72)	0.528 <sup>c</sup>

## Ranch Hands - Log2 (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g4) Minimal (n=489)	≤18.6	--	--	--
	>18.6	--	--	--
h4) Maximal (n=704)	≤18.6	--	--	SUN2HR (p=0.126)
	>18.6	0.76 (0.33,1.74)	0.516 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Lower Extremities)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e5) Minimal (n=489)	≤18.6	0.0 (65)	0.0 (121)	0.0 (54)	--	--
	>18.6	0.0 (54)	0.0 (121)	0.0 (74)	--	--
f5) Maximal (n=704)	≤18.6	0.0 (102)	0.0 (179)	0.0 (81)	--	--
	>18.6	0.0 (78)	0.0 (166)	0.0 (98)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g5) Minimal (n=489)	≤18.6	--	--	Minimal (0g (88=0)
	>18.6	--	--	
h5) Maximal (n=704)	≤18.6	--	--	Maximal (0d (107=0)
	>18.6	--	--	

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Minimal-Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal-Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-8. (Continued)

Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Other Sites and NOS)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Current Dioxin Low	Medium	High		
e6) Minimal (n=489)	≤18.6	0.0 (65)	0.8 (121)	0.0 (54)	1.29 (0.59,2.86)	0.523 <sup>c</sup>
	>18.6	0.0 (54)	1.7 (121)	1.4 (74)		
f6) Maximal (n=704)	≤18.6	0.0 (102)	0.6 (179)	0.0 (81)	1.52 (0.77,2.98)	0.224 <sup>c</sup>
	>18.6	0.0 (78)	1.2 (166)	1.0 (98)		

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g6) Minimal (n=489)	≤18.6	--	--	SUN2HR (p=0.092)
	>18.6	1.32 (0.58,2.99)	0.509 <sup>c</sup>	
h6) Maximal (n=704)	≤18.6	--	--	SUN2HR (p=0.093)
	>18.6	1.57 (0.78,3.16)	0.209 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

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

TABLE 7-8. (Continued)

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(All Sites Combined)  
(Verified)**

**i1) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	7.0	All Categories		
Unknown	333	9.9	Unknown vs. Background	1.45 (0.92,2.30)	0.110
Low	184	9.2	Low vs. Background	1.34 (0.76,2.39)	0.313
High	179	4.5	High vs. Background	0.62 (0.29,1.33)	0.215
Total	1,435				

**j1) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	718	All Categories		0.188	SUN2HR (p=0.008) LAT (p=0.023)
Unknown	324	Unknown vs. Background	1.45 (0.89,2.34)	0.134	AGE*ETHBACK (p=0.025)
Low	180	Low vs. Background	1.51 (0.84,2.74)	0.171	HAIR*XRAY (p=0.033)
High	175	High vs. Background	0.77 (0.35,1.69)	0.515	SUNRPT*XRAY (p=0.037)
Total	1,397				

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

**TABLE 7-8. (Continued)**

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Ear, Face, Head, and Neck)  
(Verified)**

**j2) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	5.3	All Categories		0.026
Unknown	333	7.5	Unknown vs. Background	1.46 (0.87,2.45)	0.156
Low	184	6.0	Low vs. Background	1.14 (0.57,2.28)	0.707
High	179	1.7	High vs. Background	0.31 (0.09,1.00)	0.050
Total	1,435				

**j2) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	718	All Categories		0.128	AGE (p=0.019)
Unknown	324	Unknown vs. Background	1.34 (0.78,2.31)	0.285	ETHBACK (p=0.018)
Low	180	Low vs. Background	1.28 (0.63,2.59)	0.498	HAIR (p=0.042)
High	175	High vs. Background	0.38 (0.12,1.28)	0.119	SUN2HR (p=0.022)
Total	1,397				SUNRPT (p=0.047)
					LAT (p=0.021)

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

High (Ranch Hands): Current Dioxin  $>$ 33.3 ppt.

**TABLE 7-8. (Continued)**

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Trunk)  
(Verified)**

**i3) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	1.8	All Categories	1.0	0.955
Unknown	333	2.1	Unknown vs. Background	1.20 (0.47,3.04)	0.701
Low	184	1.6	Low vs. Background	0.93 (0.26,3.29)	0.904
High	179	2.2	High vs. Background	1.28 (0.41,3.97)	0.673
Total	1,435				

**j3) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	738	All Categories	1.0	0.896	AGE (p=0.060) SUNRPT (p=0.009)
Unknown	333	Unknown vs. Background	1.21 (0.48,3.08)	0.689	
Low	184	Low vs. Background	0.97 (0.27,3.46)	0.961	
High	179	High vs. Background	1.53 (0.48,4.87)	0.468	
Total	1,434				

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

High (Ranch Hands): Current Dioxin  $>$ 33.3 ppt.

