

Table 5-27

Pre-post SEA Counts and Rates of Eye Anomalies

Variable: Eye Anomalies
 Restrictions: Full Siblings of Ranch Hands and Comparisons
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
 to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Background | 1250 | 6 | 4.8 | 812 | 3 | 3.7 | | All Exp Categ | |
| Unknown | 514 | 4 | 7.8 | 221 | 3 | 13.6 | | Unk vs Bkgd | |
| Low | 244 | 0 | 0.0 | 148 | 1 | 6.8 | | Low vs Bkgd | |
| High | 148 | 0 | 0.0 | 195 | 3 | 15.4 | | High vs Bkgd | |
| Total | 2156 | | | 1376 | | | | | |

Anomalies of the Ear, Face and Neck (All Children)

Model 1: Children of Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$

There is insufficient data (Table 5-28) to assess the significance of variation in the association between anomalies of the ear, face and neck and initial dioxin with time of conception among full sibling children of Ranch Hands.

Table 5-28

**Pre-post SEA Counts and Rates of
Ear, Face and Neck Anomalies**

Variable: Ear, Face and Neck Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|--------|--|-----|---------|------|----------|-----|---------|
| Exposure Restriction | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
| | | Initial Dioxin | n | Pre-SEA | | Post-SEA | | p-Value |
| | | | | Abn | Rate | n | Abn | Rate |
| a) D>10 ppt (n=1208) | Low | | 249 | 1 | 4.0 | 106 | 0 | 0.0 |
| | Medium | | 338 | 1 | 3.0 | 245 | 4 | 16.3 |
| | High | | 113 | 0 | 0.0 | 157 | 3 | 19.1 |
| b) D>5 ppt (n=1748) | Low | | 286 | 3 | 10.5 | 155 | 4 | 25.8 |
| | Medium | | 616 | 1 | 1.6 | 308 | 3 | 9.7 |
| | High | | 156 | 1 | 6.4 | 227 | 4 | 17.6 |

Anomalies of the Ear, Face and Neck (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

There is insufficient data (Table 5-29) to assess the significance of variation in the association between anomalies of the ear, face and neck and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands.

Table 5-29

**Pre-post SEA Counts and Rates of
Ear, Face and Neck Anomalies**

Variable: Ear, Face and Neck Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: \log_2 (Current Dioxin), Time

| Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|--|-----------------|-----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 0.0 (0/137) | 5.5 (1/183) | 0.0 (0/37) | |
| | | >18.6 | 0.0 (0/95) | 5.8 (1/171) | 0.0 (0/78) | |
| | Post-SEA | ≤18.6 | 0.0 (0/62) | 7.5 (1/134) | 0.0 (0/72) | |
| | | >18.6 | 25.0 (1/40) | 18.5 (2/108) | 32.3 (3/93) | |
| | Pre-SEA | ≤18.6 | 6.4 (1/157) | 6.4 (2/313) | 0.0 (0/66) | |
| | | >18.6 | 6.7 (1/150) | 3.7 (1/270) | 0.0 (0/102) | |
| b) D>5 ppt (n=1748) | Post-SEA | ≤18.6 | 33.3 (3/90) | 11.5 (2/174) | 0.0 (0/110) | |
| | | >18.6 | 0.0 (0/63) | 14.7 (2/136) | 34.2 (4/117) | |

Anomalies of the Ear, Face and Neck (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

There is insufficient data (Table 5-30) to assess the significance of variation in the association between anomalies of the ear, face and neck and categorized current dioxin with time of conception.

Table 5-30

Pre-post SEA Counts and Rates of Ear, Face and Neck Anomalies

Variable: Ear, Face and Neck Anomalies
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|---------------------|-----|------|----------------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn Rate | | n | Post-SEA Abn Rate | | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 8 | 5.5 | 981 | 11 | 11.2 | 2.06 | All Exp Categ | |
| Unknown | 582 | 5 | 8.6 | 282 | 5 | 17.7 | 2.08 | Unk vs Bkgd | |
| Low | 290 | 2 | 6.9 | 174 | 2 | 11.5 | 1.67 | Low vs Bkgd | |
| High | 168 | 0 | 0.0 | 227 | 4 | 17.6 | ---- | High vs Bkgd | |
| Total | 2499 | | | 1664 | | | | | |

Anomalies of the Ear, Face and Neck (Full Siblings)

Model 1: Children of Ranch Hands - Log₂(Initial Dioxin)

There is insufficient data (Table 5-31) to assess the significance of variation in the association between anomalies of the ear, face and neck and initial dioxin with time of conception among full sibling children of Ranch Hands.

Table 5-31

**Pre-post SEA Counts and Rates of
Ear, Face and Neck Anomalies**

Variable: Ear, Face and Neck Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
|-------------------------|-------------------|--|---------|------|----------|-----|------|---------|
| Exposure Restriction | Initial Dioxin | n | Pre-SEA | | Post-SEA | | | p-Value |
| | | | Abn | Rate | n | Abn | Rate | |
| a) D>10 ppt (n=1030) | Low | 231 | 1 | 4.3 | 78 | 0 | 0.0 | |
| | Medium | 276 | 0 | 0.0 | 206 | 4 | 19.4 | |
| | High | 103 | 0 | 0.0 | 136 | 3 | 22.1 | |
| b) D>5 ppt (n=1489) | Low | 252 | 2 | 7.9 | 114 | 3 | 26.3 | |
| | Medium | 545 | 1 | 1.8 | 245 | 3 | 12.2 | |
| | High | 135 | 0 | 0.0 | 198 | 4 | 20.2 | |

Anomalies of the Ear, Face and Neck (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

There is insufficient data (Table 5-32) to assess the significance of variation in the association between ear, face and neck anomalies and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands.

Table 5-32

**Pre-post SEA Counts and Rates of
Ear, Face and Neck Anomalies**

Variable: Ear, Face and Neck Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\text{Log}_2(\text{Current Dioxin})$, Time

Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$, Time - Unadjusted

| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
|-------------------------|-----------------------|---------------------------|--|-----------------|----------------|---------|
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 0.0 (0/124) | 6.5 (1/155) | 0.0 (0/35) | |
| | | >18.6 | 0.0 (0/85) | 0.0 (0/143) | 0.0 (0/69) | |
| | Post-SEA | ≤18.6 | 0.0 (0/47) | 8.7 (1/115) | 0.0 (0/64) | |
| | | >18.6 | 35.7 (1/28) | 21.7 (2/92) | 40.0 (3/75) | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 0.0 (0/126) | 7.2 (2/276) | 0.0 (0/60) | |
| | | >18.6 | 6.9 (1/145) | 0.0 (0/237) | 0.0 (0/88) | |
| | Post-SEA | ≤18.6 | 33.9 (2/59) | 13.9 (2/144) | 0.0 (0/98) | |
| | | >18.6 | 0.0 (0/53) | 18.9 (2/106) | 41.2 (4/97) | |

Anomalies of the Ear, Face and Neck (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

There is insufficient data (Table 5-33) to assess the significance of variation in the association between ear, face and neck anomalies and categorized current dioxin with time of conception among full siblings.

Table 5-33

Pre-post SEA Counts and Rates of Ear, Face and Neck Anomalies

Variable: Ear, Face and Neck Anomalies
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Background | 1250 | 8 | 6.4 | 812 | 11 | 13.5 | 2.13 | All Exp Categ | |
| Unknown | 514 | 4 | 7.8 | 221 | 4 | 18.1 | 2.35 | Unk vs Bkgd | |
| Low | 244 | 1 | 4.1 | 148 | 2 | 13.5 | 5.03 | Low vs Bkgd | |
| High | 148 | 0 | 0.0 | 195 | 4 | 20.5 | -- | High vs Bkgd | |
| Total | 2156 | | | 1376 | | | | | |

Circulatory System and Heart Anomalies (All Children)

Model 1: Children of Ranch Hands - Log₂(Initial Dioxin)

Without adjustment for covariates (Table 5-34 [a]), there is borderline significant variation in the association between circulatory system and heart anomalies and initial dioxin with time of conception among children of Ranch Hands having more than 10 ppt current dioxin ($p=0.071$). This borderline significance is due to the relatively high anomaly rate among post-SEA children of Ranch Hands with low initial dioxin (28.3 per 1000) compared to the corresponding rate among pre-SEA children (4.0 per 1000) and a reversed pattern among children of Ranch Hands with high levels of initial dioxin.

