

**Table N-2-36.**  
**Interaction Table for Estradiol**  
**(Discrete)**

<b>a) MODEL 4: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> (Current Dioxin-by-Occupation: Table 18-66)					
<b>Current Dioxin Category Summary Statistics</b>				<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>	
<b>Stratum</b>	<b>Current Dioxin</b>	<b>n</b>	<b>Percent Abnormal High</b>	<b>Adjusted Relative Risk (95% C.I.)<sup>a</sup></b>	<b>p-Value</b>
<b>Officer</b>	Low	193	3.1	0.56 (0.29,1.08)	0.082
	Medium	141	2.1		
	High	14	7.1		
<b>Enlisted Flyer</b>	Low	31	9.7	0.62 (0.32,1.20)	0.158
	Medium	57	3.5		
	High	62	1.6		
<b>Enlisted Groundcrew</b>	Low	71	1.4	1.55 (1.09,2.21)	0.015
	Medium	102	3.9		
	High	223	4.5		

<b>b) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> (Current Dioxin-by-Occupation: Table 18-66)					
<b>Current Dioxin Category Summary Statistics</b>				<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>	
<b>Stratum</b>	<b>Current Dioxin</b>	<b>n</b>	<b>Percent Abnormal High</b>	<b>Adjusted Relative Risk (95% C.I.)<sup>a</sup></b>	<b>p-Value</b>
<b>Officer</b>	Low	192	2.6	0.74 (0.48,1.12)	0.156
	Medium	136	2.2		
	High	20	10.0		
<b>Enlisted Flyer</b>	Low	33	9.1	0.71 (0.43,1.17)	0.184
	Medium	56	3.6		
	High	61	1.6		
<b>Enlisted Groundcrew</b>	Low	75	1.3	1.45 (1.04,2.01)	0.026
	Medium	105	4.8		
	High	216	4.2		

**Table N-2-36. (Continued)**  
**Interaction Table for Estradiol**  
**(Discrete)**

c) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Occupation: Table 18-66)					
Current Dioxin Category Summary Statistics				Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Percent Abnormal High	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
Officer	Low	192	2.6	0.71 (0.47,1.07)	0.103
	Medium	136	2.2		
	High	20	10.0		
Enlisted Flyer	Low	32	9.4	0.59 (0.31,1.12)	0.108
	Medium	56	3.6		
	High	61	1.6		
Enlisted Groundcrew	Low	75	1.3	1.39 (1.00,1.94)	0.052
	Medium	105	4.8		
	High	216	4.2		

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

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

## APPENDIX N-3.

### Endocrine Analysis Tables Occupation, Body Fat, HDL Cholesterol, and Cholesterol Removed from Final Model

This appendix contains results of exposure analyses after occupation, body fat, high density lipoprotein, and cholesterol have been removed from those final dioxin models (Models 2 through 6) that contained these covariates. These analyses are performed to investigate the relationship of the dependent variable to dioxin without removing any effects due to these covariates. The format of these tables closely parallels the adjusted panels of Chapter 18 tables. A summary of the tables found in this appendix follows.

Appendix N-3 Table	Chapter 18 Table	Dependent Variable
N-3-1	18-4	Composite Diabetes Indicator
N-3-2	18-5	Diabetic Severity
N-3-3	18-6	Time to Diabetes Onset
N-3-4	18-8	Testicular Volume: Minimum
N-3-5	18-9	Testicular Volume: Total
N-3-6	18-10	Retinopathy Results (Diabetics)
N-3-7	18-11	Neuropathy Results (Diabetics)
N-3-8	18-15	Dorsalis Pedis Pulses (Doppler) (Diabetics)
N-3-9	18-19	Thyroid Stimulating Hormone (TSH) (Continuous)
N-3-10	18-21	Thyroxine (T <sub>4</sub> ) (Continuous)
N-3-11	18-24	Fasting Glucose (All Participants) (Continuous)
N-3-12	18-25	Fasting Glucose (All Participants) (Discrete)
N-3-13	18-26	Fasting Glucose (Diabetics) (Continuous)
N-3-14	18-27	Fasting Glucose (Diabetics) (Discrete)
N-3-15	18-28	Fasting Glucose (Nondiabetics) (Continuous)
N-3-16	18-29	Fasting Glucose (Nondiabetics) (Discrete)
N-3-17	18-30	2-Hour Postprandial Glucose (Nondiabetics) (Continuous)
N-3-18	18-31	2-Hour Postprandial Glucose (Nondiabetics) (Discrete)
N-3-19	18-32	Fasting Urinary Glucose (All Participants)
N-3-20	18-33	Fasting Urinary Glucose (Diabetics)
N-3-21	18-35	2-Hour Postprandial Urinary Glucose (Nondiabetics)
N-3-22	18-36	Serum Insulin (All Participants) (Continuous)