**TABLE 7-8. (Continued)**

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Upper Extremities)  
(Verified)**

**i4) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.5	All Categories		0.661
Unknown	333	1.2	Unknown vs. Background	2.23 (0.56,8.99)	0.426
Low	184	0.5	Low vs. Background	1.00 (0.11,9.04)	0.999
High	179	0.6	High vs. Background	1.03 (0.12,9.29)	0.999
Total	1,435				

**j4) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	733	All Categories		0.735	HAIR (p=0.072) LAT (p=0.123)
Unknown	332	Unknown vs. Background	2.21 (0.54,9.01)	0.267	
Low	184	Low vs. Background	1.05 (0.12,9.49)	0.969	HAIR (p=0.042) LAT (p=0.027)
High	179	High vs. Background	1.24 (0.14,11.38)	0.847	SUNRPT (p=0.047) LAT (p=0.011)
Total	1,428				

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

High (Ranch Hands): Current Dioxin  $>$ 33.3 ppt.

**TABLE 7-8. (Continued)**
**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Lower Extremities)**

No Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the lower extremities (Table 7-8). Under both assumptions, the adjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the lower extremities was nonsignificant (Table 7-8) [g1] and [g2]: p=0.854 and p=0.954.

**j5) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.0	All Categories	--	--
Unknown	333	0.0	Unknown vs. Background	--	--
Low	184	0.0	Low vs. Background	--	--
High	179	0.0	High vs. Background	--	--
Total	1,435				

**j5) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	739	All Categories	--	--	--
Unknown	333	Unknown vs. Background	--	--	--
Low	184	Low vs. Background	--	--	--
High	179	High vs. Background	--	--	--
Total	1,435				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

High (Ranch Hands): Current Dioxin  $>$ 33.3 ppt.

Under both assumptions, the adjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the lower extremities was nonsignificant (Table 7-8) [g1] and [g2]: p=0.854 and p=0.954. Under the mixed model assumption, after adjusting for age, skin reaction after at least 2 hours of sun exposure, and ethnicity, the adjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the lower extremities was nonsignificant (Table 7-8) [g3] and [g4]: p=0.223 and p=0.241.

Under both assumptions, the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the trunk displayed a nonsignificant interaction between current dioxin and race (Table 7-8) [g1] and [g2]: p=0.873

TABLE 7-8. (Continued)

**Analysis of Sun Exposure-Related Malignant Skin Neoplasms  
(Other Sites and NOS)  
(Verified)**

**i6) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	739	0.1	All Categories		0.011
Unknown	333	0.0	Unknown vs. Background	--	0.999
Low	184	1.6	Low vs. Background	12.23 (1.27,118.3)	0.053
High	179	0.6	High vs. Background	4.15 (0.26,66.61)	0.704
Total	1,435				

**j6) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	739	All Categories		0.035	SUN2HR (p=0.070)
Unknown	333	Unknown vs. Background	--	--	
Low	184	Low vs. Background	13.34 (1.40,127.1)	0.024	
High	179	High vs. Background	3.93 (0.25,62.34)	0.332	
Total	1,435				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin  $\leq$ 33.3 ppt.

High (Ranch Hands): Current Dioxin >33.3 ppt.

not performed under the minimal assumption. Under the maximal assumption, the adjusted relative risk was nonsignificant (Table 7-8 [d4]:  $p=0.889$ ).

No Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the lower extremities (Table 7-8 [a5] and [b5]).

Four Ranch Hands had a verified sun exposure-related malignant neoplasm for other sites and sites NOS in these analyses. In the unadjusted analysis, the relative risks were greater than 1 but nonsignificant under both assumptions (Table 7-8 [a6] and [b6]:  $p=0.469$  and  $p=0.151$ ). Similarly, the adjusted analyses displayed nonsignificant relative risks (Table 7-8 [c6] and [d6]:  $p=0.458$  and  $p=0.143$ ).

### ***Model 2: Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time***

Under the minimal assumption, the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm for all sites combined displayed a nonsignificant current dioxin-by-time since tour interaction (Table 7-8 [e1]:  $p=0.694$ ). For Ranch Hands with tours less than or equal to 18.6 years, the relative risk of a verified sun exposure-related malignant skin neoplasm was marginally significant (Est.  $RR=0.63$ ,  $p=0.065$ ) but less than 1. For that time stratum, the relative frequencies of Ranch Hands with a sun exposure-related malignant skin neoplasm for low, medium, and high current dioxin were 12.3, 9.9, and 5.6 percent. Under the maximal assumption, the interaction was nonsignificant (Table 7-8 [f1]:  $p=0.910$ ). Under the minimal and maximal assumptions, the adjusted analyses contained nonsignificant interactions between current dioxin and time (Table 7-8 [g1] and [h1]:  $p=0.452$  and  $p=0.992$ , respectively). Within strata analyses were also nonsignificant with relative risks consistently below 1.