Without adjustment for covariates (Table 5-34 [b]), there is no significant variation in the association between circulatory system and heart anomalies and initial dioxin with time of conception among children of Ranch Hands having more than 5 ppt current dioxin ($p=0.500$).

Table 5-34

Pre-post SEA Counts and Rates of
Circulatory System and Heart Anomalies

Variable: Circulatory System and Heart Anomalies
Restrictions: All Children of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|--------|-------------------|--|------|----------|-----|------|---------|
| Exposure Restriction | | Initial Dioxin | Time of Conception Relative to the Father's Duty in SEA | | | | | |
| | | | Pre-SEA | | Post-SEA | | | p-Value |
| | | n | Abn | Rate | n | Abn | Rate | |
| a) D>10 ppt (n=1208) | Low | 249 | 1 | 4.0 | 106 | 3 | 28.3 | 0.071 |
| | Medium | 338 | 6 | 17.8 | 245 | 9 | 36.7 | |
| | High | 113 | 2 | 17.7 | 157 | 1 | 6.4 | |
| b) D>5 ppt (n=1748) | Low | 286 | 4 | 14.0 | 155 | 2 | 12.9 | 0.500 |
| | Medium | 616 | 5 | 8.1 | 308 | 10 | 32.5 | |
| | High | 156 | 4 | 25.6 | 227 | 2 | 8.8 | |

Circulatory System and Heart Anomalies (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-35 [a] and [b]), there is no significant variation in the association between circulatory system and heart anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt ($p=0.739$) or more than 5 ppt ($p=0.778$) current dioxin.

Table 5-35

Pre-post SEA Counts and Rates of
Circulatory System and Heart Anomalies

Variable: Circulatory System and Heart Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: \log_2 (Current Dioxin), Time

| Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|--|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 7.3 (1/137) | 10.9 (2/183) | 27.0 (1/37) | 0.739 |
| | | >18.6 | 0.0 (0/95) | 23.4 (4/171) | 12.8 (1/78) | |
| | Post-SEA | ≤18.6 | 16.1 (1/62) | 37.3 (5/134) | 0.0 (0/72) | |
| | | >18.6 | 50.0 (2/40) | 37.0 (4/108) | 10.8 (1/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 12.7 (2/157) | 9.6 (3/313) | 15.2 (1/66) | 0.778 |
| | | >18.6 | 13.3 (2/150) | 14.8 (4/270) | 9.8 (1/102) | |
| | Post-SEA | ≤18.6 | 11.1 (1/90) | 28.7 (5/174) | 9.1 (1/110) | |
| | | >18.6 | 0.0 (0/63) | 44.1 (6/136) | 8.5 (1/117) | |

Circulatory System and Heart Anomalies (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-36), there is no significant variation in the overall association between circulatory system and heart anomalies and categorized current dioxin with time of conception ($p=0.788$). The corresponding contrasts of children of Ranch Hands in the High ($p=0.470$), Low ($p=0.587$) and Unknown ($p=0.846$) categories versus children of Comparisons in the Background category are not significant.

Table 5-36

Pre-post SEA Counts and Rates of Circulatory System and Heart Anomalies

Variable: Circulatory System and Heart Anomalies
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|---------------------|------|------|----------------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn Rate | | n | Post-SEA Abn Rate | | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 15 | 10.3 | 981 | 16 | 16.3 | 1.60 | All Exp Categ | 0.788 |
| Unknown | 582 | 6 | 10.3 | 282 | 4 | 14.2 | 1.38 | Unk vs Bkgd | 0.846 |
| Low | 290 | 6 | 20.7 | 174 | 8 | 46.0 | 2.28 | Low vs Bkgd | 0.587 |
| High | 168 | 2 | 11.9 | 227 | 2 | 8.8 | 0.74 | High vs Bkgd | 0.470 |
| Total | 2499 | | | 1664 | | | | | |

Circulatory System and Heart Anomalies (Full Siblings)

Model 1: Children of Ranch Hands - Log₂(Initial Dioxin)

Without adjustment for covariates (Table 5-37 [a] and [b]), there is no significant variation in the association between circulatory system and heart anomalies and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.154$) or more than 5 ppt ($p=0.727$) current dioxin.

Table 5-37

**Pre-post SEA Counts and Rates of
Circulatory System and Heart Anomalies**

Variable: Circulatory System and Heart Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
|-------------------------|-------------------|--|---------|------|----------|-----|------|---------|
| Exposure Restriction | Initial Dioxin | n | Pre-SEA | | Post-SEA | | | p-Value |
| | | | Abn | Rate | n | Abn | Rate | |
| a) D>10 ppt (n=1030) | Low | 231 | 1 | 4.3 | 78 | 1 | 12.8 | 0.154 |
| | Medium | 276 | 3 | 10.9 | 206 | 7 | 34.0 | |
| | High | 103 | 2 | 19.4 | 136 | 0 | 0.0 | |
| b) D>5 ppt (n=1489) | Low | 252 | 4 | 15.9 | 114 | 1 | 8.8 | 0.727 |
| | Medium | 545 | 4 | 7.3 | 245 | 7 | 28.6 | |
| | High | 135 | 2 | 14.8 | 198 | 1 | 5.1 | |

Circulatory System and Heart Anomalies (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-38 [a] and [b]), there is no significant variation in the association between circulatory system and heart anomalies and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.621$) or more than 5 ppt ($p=0.892$) current dioxin.

Table 5-38

**Pre-post SEA Counts and Rates of
Circulatory System and Heart Anomalies**

Variable: Circulatory System and Heart Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\log_2(\text{Current Dioxin})$, Time

Ranch Hands - $\log_2(\text{Current Dioxin})$, Time - Unadjusted

| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
|-------------------------|-----------------------|---------------------------|--|-----------------|----------------|---------|
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 8.1 (1/124) | 6.5 (1/155) | 28.6 (1/35) | 0.621 |
| | | >18.6 | 0.0 (0/85) | 14.0 (2/143) | 14.5 (1/69) | |
| | Post-SEA | ≤18.6 | 0.0 (0/47) | 26.1 (3/115) | 0.0 (0/64) | |
| | | >18.6 | 35.7 (1/28) | 43.5 (4/92) | 0.0 (0/75) | |
| | | | | | | |
| | | | | | | |
| b) c>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 15.9 (2/126) | 7.2 (2/276) | 16.7 (1/60) | 0.892 |
| | | >18.6 | 13.8 (2/145) | 8.4 (2/237) | 11.4 (1/88) | |
| | Post-SEA | ≤18.6 | 16.9 (1/59) | 20.8 (3/144) | 0.0 (0/98) | |
| | | >18.6 | 0.0 (0/53) | 47.2 (5/106) | 0.0 (0/97) | |
| | | | | | | |
| | | | | | | |

Circulatory System and Heart Anomalies (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-39), there is borderline significant variation in the overall association between circulatory system and heart anomalies and categorized current dioxin with time of conception among full siblings ($p=0.095$). However, the association between circulatory system and heart anomalies and time of conception among children of Ranch Hands in the Unknown ($p=0.992$), Low ($p=0.234$) and High ($p=0.377$) categories do not differ significantly from the corresponding association among children of Comparisons in the Background category.

Table 5-39

Pre-post SEA Counts and Rates of Circulatory System and Heart Anomalies

Variable: Circulatory System and Heart Anomalies
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1250 | 14 | 11.2 | 812 | 14 | 17.2 | 1.55 | All Exp Categ | 0.095 |
| Unknown | 514 | 6 | 11.7 | 221 | 4 | 18.1 | 1.56 | Unk vs Bkgd | 0.992 |
| Low | 244 | 3 | 12.3 | 148 | 7 | 47.3 | 3.99 | Low vs Bkgd | 0.234 |
| High | 148 | 2 | 13.5 | 195 | 0 | 0.0 | ---- | High vs Bkgd | 0.377 |
| Total | 2156 | | | 1376 | | | | | |

Respiratory System Anomalies (All Children)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

There is insufficient data (Table 5-40) to assess the significance of variation in the association between respiratory system anomalies and initial dioxin with time of conception among children of Ranch Hands.