Appendix N-3 Table	Chapter 18 Table	Dependent Variable
N-3-23	18-37	Serum Insulin (All Participants) (Discrete)
N-3-24	18-38	Serum Insulin (Diabetics) (Continuous)
N-3-25	18-39	Serum Insulin (Diabetics) (Discrete)
N-3-26	18-40	Serum Insulin (Nondiabetics) (Continuous)
N-3-27	18-41	Serum Insulin (Nondiabetics) (Discrete)
N-3-28	18-42	Serum Glucagon (All Participants) (Continuous)
N-3-29	18-43	Serum Glucagon (All Participants) (Discrete)
N-3-30	18-44	Serum Glucagon (Diabetics) (Continuous)
N-3-31	18-45	Serum Glucagon (Diabetics) (Discrete)
N-3-32	18-46	Serum Glucagon (Nondiabetics) (Continuous)
N-3-33	18-48	$\alpha$ -1-C Hemoglobin (All Participants) (Continuous)
N-3-34	18-49	$\alpha$ -1-C Hemoglobin (All Participants) (Discrete)
N-3-35	18-50	$\alpha$ -1-C Hemoglobin (Diabetics) (Continuous)
N-3-36	18-51	$\alpha$ -1-C Hemoglobin (Diabetics) (Discrete)
N-3-37	18-52	$\alpha$ -1-C Hemoglobin (Nondiabetics) (Continuous)
N-3-38	18-53	$\alpha$ -1-C Hemoglobin (Nondiabetics) (Discrete)
N-3-39	18-55	Serum Proinsulin (Diabetics) (Continuous)
N-3-40	18-56	Serum Proinsulin (Diabetics) (Discrete)
N-3-41	18-57	Serum C Peptide (Diabetics) (Continuous)
N-3-42	18-58	Serum C Peptide (Diabetics) (Discrete)
N-3-43	18-59	Total Testosterone (Continuous)
N-3-44	18-60	Total Testosterone (Discrete)
N-3-45	18-61	Free Testosterone (Continuous)
N-3-46	18-62	Free Testosterone (Discrete)
N-3-47	18-63	Sex Hormone Binding Globulin
N-3-48	18-66	Estradiol (Discrete)
N-3-49	18-67	Luteinizing Hormone (LH) (Continuous)
N-3-50	18-68	Luteinizing Hormone (LH) (Discrete)



**Table N-3-1.**  
**Analysis of Composite Diabetes Indicator**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
506	1.16 (0.96,1.40)	0.121	AGE (p<0.001) RACE (p=0.107) FAMDIAB (p=0.026)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	1,044			AGE (p<0.001) RACE (p=0.031) FAMDIAB (p<0.001)
Background RH	367	0.87 (0.59,1.30)	0.497	
Low RH	252	1.19 (0.80,1.75)	0.388	
High RH	254	1.41 (0.95,2.10)	0.091	
Low plus High RH	506	1.29 (0.95,1.75)	0.105	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

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

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

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

**Table N-3-1. (Continued)**  
**Analysis of Composite Diabetes Indicator**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED				
Model <sup>a</sup>	Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	873	1.34 (1.17,1.54)	<0.001	AGE (p<0.001) RACE (p=0.085) FAMDIAB (p=0.002)
5	873	1.34 (1.18,1.52)	<0.001	AGE (p<0.001) RACE (p=0.069) FAMDIAB (p=0.002)
6 <sup>c</sup>	871	1.23 (1.08,1.41)	0.002	AGE (p<0.001) RACE (p=0.036) FAMDIAB (p=0.002) PERS (p=0.136)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-2.**  
**Analysis of Diabetic Severity**  
**Occupation and Body Fat Removed From Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED				
Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>b</sup>				
n	Contrast vs. Nondiabetic	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
518	No Treatment	1.02 (0.79,1.31)	0.902	AGE (p<0.001) RACE (p=0.126) FAMDIAB (p=0.183)
	Diet Only	1.16 (0.83,1.63)	0.389	
	Oral Hypoglycemic	1.81 (1.24,2.65)	0.002	
	Insulin Dependent	0.85 (0.45,1.63)	0.630	

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

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

**Table N-3-2. (Continued)**  
**Analysis of Diabetic Severity**  
**Occupation and Body Fat Removed From Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>No Treatment vs. Nondiabetic</b>		<b>Diet Only vs. Nondiabetic</b>	
		<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>
Comparison	1,045				
Background RH	368	0.87 (0.53,1.43)	0.580	0.84 (0.38,1.89)	0.679
Low RH	252	1.17 (0.72,1.89)	0.529	1.40 (0.68,2.89)	0.366
High RH	254	1.07 (0.63,1.82)	0.806	1.71 (0.82,3.56)	0.151
Low plus High RH	506	1.13 (0.76, 1.66)	0.550	1.54 (0.86, 2.75)	0.143

  

<b>Dioxin Category</b>	<b>n</b>	<b>Oral Hypoglycemic vs. Nondiabetic</b>		<b>Insulin Dependent vs. Nondiabetic</b>		<b>Covariate Remarks</b>
		<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	
Comparison	1,045					AGE (p<0.001) RACE (p=0.029) FAMDIAB (p<0.001)
Background RH	368	--	--	2.04 (0.81,5.17)	0.132	
Low RH	252	0.80 (0.28,2.25)	0.668	1.36 (0.46,4.03)	0.578	
High RH	254	2.63 (1.20,5.78)	0.016	1.08 (0.29,4.06)	0.907	
Low plus High RH	506	1.58 (0.79,3.15)	0.195	1.25 (0.49,3.17)	0.643	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