Under the minimal assumption, the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the ear, face, head, and neck contained a nonsignificant interaction between current dioxin and time since tour (Table 7-8 [e2]:  $p=0.759$ ); thus, the relative risks were not significantly different between time strata. For time less than or equal to 18.6 years, the relative risk was marginally significant (Est.  $RR=0.54$ ,  $p=0.075$ ) but less than 1. The relative frequencies of Ranch Hands within the low, medium, and high current dioxin categories were 7.7, 6.6, and 1.9 percent for that time stratum. For the other time stratum, the relative risk was significant but also less than 1 (Est.  $RR=0.47$ ,  $p=0.029$ ) and the associated relative frequencies of Ranch Hands were 13.0, 3.3, and 2.7 percent. Under the maximal assumption, the interaction of current dioxin and time since tour was nonsignificant (Table 7-8 [f2]:  $p=0.941$ ) and the relative risks within time strata were nonsignificant and less than 1. Under both assumptions, the adjusted analyses exhibited nonsignificant interactions between current dioxin and time (Table 7-8 [g2] and [h2]:  $p=0.854$  and  $p=0.954$ ). Under the minimal assumption, after adjusting for age, skin reaction after at least 2 hours of sun exposure, and ethnic background, the relative risks of each time stratum became nonsignificant ( $p=0.223$  and  $p=0.140$ ).

Under both assumptions, the unadjusted analysis of the frequency of Ranch Hands with a verified sun exposure-related malignant skin neoplasm on the trunk displayed a nonsignificant interaction between current dioxin and time (Table 7-8 [e3] and [f3]:  $p=0.872$

and  $p=0.927$ ). The adjusted analyses also displayed nonsignificant current dioxin-by-time interactions (Table 7-8 [g3] and [h3]:  $p=0.927$  and  $p=0.800$ ).

Under the minimal assumption, three Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the upper extremities (one Ranch Hand for time less than or equal to 18.6 years and two Ranch Hands for time over 18.6 years). Because only one Ranch Hand with a later tour had a verified sun exposure-related malignant skin neoplasm on the upper extremities, the relative risk, confidence interval, and  $p$ -value were not reported for that time stratum, as well as the  $p$ -value associated with the interaction of current dioxin and time. The relative risk for the other time stratum was nonsignificant (Table 7-8 [e4]:  $p=0.929$ ). Under the maximal assumption, five Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the upper extremities (one Ranch Hand for time less than or equal to 18.6 years and four Ranch Hands for time over 18.6 years). As in the minimal analysis, the interaction and relative risk for time less than or equal to 18.6 years were not evaluated because only one Ranch Hand had the neoplasm of interest in the later time since tour stratum. For time over 18.6 years, the relative risk was nonsignificant (Table 7-8 [f4]:  $p=0.528$ ). An adjusted analysis was not performed under the minimal assumption due to sparse data. Under the maximal assumption, a nonsignificant relative risk was displayed for time over 18.6 years (Table 7-8 [h4]:  $p=0.516$ ).

No Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the lower extremities (Table 7-8 [e5] and [f5]).

Under both assumptions, one Ranch Hand in the time less than or equal to 18.6 years stratum and three Ranch Hands in the time over 18.6 years stratum had a verified sun exposure-related malignant skin neoplasm for other sites and sites NOS. The interaction of current dioxin and time since tour was not evaluated for significance nor was the relative risk for time less than or equal to 18.6 years due to the sparseness of these data. Under each assumption, the relative risk of sun exposure-related malignant skin neoplasms on other sites and NOS was nonsignificant (Table 7-8 [e6] and [f6]:  $p=0.523$  and  $p=0.224$ ) for time over 18.6 years. The adjusted analyses reported for time over 18.6 years displayed nonsignificant relative risks (Table 7-8 [g6] and [h6]:  $p=0.509$  and  $p=0.209$ ).

#### ***Model 3: Ranch Hands and Comparisons by Current Dioxin Category***

In the unadjusted analysis for verified sun exposure-related malignant skin neoplasms for all sites combined, the relative frequencies were not significantly different among Ranch Hands with unknown, low, and high current dioxin and Comparisons with background current dioxin (Table 7-8 [i1]:  $p=0.101$ ). There were no suspected cases of sun exposure-related malignant skin neoplasms. In the adjusted analysis, the overall contrast remained nonsignificant (Table 7-8 [j1]:  $p=0.188$ ).