Table 5-40

**Pre-post SEA Counts and Rates of
Respiratory System Anomalies**

Variable: Respiratory System Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
|-----------------------------|-------------------|-----|----------------|------|-----|-----------------|------|---------|
| a) $c > 10$ ppt (n=1208) | Low | 249 | 0 | 0.0 | 106 | 0 | 0.0 | |
| | Medium | 338 | 0 | 0.0 | 245 | 1 | 4.1 | |
| | High | 113 | 0 | 0.0 | 157 | 1 | 6.4 | |
| b) $c > 5$ ppt (n=1748) | Low | 286 | 0 | 0.0 | 155 | 1 | 6.5 | |
| | Medium | 616 | 0 | 0.0 | 308 | 1 | 3.2 | |
| | High | 156 | 0 | 0.0 | 227 | 1 | 4.4 | |

Respiratory System Anomalies (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

There is insufficient data (Table 5-41) to assess the significance of variation in the association between respiratory system anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands.

Table 5-41

**Pre-post SEA Counts and Rates of
Respiratory System Anomalies**

Variable: Respiratory System Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: \log_2 (Current Dioxin), Time

| Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|----------------------|----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 0.0 (0/137) | 0.0 (0/183) | 0.0 (0/37) | |
| | | >18.6 | 0.0 (0/95) | 0.0 (0/171) | 0.0 (0/78) | |
| | Post-SEA | ≤18.6 | 0.0 (0/62) | 0.0 (0/134) | 0.0 (0/72) | |
| | | >18.6 | 0.0 (0/40) | 9.3 (1/108) | 10.8 (1/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 0.0 (0/157) | 0.0 (0/313) | 0.0 (0/66) | |
| | | >18.6 | 0.0 (0/150) | 0.0 (0/270) | 0.0 (0/102) | |
| | Post-SEA | ≤18.6 | 11.1 (1/90) | 0.0 (0/174) | 0.0 (0/110) | |
| | | >18.6 | 0.0 (0/63) | 7.4 (1/136) | 8.5 (1/117) | |

Respiratory System Anomalies (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

There is insufficient data (Table 5-42) to assess the significance of variation in the association between respiratory system anomalies and categorized current dioxin with time of conception.

Table 5-42

Pre-post SEA Counts and Rates of Respiratory System Anomalies

Variable: Respiratory System Anomalies
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 1 | 0.7 | 981 | 2 | 2.0 | | All Exp Categ | |
| Unknown | 582 | 0 | 0.0 | 282 | 2 | 7.1 | | Unk vs Bkgd | |
| Low | 290 | 0 | 0.0 | 174 | 1 | 5.7 | | Low vs Bkgd | |
| High | 168 | 0 | 0.0 | 227 | 1 | 4.4 | | High vs Bkgd | |
| Total | 2499 | | | 1664 | | | | | |

Respiratory System Anomalies (Full Siblings)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

There is insufficient data (Table 5-43) to assess the significance of variation in the association between respiratory system anomalies and initial dioxin with time of conception among full sibling children of Ranch Hands.

Table 5-43

**Pre-post SEA Counts and Rates of
Respiratory System Anomalies**

Variable: Respiratory System Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|-------------------|--|----------------|------|-----|-----------------|------|---------|
| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
| Exposure Assumption | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
| a) D>10 ppt (n=1030) | Low | 231 | 0 | 0.0 | 78 | 0 | 0.0 | |
| | Medium | 276 | 0 | 0.0 | 206 | 1 | 4.9 | |
| | High | 103 | 0 | 0.0 | 136 | 1 | 7.4 | |
| b) D>5 ppt (n=1489) | Low | 252 | 0 | 0.0 | 114 | 1 | 8.8 | |
| | Medium | 545 | 0 | 0.0 | 245 | 1 | 4.1 | |
| | High | 135 | 0 | 0.0 | 198 | 1 | 5.1 | |

Respiratory System Anomalies (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

There is insufficient data (Table 5-44) to assess the significance of variation in the association between respiratory system anomalies and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands.

Table 5-44

**Pre-post SEA Counts and Rates of
Respiratory System Anomalies**

Variable: Respiratory System Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\text{Log}_2(\text{Current Dioxin})$, Time

| Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$, Time - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 0.0 (0/124) | 0.0 (0/155) | 0.0 (0/35) | |
| | | >18.6 | 0.0 (0/85) | 0.0 (0/143) | 0.0 (0/69) | |
| | Post-SEA | ≤18.6 | 0.0 (0/47) | 0.0 (0/115) | 0.0 (0/64) | |
| | | >18.6 | 0.0 (0/28) | 10.9 (1/92) | 13.3 (1/75) | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 0.0 (0/126) | 0.0 (0/276) | 0.0 (0/60) | |
| | | >18.6 | 0.0 (0/145) | 0.0 (0/237) | 0.0 (0/88) | |
| | Post-SEA | ≤18.6 | 16.9 (1/59) | 0.0 (0/144) | 0.0 (0/98) | |
| | | >18.6 | 0.0 (0/53) | 9.4 (1/106) | 10.3 (1/97) | |

Respiratory System Anomalies (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

There is insufficient data (Table 5-45) to assess the significance of variation in the association between respiratory system anomalies and categorized current dioxin with time of conception among full siblings.

Table 5-45

Pre-post SEA Counts and Rates of Respiratory System Anomalies

Variable: Respiratory System Anomalies
Restrictions: Full Siblings of Ranch Hands of Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1250 | 1 | 0.8 | 812 | 2 | 2.5 | | All Exp Categ | |
| Unknown | 514 | 0 | 0.0 | 221 | 2 | 9.0 | | Unk vs Bkgd | |
| Low | 244 | 0 | 0.0 | 148 | 1 | 6.8 | | Low vs Bkgd | |
| High | 148 | 0 | 0.0 | 195 | 1 | 5.1 | | High vs Bkgd | |
| Total | 2156 | | | 1376 | | | | | |

Digestive System Anomalies (All Children)

Model 1: Children of Ranch Hands - Log₂(Initial Dioxin)

Without adjustment for covariates (Table 5-46 [a] and [b]), there is no significant variation in the association between digestive system anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt (p=0.704) or more than 5 ppt (p=0.926) current dioxin.

Table 5-46

**Pre-post SEA Counts and Rates of
Digestive System Anomalies**

Variable: Digestive System Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
|-------------------------|-------------------|-----|----------------|------|-----|-----------------|------|---------|
| a) D>10 ppt (n=1208) | Low | 249 | 7 | 28.1 | 106 | 2 | 18.9 | 0.704 |
| | Medium | 338 | 3 | 8.9 | 245 | 6 | 24.5 | |
| | High | 113 | 2 | 17.7 | 157 | 4 | 25.5 | |
| b) D>5 ppt (n=1748) | Low | 286 | 3 | 10.5 | 155 | 3 | 19.4 | 0.926 |
| | Medium | 616 | 8 | 13.0 | 308 | 8 | 26.0 | |
| | High | 156 | 3 | 19.2 | 227 | 5 | 22.0 | |

Digestive System Anomalies (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-47 [a]), there is significant variation in the association between digestive system anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt current dioxin ($p=0.030$). This significance is caused by high rates of digestive anomalies in post-SEA children of Ranch Hands with late tours and high dioxin levels (27.8 per 1000) in post-SEA children of Ranch Hands with early tours and intermediate dioxin levels (37.0 per 1000), as compared with the corresponding pre-SEA rates (0.0 per 1000 and 5.8 per 1000).

Without adjustment for covariates (Table 5-47 [b]), there is borderline significant variation in the association between digestive system anomalies and current dioxin with time of conception among children of Ranch Hands having more than 5 ppt current dioxin ($p=0.071$). This borderline significance is caused by high rates of digestive anomalies in post-SEA children of Ranch

Hands with late tours and high dioxin levels (18.2 per 1000) and in post-SEA children of Ranch Hands with early tours and intermediate dioxin levels (51.5 per 1000), as compared with the corresponding pre-SEA rates (0.0 per 1000 and 3.7 per 1000).