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

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

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



**Table N-3-2. (Continued)**  
**Analysis of Diabetic Severity**  
**Occupation and Body Fat Removed From Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED					
Model <sup>a</sup>	Analysis Results for Log <sub>2</sub> (Current Dioxin)				
	n	Contrast	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	874	No Treatment	1.23 (1.02, 1.47)	0.030	AGE (p<0.001) RACE (p=0.048) FAMDIAB (p=0.020)
		Diet Only	1.46 (1.12, 1.90)	0.005	
		Oral Hypoglycemic	2.87 (1.97, 4.18)	<0.001	
		Insulin Dependent	0.71 (0.46, 1.10)	0.130	
5	874	No Treatment	1.23 (1.04, 1.45)	0.014	AGE (p<0.001) RACE (p=0.032) FAMDIAB (p=0.022)
		Diet Only	1.54 (1.21, 1.97)	<0.001	
		Oral Hypoglycemic	2.80 (1.95, 4.02)	<0.001	
		Insulin Dependent	0.78 (0.58, 1.07)	0.123	
6 <sup>c</sup>	873	No Treatment	****	****	CURR*AGE (p<0.001) FAMDIAB (p=0.015)
		Diet Only	****	****	
		Oral Hypoglycemic	****	****	
		Insulin Dependent	****	****	

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).  
Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).  
Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

\*\*\*\* Log<sub>2</sub> (current dioxin + 1)-by-covariate interaction (p≤0.01); adjusted relative risk, confidence interval, and p-value not presented; refer to Appendix Table N-4-1 for further analysis of this interaction.

**Table N-3-3.**  
**Analysis of Time to Diabetes Onset (years)**  
**Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED				
Initial Dioxin Category Summary Statistics		Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>a</sup>		
Initial Dioxin	n	Adj. Slope (Std. Error) <sup>b</sup>	p-Value	Covariate Remarks
Low	171	-0.0361 (0.0328)	0.271	AGE (p<0.001)
Medium	167			RACE (p=0.098)
High	168			FAMDIAB (p=0.038)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>b</sup> Slope and standard error based on time to diabetes onset versus log<sub>2</sub> (initial dioxin) in a failure time analysis model, using a censored Weibull distribution.

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

b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED			
Model <sup>a</sup>	Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)		
	Adj. Slope (Std. Error) <sup>b</sup>	p-Value	Covariate Remarks
4	-0.1117 (0.0270)	<0.001	AGE (<0.001) RACE (p=0.066) FAMDIAB (p=0.002)
5	-0.1117 (0.0246)	<0.001	AGE (<0.001) RACE (p=0.051) FAMDIAB (p=0.002)
6 <sup>c</sup>	-0.0890 (0.0256)	<0.001	AGE (<0.001) RACE (p=0.024) FAMDIAB (p=0.002)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>b</sup> Slope and standard error based on time to diabetes onset versus log<sub>2</sub> (current dioxin + 1) in a failure time analysis model, using a censored Weibull distribution.

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-4.**  
**Analysis of Testicular Volume: Minimum (cm<sup>3</sup>)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>						
<b>Initial Dioxin Category Summary Statistics</b>			<b>Analysis Results for Log<sub>e</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Mean<sup>a</sup></b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)</b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Low	172	14.60	0.049	-0.4098 (0.2003)	0.041	AGE (p<0.001) RACE (p=0.004)
Medium	170	15.65				
High	171	14.05				

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>a</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)</b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	1,057	15.11			AGE (p<0.001) RACE (p=0.001)
Background RH	368	15.28	0.16 (-0.48,0.81)	0.619	
Low RH	256	15.27	0.16 (-0.58,0.90)	0.674	
High RH	257	14.81	-0.30 (-1.04,0.44)	0.431	
Low plus High RH	513	15.04	-0.07 (-0.64,0.50)	0.809	

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

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

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

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

**Table N-3-4. (Continued)**  
**Analysis of Testicular Volume: Minimum (cm<sup>3</sup>)**  
**Occupation and Body Fat Removed from Final Model**

c) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>a</sup>	Current Dioxin Category Adjusted Mean/(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error)	p-Value	Covariate Remarks
6 <sup>b</sup>	14.88 (296)	15.15 (292)	14.63 (292)	0.042	-0.2234 (0.1215)	0.066	AGE (p<0.001) RACE (p=0.005)

<sup>a</sup> Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>b</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 6: Low = ≤ 46 ppq; Medium = >46-128 ppq; High = >128 ppq.



**Table N-3-5.**  
**Analysis of Testicular Volume: Total (cm<sup>3</sup>)**  
**Occupation Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>b</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	172	31.63	0.053	-0.0725 (0.0337)	0.032	AGE (p<0.001) RACE (p=0.007)
Medium	170	32.99				
High	171	30.34				

<sup>a</sup> Transformed from square root scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on square root of total testicular volume versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-6.**  
**Analysis of Retinopathy Results (Diabetics)**  
**Body Fat Removed from Final Model**

<b>a) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Model<sup>a</sup></b>	<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			
	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
4	132	1.38 (0.84,2.28)	0.194	PERS (p=0.003) FAMDIAB (p=0.016) DIABSEV (p=0.001)
5	132	1.31 (0.83,2.06)	0.227	PERS (p=0.004) FAMDIAB (p=0.019) DIABSEV (p=0.001)
6 <sup>c</sup>	132	1.39 (0.84,2.28)	0.186	PERS (p=0.003) FAMDIAB (p=0.016) DIABSEV (p=0.001)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).  
 Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).  
 Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.  
 Models 5 and 6: Low = ≤ 46 ppq; Medium = >46-128 ppq; High = >128 ppq.

