

## 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
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N-3-2	18-5	Diabetic Severity
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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)
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N-3-17	18-30	2-Hour Postprandial Glucose (Nondiabetics) (Continuous)
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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)

<b>Appendix N-3 Table</b>	<b>Chapter 18 Table</b>	<b>Dependent Variable</b>
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**

<b>c) 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	1.34 (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**

<b>a) MODEL 2: RANCH HANDS -- INITIAL DIOXIN -- ADJUSTED</b>				
<b>Analysis Results for Log<sub>2</sub> (Initial Dioxin)<sup>b</sup></b>				
<b>n</b>	<b>Contrast vs. Nondiabetic</b>	<b>Adj. Relative Risk (95% C.I.)<sup>a</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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.

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**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>	n	Contrast	Analysis Results for Log <sub>2</sub> (Current Dioxin)		Covariate Remarks
			Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	
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.

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**Table N-3-3.**  
**Analysis of Time to Diabetes Onset (years)**  
**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>2</sub> (Initial Dioxin)<sup>a</sup></b>		
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Slope (Std. Error)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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>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>Adj. Slope (Std. Error)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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>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	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**

<b>c) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>							
<b>Model<sup>a</sup></b>	<b>Current Dioxin Category Adjusted Mean/(n)</b>			<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			
	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)</b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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**

<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>b</sup></b>			
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)<sup>c</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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 ≤ 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-3-7. (Continued)**  
**Analysis of Neuropathy Results (Diabetics)**  
**Occupation and Body Fat Removed from Final Model**

b) 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	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**

<b>a) 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	1,027	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 ppt < 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>b) MODELS 4, 5, AND 6: RANCH HANDS – CURRENT DIOXIN – ADJUSTED</b>							
<b>Model<sup>b</sup></b>	<b>Current Dioxin Category Adjusted Mean<sup>a</sup>/(n)</b>			<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			
	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)<sup>c</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
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) RACE (p=0.055) PERS*FAMDIAB (p=0.001)
Medium	167	110.02				
High	168	114.09				

<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-3-11. (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) DIABSEV (p=0.001)
Medium	31	163.34				
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>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
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>
Comparison	147		
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 ≤ 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-3-14. (Continued)**  
**Analysis of Fasting Glucose (Diabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>c) 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	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**

<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>b</sup></b>			
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)<sup>c</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Low	139	99.68	0.059	-0.0033 (0.0034)	0.323	AGE (p=0.010)
Medium	137	98.79				PERS*FAMDIAB (p=0.079)
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 ≤ 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.

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

<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) PERS (p=0.076)
Medium	141	106.51				
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>					
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	896	104.45**			DXCAT*FAMDIAB (p=0.031)
Background RH	328	102.70**	-1.75 -- **	0.308**	PERS (p=0.004)
Low RH	203	105.36**	0.91 -- **	0.661**	AGE (p<0.001)
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>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	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**

<b>c) MODELS 4 AND 5: 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	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 ≤ 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>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>
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>a,b</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 ≤ 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-3-21.**  
**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 ≤ 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.

<b>b) MODELS 5 AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Model<sup>a</sup></b>	<b>n</b>	<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</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 ppt  $<$  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>					
Low vs. Normal			High vs. Normal		Covariate Remarks
n	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 ppt < 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
	Low vs. Normal			High vs. Normal		
	n	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.

**Table N-3-24.**  
**Analysis of Serum Insulin (mIU/ml) (Diabetics)**  
**(Continuous)**  
**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	31	51.36	0.570	-0.0907 (0.0626)	0.151	RACE (p=0.046)
Medium	31	60.57				DIABSEV (p=0.712)
High	34	40.38				FAST (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 serum insulin versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-24. (Continued)**  
**Analysis of Serum Insulin (mIU/ml) (Diabetics)**  
**(Continuous)**  
**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	147	40.06			RACE (p<0.001) DIABSEV (p=0.002) FAST (p<0.001) PERS*FAMDIAB (p=0.040)
Background RH	39	42.38	2.32 --	0.720	
Low RH	48	53.49	13.43 --	0.039	
High RH	46	37.67	-2.39 --	0.670	
Low plus High RH	94	45.04	4.99 --	0.292	