Table 5-47

Pre-post SEA Counts and Rates of
Digestive System Anomalies

Variable: Digestive System Anomalies
Restrictions: All Children of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 2: \log_2 (Current Dioxin), Time

| Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|--|-----------------|-----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 36.5 (5/137) | 16.4 (3/183) | 0.0 (0/37) | 0.030 |
| | | >18.6 | 10.5 (1/95) | 5.8 (1/171) | 25.6 (2/78) | |
| | Post-SEA | ≤18.6 | 16.1 (1/62) | 14.9 (2/134) | 27.8 (2/72) | |
| | | >18.6 | 25.0 (1/40) | 37.0 (4/108) | 21.5 (2/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 12.7 (2/157) | 25.6 (8/313) | 0.0 (0/66) | 0.071 |
| | | >18.6 | 0.0 (0/150) | 3.7 (1/270) | 29.4 (3/102) | |
| | Post-SEA | ≤18.6 | 11.1 (1/90) | 23.0 (4/174) | 18.2 (2/110) | |
| | | >18.6 | 0.0 (0/63) | 51.5 (7/136) | 17.1 (2/117) | |

Digestive System Anomalies (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-48), there is no significant variation in the overall association between digestive system anomalies and categorized current dioxin with time of conception ($p=0.523$). The association between time of conception and digestive system anomalies among children of Ranch Hands in the High ($p=0.285$), Low ($p=0.394$) and Unknown ($p=0.828$) categories are not significantly different from that among children of Comparisons in the Background category.

Table 5-48

Pre-post SEA Counts and Rates of Digestive System Anomalies

Variable: Digestive System Anomalies
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|---|------|-------------|------|------|--------------|------|------------|-------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 15 | 10.3 | 981 | 24 | 24.5 | 2.41 | All Exp Categ | 0.523 |
| Unknown | 582 | 6 | 10.3 | 282 | 6 | 21.3 | 2.09 | Unk vs Bkgd | 0.828 |
| Low | 290 | 2 | 6.9 | 174 | 6 | 34.5 | 5.14 | Low vs Bkgd | 0.394 |
| High | 168 | 3 | 17.9 | 227 | 4 | 17.6 | 0.99 | High vs Bkgd | 0.285 |
| Total | 2499 | | | 1664 | | | | | |

Digestive System Anomalies (Full Siblings)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-49 [a] and [b]), there is no significant variation in the association between digestive system anomalies and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.890$) or more than 5 ppt ($p=0.926$) current dioxin.

Table 5-49

Pre-post SEA Counts and Rates of Digestive System Anomalies

Variable: Digestive System Anomalies
Restrictions: Full Siblings of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 1: \log_2 (Initial Dioxin)

| Ranch Hands - \log_2 (Initial Dioxin) - Unadjusted | | | | | | | | |
|--|-------------------|-----|----------------|------|-----|-----------------|------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | |
| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
| a) D>10 ppt (n=1030) | Low | 231 | 7 | 30.3 | 78 | 1 | 12.8 | 0.890 |
| | Medium | 276 | 3 | 10.9 | 206 | 6 | 29.1 | |
| | High | 103 | 2 | 19.4 | 136 | 3 | 22.1 | |
| b) D>5 ppt (n=1489) | Low | 252 | 3 | 11.9 | 114 | 2 | 17.5 | 0.926 |
| | Medium | 545 | 8 | 14.7 | 245 | 6 | 24.5 | |
| | High | 135 | 3 | 22.2 | 198 | 4 | 20.2 | |

Digestive System Anomalies (Full Siblings)

Model 2: Children of Ranch Hands - \log_2 (Current Dioxin) and Time

Without adjustment for covariates (Table 5-50 [a]), there is significant variation in the association between digestive system anomalies and current dioxin with time since duty in SEA and time of conception among full siblings of Ranch Hands having more than 10 ppt ($p=0.030$).

Without adjustment for covariates (Table 5-50 [b]), there is borderline significant variation in the association between digestive system anomalies and current dioxin with time of conception among full siblings of Ranch Hands having more than 5 ppt current dioxin (p=0.057).

Both the significant variation in Table 5-50 [a] and the borderline significant variation in Table 5-50 [b] are caused by high post-SEA rates of digestive anomalies in children of Ranch Hands with late tours and high dioxin levels and in children of Ranch Hands with early tours and intermediate dioxin levels, relative to the corresponding pre-SEA rates.

Table 5-50

Pre-post SEA Counts and Rates of
Digestive System Anomalies

Variable: Digestive System Anomalies
Restrictions: Full Siblings of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 2: Log₂(Current Dioxin), Time

| Ranch Hands - Log ₂ (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|--|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 40.3 (5/124) | 19.4 (3/155) | 0.0 (0/35) | 0.030 |
| | | >18.6 | 11.8 (1/85) | 7.0 (1/143) | 29.0 (2/69) | |
| | Post-SEA | ≤18.6 | 21.3 (1/47) | 17.4 (2/115) | 31.3 (2/64) | |
| | | >18.6 | 0.0 (0/28) | 43.5 (4/92) | 13.3 (1/75) | |

Table 5-50 (Continued)

| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
|-------------------------|-----------------------|---------------------------|--|-----------------|----------------|---------|
| | | | Low | Medium | High | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 15.9 (2/126) | 29.0 (8/276) | 0.0 (0/60) | 0.057 |
| | | >18.6 | 0.0 (0/145) | 4.2 (1/237) | 34.1 (3/88) | |
| | Post-SEA | ≤18.6 | 0.0 (0/59) | 27.8 (4/144) | 20.4 (2/98) | |
| | | >18.6 | 0.0 (0/53) | 47.2 (5/106) | 10.3 (1/97) | |

Digestive System Anomalies (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-51), there is no significant variation in the overall association between digestive system anomalies and categorized current dioxin with the time of conception among full siblings ($p=0.397$). Additionally, the association between digestive system anomalies and time of conception among children of Ranch Hands in the Unknown ($p=0.863$), Low ($p=0.242$) and High ($p=0.344$) categories does not differ significantly from the corresponding association among children of Comparisons in the Background category.

Table 5-51

**Pre-post SEA Counts and Rates of
Digestive System Anomalies**

Variable: Digestive System Anomalies
 Restrictions: Full Siblings of Ranch Hands and Comparisons
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn Rate | n | Post-SEA Abn Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|---------------------|------|----------------------|---------------|----------------------|---------|
| Background | 1250 | 14 11.2 | 812 | 16 19.7 | 1.77 | All Exp Categ | 0.397 |
| Unknown | 514 | 6 11.7 | 221 | 4 18.1 | 1.56 | Unk vs Bkgd | 0.863 |
| Low | 244 | 2 8.2 | 148 | 6 40.5 | 5.11 | Low vs Bkgd | 0.242 |
| High | 148 | 3 20.3 | 195 | 3 15.4 | 0.76 | High vs Bkgd | 0.344 |
| Total | 2156 | | 1376 | | | | |

Genital Anomalies (All Children)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-52 [a] and [b]), there is no significant variation in the association between genital anomalies and initial dioxin with time of conception among children of Ranch Hands having more than 10 ppt ($p=0.445$) or more than 5 ppt ($p=0.906$) current dioxin.

Table 5-52

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

Time of Conception Relative
 to the Father's Duty in SEA

| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
|-------------------------|-------------------|-----|----------------|------|-----|-----------------|------|---------|
| a) D>10 ppt (n=1208) | Low | 249 | 1 | 4.0 | 106 | 1 | 9.4 | 0.445 |
| | Medium | 338 | 8 | 23.7 | 245 | 10 | 40.8 | |
| | High | 113 | 0 | 0.0 | 157 | 2 | 12.7 | |
| b) D>5 ppt (n=1748) | Low | 286 | 4 | 14.0 | 155 | 2 | 12.9 | 0.906 |
| | Medium | 616 | 8 | 13.0 | 308 | 11 | 35.7 | |
| | High | 156 | 3 | 19.2 | 227 | 2 | 8.8 | |

Genital Anomalies (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-53 [a] and [b]), there is no significant variation in the association between genital anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt ($p=0.690$) or more than 5 ppt ($p=0.312$) current dioxin.