**Table N-3-7.**  
**Analysis of Neuropathy Results (Diabetics)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	148			AGE (p=0.028) RACE (p=0.013) PERS (p=0.670) DIABSEV (p<0.001)
Background RH	42	1.72 (0.44,6.78)	0.439	
Low RH	49	0.36 (0.07,1.84)	0.221	
High RH	47	2.53 (0.76,8.42)	0.131	
Low plus High RH	96	1.16 (0.41,3.31)	0.779	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

**Table N-3-7. (Continued)**  
**Analysis of Neuropathy Results (Diabetics)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Model<sup>a</sup></b>	<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			
	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
4	133	1.02 (0.68,1.52)	0.924	FAMDIAB*DIABSEV (p=0.044) AGE*PERS (p=0.040) AGE*RACE (p=0.086)
5	133	0.98 (0.70,1.38)	0.923	FAMDIAB*DIABSEV (p=0.044) AGE*PERS (p=0.038) AGE*RACE (p=0.083)
6 <sup>c</sup>	133	1.10 (0.75,1.59)	0.627	FAMDIAB*DIABSEV (p=0.032) AGE*PERS (p=0.036) AGE*RACE (p=0.075)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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



**Table N-3-8.**  
**Analysis of Dorsalis Pedis Pulses (Diabetics)**  
**Cholesterol and High Density Lipoprotein Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
91	1.37 (0.88,2.12)	0.155	DIABSEV (p=0.219) FAMDIAB (p=0.568) DRKYR (p=0.294) HRTDIS (p=0.165)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>				
<b>Model<sup>a</sup></b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
5	133	1.21 (0.92,1.59)**	0.164**	CURR*PACKYR (p=0.019) DIABSEV (p=0.044) DRKYR (p=0.046) HRTDIS (p=0.072)
6 <sup>c</sup>	133	1.18 (0.86,1.61)**	0.298**	CURR*PACKYR (p=0.020) DIABSEV (p=0.048) DRKYR (p=0.050) HRTDIS (p=0.072)

<sup>a</sup> Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

\*\* Log<sub>2</sub> (current dioxin + 1)-by-covariate interaction (0.01 < p ≤ 0.05); adjusted relative risk, confidence interval, and p-value derived after deletion of this interaction; refer to Appendix Table N-4-2 for further analysis of this interaction.

**Table N-3-9.**  
**Analysis of Thyroid Stimulating Hormone (TSH) ( $\mu$ IU/ml)**  
**(Continuous)**  
**Occupation Removed From Final Model**

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED					
Dioxin Category	n	Adj. Mean <sup>ab</sup>	Difference of Adj. Mean vs. Comparisons (95% C.I.) <sup>c</sup>	p-Value <sup>d</sup>	Covariate Remarks
Comparison	1,027	1.37			AGE ( $p < 0.001$ ) RACE ( $p < 0.001$ )
Background RH	365	1.40	0.04 --	0.485	
Low RH	254	1.39	0.02 --	0.705	
High RH	255	1.45	0.08 --	0.196	
Low plus High RH	509	1.42	0.05 --	0.278	

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq 10$  ppt.

Background (Ranch Hand): Current Dioxin  $\leq 10$  ppt.

Low (Ranch Hand): Current Dioxin  $> 10$  ppt,  $10 \text{ ppt} < \text{Initial Dioxin} \leq 143$  ppt.

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

**Table N-3-9. (Continued)**  
**Analysis of Thyroid Stimulating Hormone (TSH) ( $\mu$ IU/ml)**  
**(Continuous)**  
**Occupation Removed From Final Model**

b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	1.35 (291)	1.40 (290)	1.38 (293)	0.020	0.0089 (0.0143)	0.534	RACE (p < 0.001)
5	1.33 (296)	1.40 (288)	1.39 (290)	0.021	0.0116 (0.0123)	0.345	RACE (p < 0.001)
6 <sup>d</sup>	1.35 (295)	1.41 (288)	1.39 (290)	0.022	0.0072 (0.0133)	0.590	RACE (p < 0.001)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of TSH versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low =  $\leq 8.1$  ppt; Medium =  $>8.1$ -20.5 ppt; High =  $>20.5$  ppt.

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

**Table N-3-9. (Continued)**  
**Analysis of Thyroid Stimulating Hormone (TSH) ( $\mu$ IU/ml)**  
**(Continuous)**  
**Occupation Removed From Final Model**

b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	1.35 (291)	1.40 (290)	1.38 (293)	0.020	0.0089 (0.0143)	0.534	RACE (p < 0.001)
5	1.33 (296)	1.40 (288)	1.39 (290)	0.021	0.0116 (0.0123)	0.345	RACE (p < 0.001)
6 <sup>d</sup>	1.35 (295)	1.41 (288)	1.39 (290)	0.022	0.0072 (0.0133)	0.590	RACE (p < 0.001)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of TSH versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low =  $\leq 8.1$  ppt; Medium =  $>8.1$ -20.5 ppt; High =  $>20.5$  ppt.