<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 ≤ 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-3-24. (Continued)**  
**Analysis of Serum Insulin (mIU/ml) (Diabetics)**  
**(Continuous)**  
**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	42.61 (26)	51.59 (55)	47.32 (52)	0.535	-0.0320 (0.0559)	0.568	RACE (p=0.028) DIABSEV (p=0.352) FAST (p<0.001) PERS*FAMDIAB (p=0.106)
5	42.07 (24)	54.85 (53)	43.75 (56)	0.535	-0.0224 (0.0463)	0.630	RACE (p=0.029) DIABSEV (p=0.337) FAST (p<0.001) PERS*FAMDIAB (p=0.109)
6 <sup>d</sup>	40.24 (24)	54.04 (53)	44.91 (56)	0.536	-0.0090 (0.0530)	0.865	RACE (p=0.027) DIABSEV (p=0.310) FAST (p<0.001) PERS*FAMDIAB (p=0.108)

<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-3-25.**  
**Analysis of Serum Insulin (Diabetics)**  
**(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>
96	0.63 (0.43,0.92)**	0.013**	AGE (p=0.652) RACE (p=0.075) DIABSEV (p=0.140)

<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 (0.01 < 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-4-8 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	148			DXCAT*AGE (p=0.032) RACE (p=0.053) PERS (p=0.008) DIABSEV (p<0.001)
Background RH	42	1.12 (0.51,2.48)**	0.778**	
Low RH	49	1.78 (0.81,3.92)**	0.151**	
High RH	47	0.70 (0.33,1.51)**	0.368**	
Low plus High RH	96	1.12 (0.62,2.01)**	0.716**	

<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 ≤ 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-4-8 for further analysis of this interaction.

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-3-25. (Continued)**  
**Analysis of Serum Insulin (Diabetics)**  
**(Discrete)**  
**Occupation and 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	0.82 (0.63,1.06)	0.121	DIABSEV (p=0.049)
5	138	0.85 (0.69,1.06)	0.151	DIABSEV (p=0.042)
6 <sup>c</sup>	138	0.86 (0.67,1.11)	0.245	DIABSEV (p=0.042)

<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-3-26.**  
**Analysis of Serum Insulin (mIU/ml) (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	142	68.66	0.153	0.0977 (0.0328)	0.003	AGE (p < 0.001)
Medium	141	74.55				
High	139	87.35				

<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-3-26. (Continued)**  
**Analysis of Serum Insulin (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	68.01**			DXCAT*AGE (p=0.038) RACE (p=0.961) FAST (p=0.882) PERS*FAMDIAB (p=0.104)
Background RH	329	62.07**	-5.94 -- **	0.072**	
Low RH	203	67.83**	-0.18 -- **	0.965**	
High RH	208	78.72**	10.71 -- **	0.016**	
Low plus High RH	411	73.14**	5.13 -- **	0.120**	

<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 means, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-9 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-3-26. (Continued)**  
**Analysis of Serum Insulin (mIU/ml) (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	33.14 (267)	40.35 (242)	53.85 (244)	0.095	0.1587 (0.0220)	<0.001	AGE (p<0.001) PERS (p=0.871) FAST (p=0.247)
5	33.03 (274)	40.82 (241)	55.58 (238)	0.109	0.1513 (0.0187)	<0.001	AGE (p<0.001) PERS (p=0.839) FAST (p=0.255)
6 <sup>b</sup>	35.36 (273)	41.34 (241)	52.47 (238)	0.132	0.1226 (0.0198)	<0.001	AGE (p<0.001) PERS (p=0.577) FAST (p=0.261)

<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-3-27.**  
**Analysis of Serum Insulin (Nondiabetics)**  
**(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>					
Low vs. Normal			High vs. Normal		
n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
422	0.84 (0.54,1.30)	0.417	1.20 (1.00,1.50)	0.024	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-3-27. (Continued)**  
**Analysis of Serum Insulin (Nondiabetics)**  
**(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	897					AGE (p<0.001) PERS (p=0.026) FAMDIAB (p=0.048)
Background RH	329	0.80 (0.45,1.44)	0.461	0.71 (0.54,0.93)	0.013	
Low RH	203	0.88 (0.42,1.82)	0.725	0.86 (0.61,1.20)	0.366	
High RH	208	0.93 (0.43,2.01)	0.844	1.19 (0.85,1.68)	0.314	
Low plus High RH	411	0.90 (0.50,1.60)	0.714	1.01 (0.78,1.31)	0.951	

<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.