Table 5-53

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\text{Log}_2(\text{Current Dioxin})$, Time

| Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$, Time - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|-----------------|-----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 0.0 (0/137) | 32.8 (6/183) | 0.0 (0/37) | 0.690 |
| | | >18.6 | 0.0 (0/95) | 17.5 (3/171) | 0.0 (0/78) | |
| | Post-SEA | ≤18.6 | 16.1 (1/62) | 59.7 (8/134) | 13.9 (1/72) | |
| | | >18.6 | 0.0 (0/40) | 27.8 (3/108) | 10.8 (1/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 6.4 (1/157) | 19.2 (6/313) | 15.2 (1/66) | 0.312 |
| | | >18.6 | 20.0 (3/150) | 14.8 (4/270) | 0.0 (0/102) | |
| | Post-SEA | ≤18.6 | 11.1 (1/90) | 46.0 (8/174) | 18.2 (2/110) | |
| | | >18.6 | 0.0 (0/63) | 22.1 (3/136) | 8.5 (1/117) | |

Genital Anomalies (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-54), there is no significant variation in the overall association between genital anomalies and categorized current dioxin with time of conception ($p=0.370$). The association between time of conception and genital anomalies among children of Ranch Hands in the High ($p=0.857$), Low ($p=0.913$) and Unknown ($p=0.144$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-54

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|---|------|-------------|------|------|--------------|------|------------|-------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 15 | 10.3 | 981 | 18 | 18.3 | 1.80 | All Exp Categ | 0.370 |
| Unknown | 582 | 6 | 10.3 | 282 | 1 | 3.5 | 0.34 | Unk vs Bkgd | 0.144 |
| Low | 290 | 8 | 27.6 | 174 | 9 | 51.7 | 1.92 | Low vs Bkgd | 0.913 |
| High | 168 | 1 | 6.0 | 227 | 3 | 13.2 | 2.24 | High vs Bkgd | 0.857 |
| Total | 2499 | | | 1664 | | | | | |

Genital Anomalies (Full Siblings)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-55 [a] and [b]), there is no significant variation in the association between genital anomalies and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.670$) or more than 5 ppt ($p=0.581$) current dioxin.

Table 5-55

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|-------------------|--|----------------|------|-----|-----------------|------|---------|
| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
| a) D>10 ppt (n=1030) | Low | 231 | 1 | 4.3 | 78 | 1 | 12.8 | 0.670 |
| | Medium | 276 | 4 | 14.5 | 206 | 6 | 29.1 | |
| | High | 103 | 0 | 0.0 | 136 | 2 | 14.7 | |
| b) D>5 ppt (n=1489) | Low | 252 | 4 | 15.9 | 114 | 2 | 17.5 | 0.581 |
| | Medium | 545 | 6 | 11.0 | 245 | 7 | 28.6 | |
| | High | 135 | 1 | 7.4 | 198 | 2 | 10.1 | |

Genital Anomalies (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-56 [a] and [b]), there is no significant variation in the association between genital anomalies and categorized current dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.536$) or more than 5 ppt current dioxin ($p=0.303$).

Table 5-56

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model: $\text{Log}_2(\text{Current Dioxin}), \text{Time}$

| Ranch Hands - Log ₂ (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|----------------------|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) | | | p-Value |
| | | | Current Dioxin | | | |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 0.0 (0/124) | 19.4 (3/155) | 0.0 (0/35) | 0.536 |
| | | >18.6 | 0.0 (0/85) | 14.0 (2/143) | 0.0 (0/69) | |
| | Post-SEA | ≤18.6 | 21.3 (1/47) | 52.2 (6/115) | 15.6 (1/64) | |
| | | >18.6 | 0.0 (0/28) | 10.9 (1/92) | 13.3 (1/75) | |
| | | | | | | |
| | | | | | | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 7.9 (1/126) | 14.5 (4/276) | 0.0 (0/60) | 0.303 |
| | | >18.6 | 20.7 (3/145) | 12.7 (3/237) | 0.0 (0/88) | |
| | Post-SEA | ≤18.6 | 16.9 (1/59) | 48.6 (7/144) | 10.2 (1/98) | |
| | | >18.6 | 0.0 (0/53) | 9.4 (1/106) | 10.3 (1/97) | |
| | | | | | | |
| | | | | | | |

Genital Anomalies (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-57), there is no overall variation in the association between genital anomalies and categorized current dioxin with time of conception among full siblings ($p=0.219$). The associations between time of conception and genital anomalies among children of Ranch Hands in the High ($p=0.545$), Low ($p=0.760$) and Unknown ($p=0.162$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-57

Pre-post SEA Counts and Rates of Genital Anomalies

Variable: Genital Anomalies
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Background | 1250 | 13 | 10.4 | 812 | 16 | 19.7 | 1.91 | All Exp Categ | 0.219 |
| Unknown | 514 | 6 | 11.7 | 221 | 1 | 4.5 | 0.38 | Unk vs Bkgd | 0.162 |
| Low | 244 | 5 | 20.5 | 148 | 7 | 47.3 | 2.37 | Low vs Bkgd | 0.760 |
| High | 148 | 0 | 0.0 | 195 | 2 | 10.3 | ---- | High vs Bkgd | 0.545 |
| Total | 2156 | | | 1376 | | | | | |

Urinary System Anomalies (All Children)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-58 [a] and [b]), there is no significant variation in the association between urinary system anomalies and initial dioxin with time of conception among children of Ranch Hands having more than 10 ppt ($p=0.446$) or more than 5 ppt ($p=0.979$) current dioxin.

Table 5-58

**Pre-post SEA Counts and Rates of
Urinary System Anomalies**

Variable: Urinary System Anomalies
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Restriction | Initial Dioxin | Pre-SEA | | | Post-SEA | | | p-Value |
|-------------------------|-------------------|---------|-----|------|----------|-----|------|---------|
| | | n | Abn | Rate | n | Abn | Rate | |
| a) D>10 ppt (n=1208) | Low | 249 | 2 | 8.0 | 106 | 3 | 28.3 | 0.446 |
| | Medium | 338 | 5 | 14.8 | 245 | 6 | 24.5 | |
| | High | 113 | 2 | 17.7 | 157 | 4 | 25.5 | |
| b) D>5 ppt (n=1748) | Low | 286 | 4 | 14.0 | 155 | 2 | 12.9 | 0.979 |
| | Medium | 616 | 7 | 11.4 | 308 | 7 | 22.7 | |
| | High | 156 | 3 | 19.2 | 227 | 6 | 26.4 | |

Urinary System Anomalies (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-59 [a] and [b]), there is no significant variation in the association between urinary system anomalies and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt ($p=0.895$) or more than 5 ppt ($p=0.637$) current dioxin.

Table 5-59

**Pre-post SEA Counts and Rates of
Urinary System Anomalies**

Variable: Urinary System Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: \log_2 (Current Dioxin), Time

| Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted | | | | | | |
|--|-----------------------|---------------------------|--|-----------------|-----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 0.0 (0/137) | 16.4 (3/183) | 27.0 (1/37) | 0.895 |
| | | >18.6 | 21.1 (2/95) | 5.8 (1/171) | 25.6 (2/78) | |
| | Post-SEA | ≤18.6 | 16.1 (1/62) | 22.4 (3/134) | 13.9 (1/72) | |
| | | >18.6 | 25.0 (1/40) | 37.0 (4/108) | 32.3 (3/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 12.7 (2/157) | 9.6 (3/313) | 15.2 (1/66) | 0.637 |
| | | >18.6 | 13.3 (2/150) | 14.8 (4/270) | 19.6 (2/102) | |
| | Post-SEA | ≤18.6 | 22.2 (2/90) | 17.2 (3/174) | 18.2 (2/110) | |
| | | >18.6 | 0.0 (0/63) | 36.8 (5/136) | 25.6 (3/117) | |