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



**Table N-3-10.**  
**Analysis of Thyroxine (T<sub>4</sub>) (μg/dl)**  
**(Continuous)**  
**Occupation Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>						
<b>Initial Dioxin Category Summary Statistics</b>			<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Mean<sup>a</sup></b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)</b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Low	170	7.70	0.013	0.0413 (0.0432)	0.340	RACE (p=0.110)
Medium	171	7.57				
High	168	7.80				

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>a</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)</b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	1,026	7.79			AGE (p=0.400) RACE*PERS (p=0.029)
Background RH	365	7.70	-0.09 (-0.25,0.06)	0.245	
Low RH	253	7.83	0.04 (-0.14,0.23)	0.643	
High RH	255	7.80	0.01 (-0.18,0.19)	0.935	
Low plus High RH	508	7.81	0.03 (-0.12,0.17)	0.724	

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

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

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

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

**Table N-3-10. (Continued)**  
**Analysis of Thyroxine (T<sub>4</sub>) (μg/dl)**  
**(Continuous)**  
**Occupation Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>a</sup>	Current Dioxin Category Adjusted Mean/(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error)	p-Value	Covariate Remarks
4	7.58 (291)	7.70 (289)	7.70 (293)	0.009	0.0499 (0.0308)	0.106	RACE (p=0.228) PERS (p=0.061)
5	7.63 (296)	7.63 (287)	7.73 (290)	0.008	0.0356 (0.0264)	0.178	RACE (p=0.235) PERS (p=0.057)
6 <sup>b</sup>	7.61 (295)	7.63 (287)	7.74 (290)	0.009	0.0441 (0.0285)	0.123	RACE (p=0.207) PERS (p=0.067)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>b</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-11.**  
**Analysis of Fasting Glucose (mg/dl) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>b</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	170	108.67	0.147	0.0178 (0.0076)	0.020	AGE (p<0.001)
Medium	167	110.02				RACE (p=0.055)
High	168	114.09				PERS*FAMDIAB (p=0.001)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-11. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)<sup>c</sup></b>	<b>p-Value<sup>d</sup></b>	<b>Covariate Remarks</b>
Comparison	1,045	107.69			AGE (p<0.001) RACE (p=0.005) FAMDIAB (p<0.001)
Background RH	368	107.17	-0.52 --	0.676	
Low RH	252	107.02	-0.67 --	0.641	
High RH	254	110.64	2.95 --	0.044	
Low plus High RH	506	108.83	1.13 --	0.311	

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not given because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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



**Table N-3-11. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	102.36 (290)	106.29 (294)	109.17 (290)	0.070	0.0235 (0.0046)	<0.001	AGE (p<0.001) FAMDIAB (p=0.003)
5	102.25 (296)	104.57 (290)	111.09 (288)	0.079	0.0228 (0.0039)	<0.001	AGE (p<0.001) FAMDIAB (p=0.004)
6 <sup>d</sup>	105.81 (295)	016.81 (290)	111.60 (288)	0.105	0.0612 (0.0042)	<0.001	AGE*FAMDIAB (p=0.024) RACE (p=0.092)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-12.**  
**Analysis of Fasting Glucose (All Participants)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
505	1.04 (0.85,1.28)	0.682	AGE (p<0.001) RACE (p=0.011) PERS*FAMDIAB (p=0.002)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>				
<b>Model<sup>a</sup></b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
4	873	1.28 (1.11,1.48)	0.001	AGE (p<0.001) RACE (p=0.028) PERS*FAMDIAB (p=0.089)
5	873	1.30 (1.14,1.49)	<0.001	AGE (p<0.001) RACE (p=0.022) PERS*FAMDIAB (p=0.106)
6 <sup>c</sup>	873	1.20 (1.04,1.38)	0.010	AGE (p<0.001) RACE (p=0.009) FAMDIAB (p=0.020)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-13.**  
**Analysis of Fasting Glucose (mg/dl) (Diabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>b</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	31	158.98	0.301	0.0438	0.061	RACE (p=0.082)
Medium	31	163.34				DIABSEV (p=0.001)
High	34	188.09				

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-13. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (Diabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED					
Dioxin Category	n	Adj. Mean <sup>ab</sup>	Difference of Adj. Mean vs. Comparisons (95% C.I.) <sup>c</sup>	p-Value <sup>d</sup>	Covariate Remarks
Comparison	147	165.40			FAMDIAB (p=0.928) AGE*DIABSEV (p=0.042) RACE*PERS (p=0.058)
Background RH	39	158.72	-6.68--	0.490	
Low RH	48	151.55	-13.85--	0.105	
High RH	46	174.29	8.89--	0.345	
Low plus High RH	94	162.28	-3.12--	0.653	

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not given because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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



**Table N-3-13. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (Diabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	148.79 (26)	159.16 (55)	170.82 (52)	0.276	0.515 (0.0194)	0.009	RACE (p=0.297) FAMDIAB*DIABSEV (p=0.093)
5	152.35 (24)	147.91 (53)	182.01 (56)	0.294	0.0515 (0.0159)	0.002	RACE (p=0.266) FAMDIAB*DIABSEV (p=0.092)
6 <sup>d</sup>	160.14 (24)	150.27 (53)	175.97 (56)	0.316	0.0345 (0.0179)	0.057	RACE (p=0.218) FAMDIAB*DIABSEV (p=0.070)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-14.**  
**Analysis of Fasting Glucose (Diabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>e</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
96	0.90 (0.62,1.29)	0.552	DIABSEV (p<0.001)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	147			AGE (p=0.028) RACE (p=0.010) FAMDIAB (p=0.273) DIABSEV (p<0.001)
Background RH	39	1.09 (0.48,2.47)	0.841	
Low RH	48	0.82 (0.38,1.77)	0.619	
High RH	46	1.08 (0.47,2.44)	0.862	
Low plus High RH	94	0.93 (0.50,1.72)	0.823	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