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-3-27. (Continued)**  
**Analysis of Serum Insulin (Nondiabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED						
Model <sup>a</sup>	n	Analysis Results for Log <sub>2</sub> (Current Dioxin + 1)				Covariate Remarks
		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	753	0.80 (0.62,1.04)	0.093	1.35 (1.20,1.52)	<0.001	AGE (p<0.001) PERS (p=0.832)
5	753	0.83 (0.68,1.01)	0.069	1.35 (1.22,1.50)	<0.001	AGE (p<0.001) PERS (p=0.849)
6 <sup>c</sup>	752	0.81 (0.66,1.00)**	0.047**	1.30 (1.17,1.44)	<0.001**	CURR*AGE (p<0.001) PERS (p=0.895)

<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 from a model fitted after deletion of this interaction; refer to Appendix Table N-4-10 for further analysis of this interaction.

**Table N-3-28.**  
**Analysis of Serum Glucagon (pg/ml) (All Participants)**  
**(Continuous)**  
**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>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	150	58.06	0.049	0.0071 (0.0092)	0.446	RACE (p=0.286) FAST (p<0.001)
Medium	149	61.51				
High	153	60.39				

<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 serum glucagon versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-28. (Continued)**  
**Analysis of Serum Glucagon (pg/ml) (All Participants)**  
**(Continuous)**  
**Occupation 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	944	61.33**			DXCAT*FAMDIAB (p=0.010)
Background RH	330	59.94**	-1.39 -- **	0.163**	AGE (p=0.001)
Low RH	223	60.17**	-1.16 -- **	0.314**	RACE (p=0.170)
High RH	218	61.91**	0.58 -- **	0.629**	FAST (p<0.001)
Low plus High RH	441	61.04**	-0.29 -- **	0.749**	

<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 ( $p \leq 0.05$ ); adjusted mean, difference of adjusted means, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-11 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-3-28. (Continued)**  
**Analysis of Serum Glucagon (pg/ml) (All Participants)**  
**(Continuous)**  
**Occupation 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	**** (258)	**** (262)	**** (251)	****	****	****	CURR*FAMDIAB (p=0.003) AGE (p=0.011) RACE (p=0.083) FAST (p<0.001)
5	57.36 (267)	58.66 (263)	60.79 (258)	0.067	0.0149 (0.0054)	0.006	AGE (p=0.007) RACE (p=0.086) FAST (p<0.001)
6 <sup>d</sup>	57.76 (266)	58.73 (263)	60.47 (258)	0.069	0.0119 (0.0058)	0.040	AGE (p=0.009) RACE (p=0.112) 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 glucagon 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.

\*\*\*\* Log<sub>2</sub> (current dioxin + 1) interaction (p<0.01); adjusted relative risk, confidence interval, and p-value not presented; refer to Appendix Table N-4-11 for further analysis of this interaction.

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-3-29.**  
**Analysis of Serum Glucagon (All Participants)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>a) 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	788	1.11 (0.46,2.67)	0.818	AGE (p=0.041)
5	788	1.04 (0.48,2.26)	0.915	AGE (p=0.042)
6 <sup>c</sup>	787	1.18 (0.50,2.76)	0.710	AGE (p=0.039)

<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-3-30.**  
**Analysis of Serum Glucagon (pg/ml) (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	28	61.33	0.049	-0.0095 (0.0267)	0.723	DIABSEV (p=0.548) FAST (p=0.302)
Medium	27	71.79				
High	28	63.99				

<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 glucagon versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-30. (Continued)**  
**Analysis of Serum Glucagon (pg/ml) (Diabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY – ADJUSTED</b>					
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	132	68.73**			DXCAT*DIABSEV (p=0.001)
Background RH	38	71.11**	2.38 -- **	0.575**	AGE (p=0.348)
Low RH	45	68.56**	-0.18 -- **	0.963**	FAST (p=0.210)
High RH	38	65.26**	-3.47 -- **	0.392**	
Low plus High RH	83	67.03**	-1.71 -- **	0.579**	

<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 ( $p \leq 0.05$ ); adjusted mean, difference of adjusted means, confidence interval, and p-value derived from a model fitted after deletion of this interaction; refer to Appendix Table N-4-12 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-3-30. (Continued)**  
**Analysis of Serum Glucagon (pg/ml) (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	65.57 (27)	64.02 (49)	70.24 (45)	0.061	0.0075 (0.0202)	0.710	DIABSEV (p=0.138) FAST (p=0.514)
5	65.34 (25)	65.94 (47)	68.08 (49)	0.064	0.0128 (0.0167)	0.445	DIABSEV (p=0.107) FAST (p=0.107)
6 <sup>d</sup>	66.65 (25)	66.24 (47)	66.73 (49)	0.070	0.0058 (0.0189)	0.759	DIABSEV (p=0.177) FAST (p=0.503)