Urinary System Anomalies (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-60), there is no significant variation in the overall association between urinary system anomalies and categorized current dioxin with time of conception ($p=0.504$). The associations between time of conception and urinary system anomalies among children of Ranch Hands in the High ($p=0.645$), Low ($p=0.142$) and Unknown ($p=0.913$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-60

Pre-post SEA Counts and Rates of Urinary System Anomalies

Variable: Urinary System Anomalies
 Restrictions: All Children of Ranch Hands and Comparisons
 Categories: Time of Conception Relative to the Father's Duty in SEA
 Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Pre-SEA Rate | Post-SEA n | Post-SEA Abn | Post-SEA Rate | Odds Ratio | Category Contrast | p-Value |
|-------------------|------|-------------|--------------|------------|--------------|---------------|------------|-------------------|---------|
| Background | 1459 | 21 | 14.4 | 981 | 12 | 12.2 | 0.85 | All Exp Categ | 0.504 |
| Unknown | 582 | 9 | 15.5 | 282 | 4 | 14.2 | 0.92 | Unk vs Bkgd | 0.913 |
| Low | 290 | 4 | 13.8 | 174 | 6 | 34.5 | 2.55 | Low vs Bkgd | 0.142 |
| High | 168 | 3 | 17.9 | 227 | 5 | 22.0 | 1.24 | High vs Bkgd | 0.645 |
| Total | 2499 | | | 1664 | | | | | |

Urinary System Anomalies (Full Siblings)

Model 1: Children of Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$

Without adjustment for covariates (Table 5-61 [a] and [b]), there is no significant variation in the association between urinary system anomalies and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.256$) or more than 5 ppt ($p=0.822$) current dioxin.

Table 5-61

Pre-post SEA Counts and Rates of Urinary System Anomalies

Variable: Urinary System Anomalies
Restrictions: Full Siblings of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|--------|-------------------|--|----------------|------|---|-----------------|---------|
| Exposure Restriction | | Initial Dioxin | Time of Conception Relative to the Father's Duty in SEA | | | | | |
| | | | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate |
| | | | | | | | | p-Value |
| a) D>10 ppt (n= 1030) | Low | 231 | 1 | 4.3 | 78 | 2 | 25.6 | 0.256 |
| | Medium | 276 | 4 | 14.5 | 206 | 6 | 29.1 | |
| | High | 103 | 2 | 19.4 | 136 | 3 | 22.1 | |
| b) D>5 ppt (n=1489) | Low | 252 | 4 | 15.9 | 114 | 2 | 17.5 | 0.822 |
| | Medium | 545 | 5 | 9.2 | 245 | 6 | 24.5 | |
| | High | 135 | 3 | 22.2 | 198 | 5 | 25.3 | |

Urinary System Anomalies (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-62 [a] and [b]), there is no significant variation in the association between urinary system anomalies and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.973$) or more than 5 ppt ($p=0.928$) current dioxin.

Table 5-62

**Pre-post SEA Counts and Rates of
Urinary System Anomalies**

Variable: Urinary System Anomalies
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\log_2(\text{Current Dioxin}), \text{Time}$

| Ranch Hands - $\log_2(\text{Current Dioxin}), \text{Time}$ - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤ 18.6 | 0.0 (0/124) | 6.5 (1/155) | 28.6 (1/35) | 0.973 |
| | | >18.6 | 23.5 (2/85) | 7.0 (1/143) | 29.0 (2/69) | |
| | Post-SEA | ≤ 18.6 | 21.3 (1/47) | 17.4 (2/115) | 15.6 (1/64) | |
| | | >18.6 | 35.7 (1/28) | 43.5 (4/92) | 26.7 (2/75) | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤ 18.6 | 15.9 (2/126) | 3.6 (2/276) | 16.7 (1/60) | 0.928 |
| | | >18.6 | 13.8 (2/145) | 16.9 (4/237) | 22.7 (2/88) | |
| | Post-SEA | ≤ 18.6 | 33.9 (2/59) | 13.9 (2/144) | 20.4 (2/98) | |
| | | >18.6 | 0.0 (0/53) | 47.2 (5/106) | 20.6 (2/97) | |

Urinary System Anomalies (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-63), there is no significant variation in the overall association between urinary system anomalies and categorized current dioxin with time since duty in SEA among full sibling children ($p=0.360$). However, the association between urinary system anomalies and time of conception among children of Ranch Hands in the Low current dioxin category, $OR=4.23$, is borderline significantly increased relative to the association among children of Comparisons in the Background category, $OR=0.89$, ($p=0.093$). The association between time of conception and urinary system anomalies among children of Ranch Hands in the High ($p=0.881$) and Unknown ($p=0.834$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-63

Pre-post SEA Counts and Rates of Urinary System Anomalies

Variable: Urinary System Anomalies
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Pre-SEA Rate | n | Post-SEA Abn | Post-SEA Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|----------------|-----------------|------|-----------------|------------------|---------------|----------------------|---------|
| Background | 1250 | 19 | 15.2 | 812 | 11 | 13.5 | 0.89 | All Exp Categ | 0.360 |
| Unknown | 514 | 9 | 17.5 | 221 | 4 | 18.1 | 1.03 | Unk vs Bkgd | 0.834 |
| Low | 244 | 2 | 8.2 | 148 | 5 | 33.8 | 4.23 | Low vs Bkgd | 0.093 |
| High | 148 | 3 | 20.3 | 195 | 4 | 20.5 | 1.01 | High vs Bkgd | 0.881 |
| Total | 2156 | | | 1376 | | | | | |

Musculoskeletal Deformities (All Children)

Model 1: Children of Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$

Without adjustment for covariates (Table 5-64 [a] and [b]), there is no significant variation in the association between musculoskeletal deformities and initial dioxin with time of conception among children of Ranch Hands having more than 10 ppt ($p=0.518$) or more than 5 ppt ($p=0.442$) current dioxin.

Table 5-64

Pre-post SEA Counts and Rates of Musculoskeletal Deformities

Variable: Musculoskeletal Deformities
Restrictions: All Children of Ranch Hands
Categories: Time of Conception relative to the
Father's Duty in SEA
Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|-------------------|-----|----------------|------|-----|-----------------|-------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | |
| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
| a) D>10 ppt (n=1208) | Low | 249 | 19 | 76.3 | 106 | 11 | 103.8 | 0.518 |
| | Medium | 338 | 13 | 38.5 | 245 | 40 | 163.3 | |
| | High | 113 | 9 | 79.6 | 157 | 14 | 89.2 | |
| b) D>5 ppt (n=1748) | Low | 286 | 16 | 55.9 | 155 | 20 | 129.0 | 0.442 |
| | Medium | 616 | 32 | 51.9 | 308 | 39 | 126.6 | |
| | High | 156 | 10 | 64.1 | 227 | 29 | 127.8 | |

Musculoskeletal Deformities (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-65 [a]), there is significant variation in the association between musculoskeletal deformities and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt current dioxin ($p=0.017$). This significance is due to a decreasing trend in musculoskeletal deformity rates with current dioxin among post-SEA children of Ranch Hands with early tours and generally increasing trends elsewhere.

Without adjustment for covariates (Table 5-65 [b]), there is no significant variation in the association between musculoskeletal deformities and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 5 ppt current dioxin ($p=0.587$).