**Table N-3-14. (Continued)**  
**Analysis of Fasting Glucose (Diabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED				
Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)				
Model <sup>a</sup>	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	138	1.08 (0.81,1.43)	0.597	DIABSEV (p=0.006)
5	138	1.14 (0.90,1.45)	0.274	DIABSEV (p=0.006)
6 <sup>c</sup>	138	1.03 (0.78,1.35)	0.850	DIABSEV (p=0.006)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-15.**  
**Analysis of Fasting Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>b</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	139	99.68	0.059	-0.0033 (0.0034)	0.323	AGE (p=0.010) PERS*FAMDIAB (p=0.079)
Medium	137	98.79				
High	135	98.54				

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (initial dioxin).

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



**Table N-3-15. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)<sup>c</sup></b>	<b>p-Value<sup>d</sup></b>	<b>Covariate Remarks</b>
Comparison	897	99.03			PERS (p=0.162) AGE*FAMDIAB (p=0.043)
Background RH	329	99.41	0.38 --	0.492	
Low RH	203	99.27	0.24 --	0.711	
High RH	208	98.55	-0.48 --	0.463	
Low plus High RH	411	98.91	-0.12 --	0.807	

<sup>a</sup> Transformed from natural logarithm of fasting glucose.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not given because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

**Table N-3-15. (Continued)**  
**Analysis of Fasting Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	99.03 (264)	99.82 (238)	98.78 (238)	0.026	0.0006 (0.0022)	0.776	PERS (p=0.144) AGE*FAMDIAB (p=0.134)
5	98.92 (272)	99.89 (236)	98.85 (232)	0.027	0.0014 (0.0019)	0.458	PERS (p=0.153) AGE*FAMDIAB (p=0.142)
6 <sup>d</sup>	98.96 (273)	99.54 (241)	98.40 (238)	0.025	0.0005 (0.0020)	0.805	AGE (p<0.001) PERS (p=0.150)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of fasting glucose versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-16.**  
**Analysis of Fasting Glucose (Nondiabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	898			AGE (p=0.014) FAMDIAB (p=0.473)
Background RH	329	0.68 (0.32,1.44)	0.320	
Low RH	204	1.13 (0.55,2.32)	0.749	
High RH	208	0.60 (0.23,1.57)	0.300	
Low plus High RH	412	0.87 (0.47,1.62)	0.671	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

<b>b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Model<sup>a</sup></b>	<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			
	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
4	754	1.02 (0.77,1.34)	0.907	RACE (p=0.144)
5	754	1.05 (0.82,1.33)	0.714	
6 <sup>c</sup>	753	0.98 (0.76,1.28)	0.907	

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-17.**  
**Analysis of 2-Hour Postprandial Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>a</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	141	101.98	0.127	0.0202 (0.0108)	0.061	AGE (p<0.001)
Medium	141	106.51				PERS (p=0.076)
High	139	108.39				

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on natural logarithm of 2-hour postprandial glucose versus log<sub>2</sub> (initial dioxin).

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



**Table N-3-17. (Continued)**  
**Analysis of 2-Hour Postprandial Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)<sup>c</sup></b>	<b>p-Value<sup>d</sup></b>	<b>Covariate Remarks</b>
Comparison	896	104.45**			DXCAT*FAMDIAB (p=0.031) PERS (p=0.004) AGE (p<0.001)
Background RH	328	102.70**	-1.75 -- **	0.308**	
Low RH	203	105.36**	0.91 -- **	0.661**	
High RH	208	108.99**	4.54 -- **	0.032**	
Low plus High RH	411	107.19**	2.75 -- **	0.091**	

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

\*\* Categorized dioxin-by-covariate interaction ( $0.01 < p \leq 0.05$ ); adjusted mean, difference of adjusted mean, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-3 for further analysis of this interaction.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

**Table N-3-17. (Continued)**  
**Analysis of 2-Hour Postprandial Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	98.74 (266)	102.15 (242)	109.88 (244)	0.074	0.0371 (0.0071)	<0.001	AGE (p<0.001) PERS (p=0.338)
5	97.80 (273)	102.95 (241)	110.48 (238)	0.082	0.0355 (0.0061)	<0.001	AGE (p<0.001) PERS (p=0.322)
6 <sup>d</sup>	98.86 (272)	102.98 (241)	109.11 (238)	0.088	0.0303 (0.0065)	<0.001	AGE (p<0.001) PERS (p=0.240)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of 2-hour postprandial glucose versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-18.**  
**Analysis of 2-Hour Postprandial Glucose (Nondiabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
421	1.18 (0.95,1.45)**	0.128**	INIT*RACE (p=0.007) PERS (p=0.199) AGE (p=0.004)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

\*\* Log<sub>2</sub> (initial dioxin)-by-covariate interaction (p≤0.05); adjusted relative risk, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-4 for further analysis of this interaction.