The unadjusted analysis of the frequencies of Ranch Hands and Comparisons with a verified sun exposure-related malignant skin neoplasm on the ear, face, head, and neck was significant (Table 7-8 [i2]:  $p=0.026$ ). Among the Comparisons in the background current dioxin category, 5.3 percent of the participants had a verified sun exposure-related malignant skin neoplasm on the ear, face, head, and neck. The corresponding relative frequencies for Ranch Hands in the unknown, low, and high current dioxin categories were 7.5, 6.0, and 1.7

percent. The contrast of Ranch Hands in the high current dioxin category with Comparisons in the background category was significant but the risk was less than 1 (Est. RR=0.31, 95% C.I.: [0.09,1.00],  $p=0.050$ ). The contrasts of low versus background ( $p=0.707$ ) and unknown versus background ( $p=0.156$ ) were both greater than 1 but nonsignificant. After adjusting for age, ethnic background, hair color, average lifetime residential latitude, and the two skin reaction to sun exposure covariates, the overall contrast became nonsignificant (Table 7-8 [j2]:  $p=0.128$ ). Each of the Ranch Hand versus Comparison contrasts was also nonsignificant.

The unadjusted and the adjusted analyses for verified sun exposure-related malignant skin neoplasm on the trunk among Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background category were nonsignificant (Table 7-8 [i3] and [j3]:  $p=0.955$  and  $p=0.896$ , respectively).

Four Comparisons and six Ranch Hands (four in the unknown category, one in the low category, and one in the high category) had a verified sun exposure-related neoplasm on the upper extremities. The unadjusted analysis contrasting Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background category contained a nonsignificant overall contrast (Table 7-8 [i4]:  $p=0.661$ ). The overall contrast for the adjusted analysis was also nonsignificant (Table 7-8 [j4]:  $p=0.735$ ).

No Comparisons and no Ranch Hands had a verified sun exposure-related malignant skin neoplasm on the lower extremities (Table 7-8 [i5]).

The unadjusted overall contrast of verified sun exposure-related malignant skin neoplasms for other sites and sites NOS among Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background category was significant (Table 7-8 [i6]:  $p=0.011$ ). The overall contrast was based on three Ranch Hands in the low category, one Ranch Hand in the high category, and one Comparison in the background category with these sun exposure-related malignant skin neoplasms. The corresponding relative frequencies for participants in the background, unknown, low, and high current dioxin categories were 0.1, 0.0, 1.6, and 0.6 percent. The contrast of low versus background was marginally significant (Est. RR=12.23, 95% C.I.: [1.27,118.3],  $p=0.053$ ). The contrasts of unknown versus background and high versus background were nonsignificant ( $p=0.999$  and  $p=0.704$ , respectively). Adjusting for skin reaction after at least 2 hours of sun exposure, the overall contrast remained significant (Table 7-8 [j6]:  $p=0.035$ ). The low versus background contrast became significant in the adjusted analysis (Adj. RR=13.34, 95% C.I.: [1.40,127.1],  $p=0.024$ ). The high versus background contrast was nonsignificant ( $p=0.332$ ). In both of these analyses, the relative risks for the high versus background contrast was lower than that for the low versus background contrast.

#### Melanoma—All Sites and by Location/Site

##### *Model 1: Ranch Hands - Log2 (Initial Dioxin)*

There were only two Ranch Hands with verified melanoma in the minimal analysis, and consequently an unadjusted analysis was not performed. The unadjusted analysis under the maximal assumption was nonsignificant (Table 7-9 [b1]:  $p=0.223$ ) based on only three

**TABLE 7-9.****Analysis of Melanoma  
(All Sites Combined)****Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted**

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a1) Minimal (n=489)	Low	118	1.7	0.52 (0.16,1.74)	0.223
	Medium	243	0.0		
	High	128	0.0		
b1) Maximal (n=704)	Low	181	0.0	0.52 (0.16,1.74)	0.223
	Medium	344	0.9		
	High	179	0.0		

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted**

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c1) Minimal (n=489)	--	--	--
d1) Maximal (n=704)	--	--	--

<sup>a</sup>Relative risk for a twofold increase in dioxin.

--: Analysis not performed due to the sparse number of abnormalities.