Table 5-65

Pre-post SEA Counts and Rates of
Musculoskeletal Deformities

Variable: Musculoskeletal Deformities
Restrictions: All Children of Ranch Hands
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 2: $\log_2(\text{Current Dioxin})$, Time

| Ranch Hands - $\log_2(\text{Current Dioxin})$, Time - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|-------------------|-------------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤ 18.6 | 94.9 (13/137) | 76.5 (14/183) | 108.1 (4/37) | 0.017 |
| | | >18.6 | 31.6 (3/95) | 17.5 (3/171) | 64.1 (5/78) | |
| | Post-SEA | ≤ 18.6 | 129.0 (8/62) | 104.5 (14/134) | 180.6 (13/72) | |
| | | >18.6 | 175.0 (7/40) | 157.4 (17/108) | 64.5 (6/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤ 18.6 | 44.6 (7/157) | 92.7 (29/313) | 60.6 (4/66) | 0.587 |
| | | >18.6 | 33.3 (5/150) | 29.6 (8/270) | 49.0 (5/102) | |
| | Post-SEA | ≤ 18.6 | 155.6 (14/90) | 126.4 (22/174) | 145.5 (16/110) | |
| | | >18.6 | 79.4 (5/63) | 169.1 (23/136) | 68.4 (8/117) | |

Musculoskeletal Deformities (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-66), there is no significant variation in the overall association between musculoskeletal deformities and categorized current dioxin with time of conception ($p=0.913$). The associations between time of conception and musculoskeletal deformities among children of Ranch Hands in the High ($p=0.584$), Low ($p=0.821$) and Unknown ($p=0.739$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-66

Pre-post SEA Counts and Rates of Musculoskeletal Deformities

Variable: Musculoskeletal Deformities
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
to the Father's duty in SEA

| Exposure Category | Pre-SEA | | | Post-SEA | | | Odds Ratio | Category Contrast | p-Value |
|----------------------|---------|-----|------|----------|-----|-------|------------|-------------------|---------|
| | n | Abn | Rate | n | Abn | Rate | | | |
| Background | 1459 | 81 | 55.5 | 981 | 132 | 134.6 | 2.65 | All Exp Categ | 0.913 |
| Unknown | 582 | 26 | 44.7 | 282 | 34 | 120.6 | 2.93 | Unk vs Bkgd | 0.739 |
| Low | 290 | 16 | 55.2 | 174 | 25 | 143.7 | 2.87 | Low vs Bkgd | 0.821 |
| High | 168 | 9 | 53.6 | 227 | 24 | 105.7 | 2.09 | High vs Bkgd | 0.584 |
| Total | 2499 | | | 1664 | | | | | |

Musculoskeletal Deformities (Full Siblings)

Model 1: Children of Ranch Hands - Log₂(Initial Dioxin)

Without adjustment for covariates (Table 5-67 [a] and [b]), there is no significant variation in the association between musculoskeletal deformities and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.329$) or more than 5 ppt ($p=0.727$).

Table 5-67

**Pre-post SEA Counts and Rates of
Musculoskeletal Deformities**

Variable: Musculoskeletal Deformities
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|--------|-------------------|--|-----|------|----------|-----|---------|
| Exposure Restriction | | Initial Dioxin | Time of Conception Relative to the Father's Duty in SEA | | | | | |
| | | | Pre-SEA | | | Post-SEA | | |
| | | | n | Abn | Rate | n | Abn | Rate |
| | | | | | | | | p-Value |
| a) D>10 ppt (n=1030) | Low | | 231 | 18 | 77.9 | 78 | 10 | 128.2 |
| | Medium | | 276 | 10 | 36.2 | 206 | 32 | 155.3 |
| | High | | 103 | 9 | 87.4 | 136 | 13 | 95.6 |
| b) D>5 ppt (n=1489) | Low | | 252 | 15 | 59.5 | 114 | 10 | 87.7 |
| | Medium | | 545 | 29 | 53.2 | 245 | 30 | 122.4 |
| | High | | 135 | 10 | 74.1 | 198 | 27 | 136.4 |

Musculoskeletal Deformities (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-68 [a]), there is significant variation in the association between musculoskeletal deformities and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 10 ppt current dioxin ($p=0.019$). There is a decreasing trend in musculoskeletal deformity rates with current dioxin among post-SEA children of Ranch Hands with early tours and generally increasing trends elsewhere.

Without adjustment for covariates (Table 5-68 [b]), there is no significant variation in the association between musculoskeletal deformities and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 5 ppt current dioxin ($p=0.386$).

Table 5-68

**Pre-post SEA Counts and Rates of
Musculoskeletal Deformities**

Variable: Musculoskeletal Deformities
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: \log_2 (Current Dioxin), Time

Ranch Hands - \log_2 (Current Dioxin), Time - Unadjusted

| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
|-------------------------|-----------------------|---------------------------|--|-------------------|------------------|---------|
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 96.8 (12/124) | 77.4 (12/155) | 114.3 (4/35) | 0.019 |
| | | >18.6 | 35.3 (3/85) | 14.0 (2/143) | 72.5 (5/69) | |
| | Post-SEA | ≤18.6 | 170.2 (8/47) | 95.7 (11/115) | 203.1 (13/64) | |
| | | >18.6 | 178.6 (5/28) | 152.2 (14/92) | 53.3 (4/75) | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 55.6 (7/126) | 94.2 (26/276) | 66.7 (4/60) | 0.386 |
| | | >18.6 | 34.5 (5/145) | 29.5 (7/237) | 56.8 (5/88) | |
| | Post-SEA | ≤18.6 | 101.7 (6/59) | 138.9 (20/144) | 153.1 (15/98) | |
| | | >18.6 | 56.6 (3/53) | 160.4 (17/106) | 61.9 (6/97) | |

Musculoskeletal Deformities (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-69), there is no significant variation in the overall association between musculoskeletal deformities and categorized current dioxin with time of conception among full siblings ($p=0.875$). The association between time of conception and musculoskeletal deformities among children of Ranch Hands in the High ($p=0.519$), Low ($p=0.672$) and Unknown ($p=0.893$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-69

Pre-post SEA Counts and Rates of Musculoskeletal Deformities

Variable: Musculoskeletal Deformities
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|---------|------|----------|-----|-------|-------|---------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA | | Post-SEA | | Odds | | Category | p-Value |
| | | Abn | Rate | n | Abn | Rate | Ratio | Contrast | |
| Background | 1250 | 78 | 62.4 | 812 | 115 | 141.6 | 2.48 | All Exp Categ | 0.875 |
| Unknown | 514 | 22 | 42.8 | 221 | 23 | 104.1 | 2.60 | Unk vs Bkgd | 0.893 |
| Low | 244 | 13 | 53.3 | 148 | 21 | 141.9 | 2.94 | Low vs Bkgd | 0.672 |
| High | 148 | 9 | 60.8 | 195 | 21 | 107.7 | 1.86 | High vs Bkgd | 0.519 |
| Total | 2156 | | | 1376 | | | | | |

Anomalies of the Skin (All Children)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-70 [a] and [b]), there is no significant variation in the association between anomalies of the skin and initial dioxin with time of conception among children of Ranch Hands having more than 10 ppt ($p=0.913$) or more than 5 ppt ($p=0.916$) current dioxin.

Table 5-70

**Pre-post SEA Counts and Rates of
Anomalies of the Skin**

Variable: Anomalies of the Skin
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

| Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted | | | | | | | | |
|--|-------------------|--|----------------|------|-----|-----------------|------|---------|
| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
| Exposure Restriction | Initial Dioxin | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | p-Value |
| a) D>10 ppt (n=1208) | Low | 249 | 1 | 4.0 | 106 | 2 | 18.9 | 0.913 |
| | Medium | 338 | 7 | 20.7 | 245 | 6 | 24.5 | |
| | High | 113 | 0 | 0.0 | 157 | 2 | 12.7 | |
| b) D>5 ppt (n=1748) | Low | 286 | 2 | 7.0 | 155 | 2 | 12.9 | 0.916 |
| | Medium | 616 | 9 | 14.6 | 308 | 8 | 26.0 | |
| | High | 156 | 0 | 0.0 | 227 | 2 | 8.8 | |

Anomalies of the Skin (All Children)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-71 [a]), there is no significant variation in the association between anomalies of the skin and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 10 ppt current dioxin ($p=0.624$).

Without adjustment for covariates (Table 5-71 [b]), there is no significant variation in the association between anomalies of the skin and current dioxin with time since duty in SEA and time of conception among children of Ranch Hands having more than 5 ppt current dioxin ($p=0.119$).