<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 glucagon 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-3-31.**  
**Analysis of Serum Glucagon (Diabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

a) 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	121	0.87 (0.41,1.82)	0.706	DIABSEV (p=0.791)
5	116	0.86 (0.39,1.89)	0.712	AGE (p=0.133) RACE (p=0.107) FAMDIAB (p=0.626) DIABSEV (p=0.934)

<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.

**Table N-3-32.**  
**Analysis of Serum Glucagon (Nondiabetics)**  
**(Continuous)**  
**Occupation Removed from Final Model**

a) 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	54.64 (236)	55.07 (217)	58.04 (214)	0.020	0.0173 (0.0065)	0.008	AGE (p=0.046) RACE (p=0.063) FAST (p=0.603)
5	54.63 (242)	55.50 (216)	57.85 (209)	0.021	0.0158 (0.0056)	0.005	AGE (p=0.047) RACE (p=0.067) FAST (p=0.598)
6 <sup>d</sup>	54.85 (241)	55.55 (216)	57.75 (209)	0.021	0.0144 (0.0060)	0.017	AGE (p=0.054) RACE (p=0.075) FAST (p=0.600)

<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 glucagon 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-3-33.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (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	171	7.51	0.142	0.0187 (0.0062)	0.003	AGE (p<0.001) RACE*FAMDIAB (p=0.393)
Medium	167	7.75				
High	168	7.87				

<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  $\alpha$ -1-C hemoglobin versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-33. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
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	1,045	7.59			RACE*FAMDIAB (p=0.077) AGE (p<0.001)
Background RH	368	7.54	-0.05 --	0.467	
Low RH	252	7.55	-0.04 --	0.631	
High RH	254	7.76	0.17 --	0.047	
Low plus High RH	506	7.66	0.07 --	0.322	

<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 ppt < Initial Dioxin  $\leq$  143 ppt.

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

**Table N-3-33. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (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	7.37 (290)	7.49 (294)	7.75 (290)	0.087	0.0167 (0.0038)	<0.001	AGE (p < 0.001) RACE (p = 0.001) FAMDIAB (p < 0.001)
5	7.38 (296)	7.43 (290)	7.84 (288)	0.091	0.0157 (0.0033)	<0.001	AGE (p < 0.001) RACE (p = 0.001) FAMDIAB (p < 0.001)
6 <sup>d</sup>	7.48 (295)	7.45 (290)	7.78 (288)	0.106	0.0108 (0.0035)	0.002	AGE (p < 0.001) RACE (p < 0.001) FAMDIAB (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  $\alpha$ -1-C hemoglobin 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-3-34.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (All Participants)**  
**(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>
506	1.11 (0.94,1.30)	0.205	AGE (p=0.001) RACE (p=0.030) 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) 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	1,045			AGE (p<0.001) RACE (p<0.001) FAMDIAB (p<0.001)
Background RH	368	0.96 (0.72,1.29)	0.794	
Low RH	252	1.03 (0.75,1.41)	0.867	
High RH	254	1.18 (0.86,1.64)	0.305	
Low plus High RH	506	1.10 (0.86,1.41)	0.449	

<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-3-34. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (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)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	873	1.15 (1.03,1.28)	0.013	AGE (p<0.001) RACE (p=0.005) PERS (p=0.076) FAMDIAB (p<0.001)
5	873	1.16 (1.05,1.28)	0.002	AGE (p<0.001) RACE (p=0.004) PERS (p=0.078) FAMDIAB (p<0.001)
6 <sup>c</sup>	872	1.08 (0.97,1.20)	0.143	AGE (p<0.001) RACE (p=0.002) PERS (p=0.040) FAMDIAB (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.