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	896			AGE (p<0.001) PERS (p=0.019) RACE*FAMDIAB (p=0.025)
Background RH	328	0.88 (0.57,1.35)	0.553	
Low RH	203	1.25 (0.80,1.96)	0.325	
High RH	208	1.86 (1.22,2.84)	0.004	
Low plus High RH	411	1.53 (1.09,2.15)	0.014	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

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

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

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

**Table N-3-18. (Continued)**  
**Analysis of 2-Hour Postprandial Glucose (Nondiabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED				
Model <sup>a</sup>	Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	753	1.40 (1.21,1.63)**	<0.001**	CURR*RACE (p=0.003) AGE (p=0.001)
5	740	1.39 (1.21,1.60)**	<0.001**	CURR*RACE (p=0.020) AGE (p=0.001) RACE*FAMDIAB (p=0.062)
6 <sup>c</sup>	739	1.35 (1.17,1.57)**	<0.001**	CURR*RACE (p=0.020) AGE (p=0.001) RACE*FAMDIAB (p=0.058)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

\*\* Log<sub>2</sub> (current dioxin + 1)-by-covariate interaction (p≤0.05); adjusted relative risk, confidence interval, and p-value derived after deletion of this interaction; refer to Appendix Table N-4-4 for further analysis of this interaction.



**Table N-3-19.**  
**Analysis of Fasting Urinary Glucose (All Participants)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
503	1.38 (1.02,1.87)	0.036	RACE (p=0.172) PERS*FAMDIAB (p=0.012)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	1,058			DXCAT*PERS (p=0.012) AGE (p=0.005) RACE (p=0.036)
Background RH	374	0.62 (0.26,1.52)**	0.300**	
Low RH	256	0.72 (0.32,1.64)**	0.435**	
High RH	259	1.80 (0.93,3.50)**	0.081**	
Low plus High RH	515	1.19 (0.68,2.10)**	0.541**	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

\*\* Categorized dioxin-by-covariate interaction ( $0.01 < p \leq 0.05$ ); adjusted relative risk, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-5 for further analysis of this interaction.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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



**Table N-3-19. (Continued)**  
**Analysis of Fasting Urinary Glucose (All Participants)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4 AND 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED				
Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)				
Model <sup>a</sup>	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	872	1.70 (1.32,2.19)	<0.001	AGE (p=0.005) FAMDIAB (p=0.372)
5	871	1.72 (1.35,2.18)**	<0.001**	CURR*PERS (p=0.042) AGE (p=0.003) FAMDIAB (p=0.438)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).  
 Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

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

\*\* Group-by-covariate interaction ( $0.01 < p \leq 0.05$ ); adjusted mean, difference of adjusted means, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-5 for further analysis of this interaction.

**Table N-3-20.**  
**Analysis of Fasting Urinary Glucose (Diabetics)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED</b>			
<b>Analysis Results for Log<sub>e</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
96	1.41 (0.98,2.03)	0.054	RACE (p=0.333) DIABSEV (p=0.020)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	146			RACE (p=0.061) FAMDIAB (p=0.435) AGE*DIABSEV (p=0.120)
Background RH	39	0.71 (0.24,2.13)	0.541	
Low RH	48	0.70 (0.28,1.79)	0.460	
High RH	46	1.17 (0.50,2.75)	0.722	
Low plus High RH	94	0.92 (0.46,1.83)	0.812	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

**Table N-3-21.**  
**Analysis of 2-Hour Postprandial Urinary Glucose (Nondiabetics)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>				
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>ab</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Comparison	910			AGE (p=0.110)
Background RH	331	0.95 (0.68,1.33)	0.749	
Low RH	208	1.10 (0.75,1.63)	0.623	
High RH	213	1.45 (1.00,2.10)	0.048	
Low plus High RH	421	1.27 (0.95,1.70)	0.111	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

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

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

<b>b) MODELS 5 AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>				
<b>Model<sup>a</sup></b>	<b>n</b>	<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
5	752	1.20 (1.07,1.34)	0.002	AGE (p=0.091)
6 <sup>c</sup>	751	1.13 (1.00,1.28)	0.051	AGE (p=0.173)

<sup>a</sup> Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-22.**  
**Analysis of Serum Insulin (mIU/ml) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED						
Initial Dioxin Category Summary Statistics			Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>a</sup>			
Initial Dioxin	n	Adj. Mean <sup>ab</sup>	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
Low	173	37.38	0.245	0.0607 (0.0300)	0.043	AGE (p<0.001) FAST (p<0.001)
Medium	172	41.98				
High	173	43.94				

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Slope and standard error based on natural logarithm of serum insulin versus log<sub>2</sub> (initial dioxin).

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



**Table N-3-22. (Continued)**  
**Analysis of Serum Insulin (mIU/ml) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
<b>Dioxin Category</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>Difference of Adj. Mean vs. Comparisons (95% C.I.)<sup>c</sup></b>	<b>p-Value<sup>d</sup></b>	<b>Covariate Remarks</b>
Comparison	1,044				DXCAT*AGE (p=0.003)
Background RH	368	****	****	****	RACE (p=0.149)
Low RH	251	****	****	****	FAST (p<0.001)
High RH	254	****	****	****	FAMDIAB*PERS (p=0.022)
Low plus High RH	505	****	****	****	

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, fasting status, and covariates specified under "Covariate Remarks" column.