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

The unadjusted analysis of the frequency of Ranch Hands and Comparisons with a verified sun exposure-related malignant skin neoplasms on the ear, nose, head, and neck was significant (Table 7-4 (2); p=0.026). An unadjusted comparison in the background current dioxin category, 5.3 percent of the participants with a history of sun exposure-related malignant skin neoplasms in the previous decade had a low level of dioxin exposure, and 44.6 percent had a high level of dioxin exposure. The adjusted analysis of the frequency of Ranch Hands and Comparisons with a verified sun exposure-related malignant skin neoplasms on the ear, nose, head, and neck was nonsignificant (Table 7-4 (2); p=0.163).

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Ear, Face, Head, and Neck)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.)	p-Value
a2) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b2) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.3	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c2) Minimal (n=489)	--	--	-- Minimal (cb (0.2 < n)
d2) Maximal (n=704)	--	--	-- Maximal (cb (401 > n)

--: Relative risk, confidence interval, and p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Trunk)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a3) Minimal (n=489)	Low	118	0.0	0.01 (0.00,1.60)	0.011
	Medium	243	0.0		
	High	128	0.0		
b3) Maximal (n=704)	Low	181	0.0	0.52 (0.12,2.28)	0.315
	Medium	344	0.6		
	High	179	0.0		

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c3) Minimal (n=489)	--	--	--
d3) Maximal (n=704)	--	--	--

<sup>a</sup>Relative risk for a twofold increase in dioxin.

--: Adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Upper Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.)	p-Value
a4) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b4) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.0	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c4) Minimal (n=489)	--	--	--
d4) Maximal (n=704)	--	--	--

--: Relative risk, confidence interval, and p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Minimal-Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal-Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Lower Extremities)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.)	p-Value
a5) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b5) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.0	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c5) Minimal (n=489)	--	--	--
d5) Maximal (n=704)	--	--	--

--: Relative risk, confidence interval, and p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Other Sites and NOS)Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.)	p-Value
a6) Minimal (n=489)	Low	118	0.0	--	--
	Medium	243	0.0	--	--
	High	128	0.0	--	--
b6) Maximal (n=704)	Low	181	0.0	--	--
	Medium	344	0.0	--	--
	High	179	0.0	--	--

Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c6) Minimal (n=489)	--	--	--
d6) Maximal (n=704)	--	--	--

--: Relative risk, confidence interval, and p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

--: Relative risk/confidence interval value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt. Adjusted analysis not performed due to the absence of abnormalities.

TABLE 7-9. (Continued)

Analysis of Melanoma  
(All Sites Combined)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e1) Minimal (n=489)	≤18.6	1.5 (65)	0.0 (121)	0.0 (54)	--	--
	>18.6	1.9 (54)	0.0 (121)	0.0 (74)	--	--
f1) Maximal (n=704)	≤18.6	0.0 (102)	0.6 (179)	0.0 (81)	--	--
	>18.6	1.3 (78)	0.6 (166)	0.0 (98)	0.36 (0.06,2.31)	0.282 <sup>b</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g1) Minimal (n=489)	≤18.6	--	--	--
	>18.6	--	--	--
h1) Maximal (n=704)	≤18.6	--	--	--
	>18.6	--	--	--

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Ear, Face, Head, and Neck)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e2) Minimal (n=489)	≤18.6	0.0 (65)	0.0 (121)	0.0 (54)	0.0 --	--
	>18.6	0.0 (54)	0.0 (121)	0.0 (74)	0.1 --	--
f2) Maximal (n=704)	≤18.6	0.0 (102)	0.0 (179)	0.0 (81)	0.0 --	--
	>18.6	1.3 (78)	0.0 (166)	0.0 (98)	0.0 --	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g2) Minimal (n=489)	≤18.6	--	--	--
	>18.6	--	--	--
h2) Maximal (n=704)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

TABLE 7-9. (Continued)

Analysis of Melanoma  
(Trunk)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e3) Minimal (n=489)	≤18.6	1.5 (65)	0.0 (121)	0.0 (54)	--	0.81> (0.81-0.81)
	>18.6	1.9 (54)	0.0 (121)	0.0 (74)	--	0.81< (0.81-0.81)
f3) Maximal (n=704)	≤18.6	0.0 (102)	0.6 (179)	0.0 (81)	--	0.81> (0.81-0.81)
	>18.6	0.0 (78)	0.6 (166)	0.0 (98)	--	0.81< (0.81-0.81)

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g3) Minimal (n=489)	≤18.6	--	--	0.81> (0.81-0.81)
	>18.6	--	--	0.81< (0.81-0.81)
h3) Maximal (n=704)	≤18.6	--	--	0.81> (0.81-0.81)
	>18.6	--	--	0.81< (0.81-0.81)

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

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