**Table N-3-35.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (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	10.72	0.327	0.0313 (0.0184)	0.092	RACE (p=0.009) DIABSEV (p<0.001)
Medium	31	10.41				
High	34	11.91				

<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  $\alpha$ -1-C hemoglobin versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-35. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (Diabetics)**  
**(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	148	10.46			AGE (p=0.423) RACE (p=0.001) DIABSEV (p<0.001)
Background RH	42	10.19	-0.27 --	0.541	
Low RH	49	10.24	-0.22 --	0.586	
High RH	47	11.11	0.65 --	0.142	
Low plus High RH	96	10.66	0.20 --	0.560	

<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 ppt < Initial Dioxin  $\leq$  143 ppt.

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

**Table N-3-35. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (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	10.00 (26)	10.64 (55)	10.99 (52)	0.364	0.0321 (0.0149)	0.034	AGE (p=0.223) RACE (p=0.054) FAMDIAB*DIABSEV (p=0.110)
5	10.17 (24)	10.15 (53)	11.43 (56)	0.369	0.0291 (0.0123)	0.020	AGE (p=0.224) RACE (p=0.050) FAMDIAB*DIABSEV (p=0.116)
6 <sup>d</sup>	10.37 (24)	10.13 (53)	11.37 (56)	0.367	0.0259 (0.0136)	0.059	RACE (p=0.032) FAMDIAB*DIABSEV (p=0.141)

<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  $\alpha$ -1-C hemoglobin 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-3-36.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (Diabetics)**  
**(Discrete)**  
**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=0.031) RACE (p=0.016) DIABSEV (p<0.001)
Background RH	42	1.03	(0.43,2.43)	0.950	
Low RH	49	1.45	(0.60,3.53)	0.414	
High RH	47	2.19	(0.82,5.84)	0.118	
Low plus High RH	96	1.75	(0.86,3.58)	0.123	

<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-3-36. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (Diabetics)**  
**(Discrete)**  
**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	138	1.49 (1.01,2.20)	0.035	AGE (p=0.019) RACE (p=0.166) DIABSEV (p<0.001)
5	138	1.49 (1.06,2.12)	0.016	DIABSEV (p<0.001) AGE*RACE (p=0.030)
6 <sup>c</sup>	138	1.28 (0.87,1.89)	0.199	DIABSEV (p<0.001) AGE*RACE (p=0.015)

<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-3-37.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (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	140	6.92	0.058	0.0031 (0.0033)	0.346	AGE (p<0.001) RACE (p=0.139) FAMDIAB (p=0.003)
Medium	137	7.11				
High	135	6.96				

<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  $\alpha$ -1-C hemoglobin versus log<sub>2</sub> (initial dioxin).

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

**Table N-3-37. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (percent) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>b) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b>					
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	898	7.11			AGE (p<0.001) RACE (p<0.001) FAMDIAB (p=0.004)
Background RH	329	7.09	-0.02 --	0.534	
Low RH	204	7.05	-0.06 --	0.199	
High RH	208	7.08	-0.03 --	0.430	
Low plus High RH	412	7.07	-0.04 --	0.179	

<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 ppt < Initial Dioxin  $\leq$  143 ppt.

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

**Table N-3-37. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (Percent) (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	7.03 (264)	7.00 (239)	7.05 (238)	0.035	0.0011 (0.0023)	0.651	AGE (p < 0.001) RACE (p = 0.018) FAMDIAB (p = 0.006)
5	7.03 (272)	7.00 (237)	7.04 (232)	0.035	0.0015 (0.0020)	0.450	AGE (p < 0.001) RACE (p = 0.017) FAMDIAB (p = 0.006)
6 <sup>d</sup>	7.05 (271)	7.01 (237)	7.03 (232)	0.038	0.0003 (0.0021)	0.880	AGE (p < 0.001) RACE (p = 0.013) FAMDIAB (p = 0.007)

<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  $\alpha$ -1-C hemoglobin 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-3-38.**  
**Analysis of  $\alpha$ -1-C Hemoglobin (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>
412	1.02 (0.83,1.24)	0.874	RACE (p=0.438) FAMDIAB (p=0.056)

<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	898			AGE (p=0.001) RACE (p<0.001) FAMDIAB (p=0.036)
Background RH	329	1.00 (0.71,1.40)	0.991	
Low RH	204	0.86 (0.58,1.30)	0.485	
High RH	208	0.92 (0.61,1.39)	0.697	
Low plus High RH	412	0.89 (0.65,1.22)	0.474	

<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-3-38. (Continued)**  
**Analysis of  $\alpha$ -1-C Hemoglobin (Nondiabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

<b>c) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Analysis Results for <math>\text{Log}_2</math> (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	740	0.97 (0.85,1.11)	0.685	RACE (p=0.056) PERS (p=0.145) FAMDIAB (p=0.017)
5	740	1.00 (0.89,1.12)	0.973	RACE (p=0.056) PERS (p=0.153) FAMDIAB (p=0.018)
6 <sup>c</sup>	739	0.96 (0.85,1.08)	0.486	RACE (p=0.038) PERS (p=0.115) FAMDIAB (p=0.018)

<sup>a</sup> Model 4:  $\text{Log}_2$  (lipid-adjusted current dioxin + 1).