<sup>c</sup> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on natural logarithm scale.

<sup>d</sup> P-value is based on difference of means on natural logarithm scale.

\*\*\*\* Categorized dioxin-by-covariate interaction ( $p \leq 0.01$ ); adjusted mean, difference of adjusted mean, confidence interval, and p-value not presented; refer to Appendix Table N-4-6 for further analysis of this interaction.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq 10$  ppt.

Background (Ranch Hand): Current Dioxin  $\leq 10$  ppt.

Low (Ranch Hand): Current Dioxin  $> 10$  ppt,  $10 \text{ ppt} < \text{Initial Dioxin} \leq 143$  ppt.

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



**Table N-3-22. (Continued)**  
**Analysis of Serum Insulin (mIU/ml) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED							
Model <sup>b</sup>	Current Dioxin Category Adjusted Mean <sup>a</sup> /(n)			Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)			
	Low	Medium	High	R <sup>2</sup>	Adj. Slope (Std. Error) <sup>c</sup>	p-Value	Covariate Remarks
4	31.45 (290)	39.97 (294)	49.42 (290)	0.159	0.1314 (0.0208)	<0.001	AGE (p<0.001) FAMDIAB (p=0.617) FAST (p<0.001)
5	30.93 (296)	39.93 (290)	49.49 (288)	0.168	0.1249 (0.0177)	<0.001	AGE (p<0.001) FAMDIAB (p=0.670) FAST (p<0.001)
6 <sup>d</sup>	32.03 (299)	39.01 (296)	46.03 (296)	0.180	0.1014 (0.0187)	<0.001	AGE (p<0.001) FAST (p<0.001)

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).

Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).

Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

<sup>c</sup> Slope and standard error based on natural logarithm of serum insulin versus log<sub>2</sub> (current dioxin + 1).

<sup>d</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.

Note: Model 4: Low = ≤ 8.1 ppt; Medium = >8.1-20.5 ppt; High = >20.5 ppt.

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

**Table N-3-23.**  
**Analysis of Serum Insulin (All Participants)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED					
Analysis Results for Log <sub>2</sub> (Initial Dioxin) <sup>a</sup>					
n	Low vs. Normal		High vs. Normal		Covariate Remarks
	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	
518	0.71 (0.47,1.10)	0.103	1.00 (0.89,1.20)	0.656	AGE (p<0.001)

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

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

**Table N-3-23. (Continued)**  
**Analysis of Serum Insulin (All Participants)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED						
Dioxin Category	n	Low vs. Normal		High vs. Normal		Covariate Remarks
		Adj. Relative Risk (95% C.I.) <sup>ab</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>ab</sup>	p-Value	
Comparison	1,044					DXCAT*PERS (p=0.018) AGE (p<0.001) FAMDIAB (p=0.175) RACE*PERS (p=0.049)
Background RH	368	0.79 (0.44,1.41)**	0.422**	0.76 (0.59,0.99)**	0.040**	
Low RH	251	0.80 (0.39,1.67)**	0.556**	0.98 (0.72,1.32)**	0.878**	
High RH	254	0.79 (0.37,1.70)**	0.547**	1.01 (0.74,1.36)**	0.970**	
Low plus High RH	505	0.80 (0.45,1.41)**	0.436**	0.99 (0.78,1.25)**	0.940**	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Adjusted for percent body fat at the time of duty in SEA, change in body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

\*\* Categorized dioxin-by-covariate interaction ( $0.01 < p \leq 0.05$ ); adjusted relative risk, confidence interval, and p-value derived from a model after deletion of this interaction; refer to Appendix Table N-4-7 for further analysis of this interaction.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq 10$  ppt.

Background (Ranch Hand): Current Dioxin  $\leq 10$  ppt.

Low (Ranch Hand): Current Dioxin  $> 10$  ppt,  $10 \text{ ppt} < \text{Initial Dioxin} \leq 143$  ppt.

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

**Table N-3-23. (Continued)**  
**Analysis of Serum Insulin (All Participants)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED						
Model <sup>a</sup>	Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)					Covariate Remarks
	n	Low vs. Normal		High vs. Normal		
		Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	
4	891	0.74 (0.58,0.94)	0.016	1.19 (1.08,1.32)	0.001	AGE (p<0.001) PERS (p=0.957)
5	891	0.79 (0.65,0.94)	0.010	1.20 (1.10,1.31)	<0.001	AGE (p<0.001) PERS (p=0.963)
6 <sup>c</sup>	890	0.77 (0.63,0.93)	0.008	1.17 (1.07,1.28)	0.001	AGE (p<0.001) PERS (p=0.968)

<sup>a</sup> Model 4: Log<sub>2</sub> (lipid-adjusted current dioxin + 1).  
 Model 5: Log<sub>2</sub> (whole-weight current dioxin + 1).  
 Model 6: Log<sub>2</sub> (whole-weight current dioxin + 1), adjusted for log<sub>2</sub> total lipids.

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

<sup>c</sup> Adjusted for log<sub>2</sub> total lipids in addition to covariates specified under "Covariate Remarks" column.