Table 5-71

Pre-post SEA Counts and Rates of Anomalies of the Skin

Variable: Anomalies of the Skin
 Restrictions: All Children of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\log_2(\text{Current Dioxin})$, Time

| Ranch Hands - $\log_2(\text{Current Dioxin})$, Time - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1210) | Pre-SEA | ≤18.6 | 7.3 (1/137) | 32.8 (6/183) | 0.0 (0/37) | 0.624 |
| | | >18.6 | 0.0 (0/95) | 5.8 (1/171) | 0.0 (0/78) | |
| | Post-SEA | ≤18.6 | 16.1 (1/62) | 29.9 (4/134) | 13.9 (1/72) | |
| | | >18.6 | 0.0 (0/40) | 27.8 (3/108) | 10.8 (1/93) | |
| b) D>5 ppt (n=1748) | Pre-SEA | ≤18.6 | 6.4 (1/157) | 19.2 (6/313) | 15.2 (1/66) | 0.119 |
| | | >18.6 | 6.7 (1/150) | 7.4 (2/270) | 0.0 (0/102) | |
| | Post-SEA | ≤18.6 | 22.2 (2/90) | 28.7 (5/174) | 9.1 (1/110) | |
| | | >18.6 | 0.0 (0/63) | 22.1 (3/136) | 8.5 (1/117) | |

Anomalies of the Skin (All Children)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-72), there is no significant variation in the overall association between anomalies of the skin and categorized current dioxin with time of conception ($p=0.854$). The corresponding contrasts of children of Ranch Hand fathers in the High ($p=0.606$), Low ($p=0.444$) and Unknown ($p=0.661$) categories versus children of Comparisons in the Background category are not significant.

Table 5-72

Pre-post SEA Counts and Rates of Anomalies of the Skin

Variable: Anomalies of the Skin
Restrictions: All Children of Ranch Hands and Comparisons
Categories: Time of Conception Relative to the
Father's Duty in SEA
Model 3: Categorized Current Dioxin

| Categorized Current Dioxin - Unadjusted | | | | | | | | | |
|--|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Time of Conception Relative to the Father's Duty in SEA | | | | | | | | | |
| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
| Background | 1459 | 11 | 7.5 | 981 | 21 | 21.4 | 2.88 | All Exp Categ | 0.854 |
| Unknown | 582 | 5 | 8.6 | 282 | 5 | 17.7 | 2.08 | Unk vs Bkgd | 0.661 |
| Low | 290 | 6 | 20.7 | 174 | 6 | 34.5 | 1.69 | Low vs Bkgd | 0.444 |
| High | 168 | 1 | 6.0 | 227 | 2 | 8.8 | 1.48 | High vs Bkgd | 0.606 |
| Total | 2499 | | | 1664 | | | | | |

Anomalies of the Skin (Full Siblings)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

Without adjustment for covariates (Table 5-73 [a] and [b]), there is no significant variation in the association between anomalies of the skin and initial dioxin with time of conception among full sibling children of Ranch Hands having more than 10 ppt ($p=0.403$) or more than 5 ppt ($p=0.759$) current dioxin.

Table 5-73

**Pre-post SEA Counts and Rates of
Anomalies of the Skin**

Variable: Anomalies of the Skin
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 1: $\text{Log}_2(\text{Initial Dioxin})$

Ranch Hands - $\text{Log}_2(\text{Initial Dioxin})$ - Unadjusted

| | | Time of Conception Relative to the Father's Duty in SEA | | | | | | |
|-------------------------|-------------------|--|-----|------|----------|-----|------|---------|
| Exposure Restriction | Initial Dioxin | Pre-SEA | | | Post-SEA | | | p-Value |
| | | n | Abn | Rate | n | Abn | Rate | |
| a) D>10 ppt (n=1030) | Low | 231 | 1 | 4.3 | 78 | 2 | 25.6 | 0.403 |
| | Medium | 276 | 3 | 10.9 | 206 | 5 | 24.3 | |
| | High | 103 | 0 | 0.0 | 136 | 1 | 7.4 | |
| b) D>5 ppt (n=1489) | Low | 252 | 2 | 7.9 | 114 | 1 | 8.8 | 0.759 |
| | Medium | 545 | 5 | 9.2 | 245 | 7 | 28.6 | |
| | High | 135 | 0 | 0.0 | 198 | 1 | 5.1 | |

Anomalies of the Skin (Full Siblings)

Model 2: Children of Ranch Hands - $\text{Log}_2(\text{Current Dioxin})$ and Time

Without adjustment for covariates (Table 5-74 [a]), there is no significant variation in the association between anomalies of the skin and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 10 ppt current dioxin ($p=0.964$).

Without adjustment for covariates (Table 5-74 [b]), there is no significant variation in the association between anomalies of the skin and current dioxin with time since duty in SEA and time of conception among full sibling children of Ranch Hands having more than 5 ppt current dioxin ($p=0.541$).

Table 5-74

Pre-post SEA Counts and Rates of Anomalies of the Skin

Variable: Anomalies of the Skin
 Restrictions: Full Siblings of Ranch Hands
 Categories: Time of Conception Relative to the
 Father's Duty in SEA
 Model 2: $\log_2(\text{Current Dioxin})$, Time

| Ranch Hands - $\log_2(\text{Current Dioxin})$, Time - Unadjusted | | | | | | |
|---|-----------------------|---------------------------|--|-----------------|----------------|---------|
| Exposure Restriction | Time of Conception | Time Since SEA (years) | Anomaly Rate (No./n) Current Dioxin | | | p-Value |
| | | | Low | Medium | High | |
| a) D>10 ppt (n=1032) | Pre-SEA | ≤18.6 | 8.1 (1/124) | 12.9 (2/155) | 0.0 (0/35) | 0.964 |
| | | >18.6 | 0.0 (0/85) | 7.0 (1/143) | 0.0 (0/69) | |
| | Post-SEA | ≤18.6 | 21.3 (1/47) | 34.8 (4/115) | 15.6 (1/64) | |
| | | >18.6 | 0.0 (0/28) | 21.7 (2/92) | 0.0 (0/75) | |
| b) D>5 ppt (n=1489) | Pre-SEA | ≤18.6 | 7.9 (1/126) | 7.2 (2/276) | 16.7 (1/60) | 0.541 |
| | | >18.6 | 6.9 (1/145) | 8.4 (2/237) | 0.0 (0/88) | |
| | Post-SEA | ≤18.6 | 16.9 (1/59) | 34.7 (5/144) | 10.2 (1/98) | |
| | | >18.6 | 0.0 (0/53) | 18.9 (2/106) | 0.0 (0/97) | |

Anomalies of the Skin (Full Siblings)

Model 3: Children of Ranch Hands and Comparisons - Categorized Current Dioxin

Without adjustment for covariates (Table 5-75), there is no significant variation in the overall association between anomalies of the skin and categorized current dioxin with time of conception among full siblings ($p=0.705$). The association between time of conception and anomalies of the skin among children of Ranch Hands in the High ($p=0.363$), Low ($p=0.697$) and Unknown ($p=0.565$) categories are not significantly different from the corresponding association among children of Comparisons in the Background category.

Table 5-75

Pre-post SEA Counts and Rates of Anomalies of the Skin

Variable: Anomalies of the Skin
Restrictions: Full Siblings of Ranch Hands and Comparisons
Categories: Time of Conception Relative to
Father's Duty in SEA
Model 3: Categorized Current Dioxin

Categorized Current Dioxin - Unadjusted

Time of Conception Relative
to the Father's Duty in SEA

| Exposure Category | n | Pre-SEA Abn | Rate | n | Post-SEA Abn | Rate | Odds Ratio | Category Contrast | p-Value |
|----------------------|------|----------------|------|------|-----------------|------|---------------|----------------------|---------|
| Background | 1250 | 8 | 6.4 | 812 | 15 | 18.5 | 2.92 | All Exp Categ | 0.705 |
| Unknown | 514 | 4 | 7.8 | 221 | 3 | 13.6 | 1.75 | Unk vs Bkgd | 0.565 |
| Low | 244 | 2 | 8.2 | 148 | 5 | 33.8 | 4.23 | Low vs Bkgd | 0.697 |
| High | 148 | 1 | 6.8 | 195 | 1 | 5.1 | 0.76 | High vs Bkgd | 0.363 |
| Total | 2156 | | | 1376 | | | | | |

Chromosomal Anomalies (All Children)

Model 1: Children of Ranch Hands - \log_2 (Initial Dioxin)

There is insufficient data (Table 5-76) to assess the significance of variation in the association between chromosomal anomalies and initial dioxin with time of conception among children of Ranch Hands.