Model 5:  $\text{Log}_2$  (whole-weight current dioxin + 1).

Model 6:  $\text{Log}_2$  (whole-weight current dioxin + 1), adjusted for  $\text{log}_2$  total lipids.

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

<sup>c</sup> Adjusted for  $\text{log}_2$  total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-39.**  
**Analysis of Serum Proinsulin (ng/ml) (Diabetics)**  
**(Continuous)**  
**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	29	0.747	0.475	-0.004 (0.025)	0.874	PERS (p=0.052)
Medium	29	0.953				FAST (p<0.001)
High	33	0.816				DIABSEV (p=0.349)

<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 serum proinsulin versus log<sub>2</sub> (initial dioxin).

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	143	0.708			RACE (p=0.005)
Background RH	36	0.602	-0.106 --	0.438	PERS (p=0.025)
Low RH	45	0.661	-0.047 --	0.703	FAST (p<0.001)
High RH	44	0.715	0.007 --	0.960	FAMDIAB*DIABSEV
Low plus High RH	89	0.687	-0.021 --	0.832	(p=0.019)

<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> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on square root scale.

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

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-3-39. (Continued)**  
**Analysis of Serum Proinsulin (ng/ml) (Diabetics)**  
**(Continuous)**  
**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	0.645 (26)	0.765 (52)	0.910 (52)	0.409	0.017 (0.021)	0.420	PERS (p=0.021) DIABSEV (p=0.260) FAST (p<0.001)
5	0.585 (24)	0.764 (50)	0.924 (56)	0.414	0.023 (0.017)	0.186	PERS (p=0.020) DIABSEV (p=0.314) FAST (p<0.001)
6 <sup>d</sup>	0.643 (24)	0.783 (50)	0.869 (56)	0.432	0.004 (0.020)	0.831	PERS (p=0.013) DIABSEV (p=0.224) FAST (p<0.001)

<sup>a</sup> Transformed from square root 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 square root of serum proinsulin 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-3-40.**  
**Analysis of Serum Proinsulin (Diabetics)**  
**(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>
91	1.12 (0.77,1.62)	0.560	AGE (p=0.240) DIABSEV (p=0.047)

<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	125	1.14 (0.85,1.54)	0.379	AGE (p=0.319) RACE (p=0.399) FAMDIAB (p=0.933) DIABSEV (p=0.002)
5	130	1.17 (0.92,1.50)	0.176	AGE (p=0.386) DIABSEV (p=0.003)
6 <sup>c</sup>	130	1.02 (0.77,1.34)**	0.905**	CURR*DIABSEV (p=0.034) AGE (p=0.428) RACE (p=0.307) PERS (p=0.594)

<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 (0.01 < p ≤ 0.05); adjusted relative risk, confidence interval, and p-value derived after deletion of this interaction; refer to Appendix Table N-4-14 for further analysis of this interaction.

**Table N-3-41.**  
**Analysis of Serum C Peptide (ng/ml) (Diabetics)**  
**(Continuous)**  
**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. 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	143	6.37			
Background RH	36	6.25	-0.12 (-1.72,1.48)	0.886	RACE (p<0.001) FAMDIAB (p=0.147) DIABSEV (p=0.022) FAST (p<0.001)
Low RH	45	8.24	1.87 (0.47,3.28)	0.010	
High RH	44	6.76	0.39 (-1.05,1.83)	0.595	
Low plus High RH	89	7.51	1.14 (0.02,2.26)	0.046	

<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.

<b>b) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>							
<b>Model<sup>a</sup></b>	<b>Current Dioxin Category Adjusted Mean/(n)</b>			<b>Analysis Results for Log<sub>2</sub> (Current Dioxin + 1)</b>			<b>Covariate Remarks</b>
	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)</b>	<b>p-Value</b>	
4	6.82 (24)	7.94 (51)	7.59 (50)	0.661	-0.087 (0.261)	0.738	RACE (p=0.042) FAMDIAB (p=0.205) DIABSEV (p=0.006) FAST (p<0.001)
5	6.88 (22)	8.12 (49)	7.40 (54)	0.661	-0.072 (0.216)	0.739	RACE (p=0.042) FAMDIAB (p=0.207) DIABSEV (p=0.006) FAST (p<0.001)
6 <sup>b</sup>	6.55 (22)	8.00 (49)	7.55 (54)	0.662	0.001 (0.247)	0.998	RACE (p=0.039) FAMDIAB (p=0.209) DIABSEV (p=0.007) FAST (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> 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-3-42.**  
**Analysis of Serum C Peptide (Diabetics)**  
**(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>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>
89	0.73 (0.50,1.08)	0.099	RACE (p=0.081) PERS*FAMDIAB (p=0.001) PERS*DIABSEV (p=0.050)

<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	143			DXCAT*AGE (p<0.001) PERS (p=0.412) AGE*DIABSEV (p=0.006)
Background RH	39	****	****	
Low RH	46	****	****	
High RH	45	****	****	
Low plus High RH	91	****	****	

<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 (p≤0.01); adjusted relative risk, confidence interval, and p-value not presented; refer to Appendix Table N-4-14 for further analysis of this interaction.

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-3-42. (Continued)**  
**Analysis of Serum C Peptide (Diabetics)**  
**(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)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	125	1.02 (0.78,1.32)	0.895	RACE (p=0.134) DIABSEV (p<0.001) PERS*FAMDIAB (p=0.123)
5	125	1.03 (0.82,1.29)**	0.824**	CURR*DIABSEV (p=0.018) AGE (p=0.817) RACE (p=0.142) PERS*FAMDIAB (p=0.101)
6 <sup>c</sup>	125	1.07 (0.83,1.39)**	0.576**	CURR*DIABSEV (p=0.022) AGE (p=0.821) RACE (p=0.127) PERS*FAMDIAB (p=0.093)

<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 (0.01 < p ≤ 0.05); adjusted relative risk, confidence interval, and p-value derived after deletion of this interaction; refer to Appendix Table N-4-14 for further analysis of this interaction.

**Table N-3-43.**  
**Analysis of Total Testosterone (ng/dl)**  
**(Continuous)**  
**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>2</sub> (Initial Dioxin)<sup>a</sup></b>			
<b>Initial Dioxin</b>	<b>n</b>	<b>Adj. Mean<sup>ab</sup></b>	<b>R<sup>2</sup></b>	<b>Adj. Slope (Std. Error)<sup>c</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
Low	171	528.0	0.131	-0.0382 (0.1348)	0.777	AGE (p=0.026)
Medium	170	510.1				RACE (p=0.029)
High	173	505.5				PERS (p=0.374)

<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 testosterone versus log<sub>2</sub> (initial dioxin).

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>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	1,056	516.9			AGE (p<0.001) RACE (p=0.017)
Background RH	364	544.2	27.3 --	0.012	
Low RH	256	530.4	13.5 --	0.272	
High RH	259	504.0	-12.9 --	0.290	
Low plus High RH	515	517.0	0.1 --	0.988	

<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> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on square root scale.

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

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-3-43. (Continued)**  
**Analysis of Total Testosterone (ng/dl)**  
**(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	561.4 (287)	522.8 (295)	489.3 (297)	0.038	-0.4629 (0.0969)	<0.001	AGE*RACE (p=0.033)
5	565.3 (292)	517.8 (293)	487.9 (294)	0.050	-0.4824 (0.0821)	<0.001	AGE*RACE (p=0.032)
6 <sup>d</sup>	550.8 (291)	513.3 (293)	494.3 (294)	0.056	-0.3680 (0.0886)	<0.001	AGE*RACE (p=0.022)

<sup>a</sup> Transformed from square root 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 square root of total testosterone 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-3-44.**  
**Analysis of Total Testosterone**  
**(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>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>
515	1.04 (0.80,1.37)	0.756	RACE (p=0.051)

<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	1,055				DXCAT*PERS (p=0.019) AGE (p=0.039) RACE (p=0.084)
Background RH	364	0.66	(0.33,1.32)**	0.238**	
Low RH	255	0.67	(0.33,1.34)**	0.254**	
High RH	259	1.23	(0.69,2.18)**	0.478**	
Low plus High RH	514	0.94	(0.58,1.52)**	0.801**	

<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-4-15 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-3-44. (Continued)**  
**Analysis of Total Testosterone**  
**(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)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	878	1.26 (1.03,1.55)	0.027	RACE (p=0.029) PERS (p=0.185)
5	878	1.27 (1.06,1.53)	0.011	RACE (p=0.031) PERS (p=0.182)
6 <sup>c</sup>	877	1.22 (1.00,1.48)	0.055	RACE (p=0.037) PERS (p=0.214)

<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-3-45.**  
**Analysis of Free Testosterone (pg/ml)**  
**(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	172	19.75	0.154	-0.009 (0.023)	0.682	AGE (p < 0.001) RACE (p = 0.018)
Medium	170	19.37				
High	173	19.44				

<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 free testosterone versus log<sub>2</sub> (initial dioxin).

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

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	1,055	18.72			AGE (p < 0.001) RACE (p = 0.166) PERS (p = 0.089)
Background RH	364	18.97	0.25 --	0.467	
Low RH	255	19.10	0.38 --	0.343	
High RH	259	19.00	0.28 --	0.482	
Low plus High RH	514	19.05	0.33 --	0.285	

<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> Difference of adjusted means after transformation to original scale; confidence interval on difference of adjusted means not presented because analysis was performed on square root scale.

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

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-3-45. (Continued)**  
**Analysis of Free Testosterone (pg/ml)**  
**(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	19.85 (287)	19.76 (294)	19.06 (297)	0.093	-0.033 (0.016)	0.037	AGE (p < 0.001) RACE (p = 0.019) PERS (p = 0.204)
5	20.15 (292)	19.38 (292)	19.23 (294)	0.093	-0.029 (0.013)	0.033	AGE (p < 0.001) RACE (p = 0.020) PERS (p = 0.197)
6 <sup>d</sup>	20.16 (291)	19.39 (292)	19.21 (294)	0.093	-0.030 (0.015)	0.044	AGE (p < 0.001) RACE (p = 0.019) PERS (p = 0.214)

<sup>a</sup> Transformed from square root 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 square root of free testosterone 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-3-46.**  
**Analysis of Free Testosterone**  
**(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>
514	1.10 (0.92,1.32)	0.305	AGE*RACE (p=0.013) RACE*PERS (p=0.006)

<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>
Comparison	1,055		
Background RH	364	0.77 (0.55,1.09)	0.136
Low RH	255	0.72 (0.49,1.06)	0.097
High RH	259	0.85 (0.59,1.21)	0.353
Low plus High RH	514	0.79 (0.59,1.04)	0.095

<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-3-46. (Continued)**  
**Analysis of Free Testosterone**  
**(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)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
4	879	1.20 (1.06,1.35)	0.004	
5	878	1.13 (1.01,1.26)	0.026	AGE (p=0.165) PERS (p=0.206)
6 <sup>c</sup>	878	1.21 (1.07,1.36)	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> 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-3-47.**  
**Analysis of Sex Hormone Binding Globulin**  
**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>
515	0.99 (0.83,1.19)	0.944	RACE (p=0.198)

<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 4: 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>
4	879	1.00 (0.88,1.13)	0.994

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

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

**Table N-3-48.**  
**Analysis of Estradiol**  
**(Discrete)**  
**Occupation 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	894	1.12 (0.88,1.43)	0.363	RACE (p=0.033)
5	894	1.08 (0.87,1.35)	0.461	RACE (p=0.032)
6 <sup>c</sup>	893	1.05 (0.83,1.32)	0.702	RACE (p=0.027)

<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-3-49.**  
**Analysis of Luteinizing Hormone (LH) (mIU/ml)**  
**(Continuous)**  
**Occupation 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. 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	1,063	3.84			AGE*RACE (p=0.013)
Background RH	374	3.92	0.08 --	0.560	
Low RH	260	4.18	0.34 --	0.020	
High RH	260	3.83	-0.01 --	0.878	
Low plus High RH	520	4.00	0.16 --	0.160	

<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-3-50.**  
**Analysis of Luteinizing Hormone (LH)**  
**(Discrete)**  
**Occupation Removed from Final Model**

<b>a) MODEL 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>
6 <sup>c</sup>	893	0.94 (0.65,1.36)	0.739	AGE (p<0.001)

<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> 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.