# SECTION 3 - TABLES

## STUDY II

## #210-76-0175

## STUDY II

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TABLE II-1a

DISTRIBUTION OF SMOKING HABITS, HEIGHT AND WEIGHT BY AGE GROUP
SHIFT STUDY-GRAIN WORKERS

| Age (Years) | Smokers | | | | Ex-smokers | | | | Nonsmokers | | | | All Groups | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | Height (cm) | Weight (kg) |
| 20-29 | 36 | 50 | 178.5 | 78.8 | 16 | 22 | 178.2 | 81.6 | 20 | 28 | 179 | 82 | 72 | 178.5 | 80.4 |
| 30-39 | 27 | 63 | 178.9 | 84.3 | 9 | 21 | 177.3 | 81.5 | 7 | 16 | 177 | 82 | 43 | 178.3 | 83.3 |
| 40-49 | 33 | 51 | 175.0 | 82.4 | 17 | 26 | 176.6 | 87.7 | 15 | 23 | 175 | 90 | 65 | 175.5 | 85.5 |
| 50-64 | 22 | 32 | 174.6 | 77.8 | 34 | 50 | 176.8 | 87.9 | 12 | 18 | 173 | 81 | 68 | 175.4 | 83.4 |
| 20-64 | 118 | 48 | 176.9 | 80.9 | 76 | 31 | 177.1 | 85.8 | 54 | 22 | 176.3 | 84 | 248 | 176.8 | 83.1 |

TABLE II-1b

DISTRIBUTION OF SMOKING HABITS, HEIGHT AND WEIGHT BY AGE GROUP
SHIFT STUDY-CONTROLS

| Age (Years) | Smokers | | | | Ex-smokers | | | | Nonsmokers | | | | All Groups | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | (%) | Height (cm) | Weight (kg) | (no.) | Height (cm) | Weight (kg) |
| 20-29 | 22 | 52 | 176.9 | 81.3 | 6 | 14 | 178.4 | 94.1 | 14 | 33 | 179.6 | 84.3 | 42 | 178.0 | 82.7 |
| 30-39 | 26 | 43 | 176.4 | 83.3 | 17 | 28 | 176.5 | 85.3 | 18 | 30 | 175.2 | 82.7 | 61 | 176.0 | 83.7 |
| 40-49 | 25 | 60 | 175.1 | 84.7 | 11 | 26 | 179.4 | 95.6 | 6 | 14 | 177.8 | 94.3 | 42 | 176.6 | 88.0 |
| 50-64 | 14 | 30 | 174.6 | 76.8 | 19 | 40 | 175.3 | 87.7 | 14 | 30 | 172.6 | 84.1 | 47 | 174.3 | 83.4 |
| 20-64 | 87 | 45 | 175.9 | 82.1 | 53 | 28 | 176.9 | 88.2 | 52 | 27 | 166.0 | 84.9 | 192 | 176.2 | 84.5 |

TABLE II-2

MEAN TOTAL DUST LEVELS AND RESPIRABLE DUST LEVELS
JOB CATEGORY, COMPANY AND WEEK

| | Total Dust Level | | | Total Dust Level | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | x | ±1SD | Range | n ≥10 mg/m$^3$ | % ≥10 mg/m$^3$ | n ≥15 mg/m$^3$ | % ≥15 mg/m$^3$ |
| GRAIN WORKERS | | | | | | | | |
| All Samples | 209 | 3.29 | 6.95 | .03-54.98 | 15 | 7.2 | 9 | 4.3 |
| Company* | | | | | | | | |
| 1 | 36 | 2.81 | 5.39 | .196-30.18 | 2 | 5.6 | 1 | 2.8 |
| 2 | 17 | 3.17 | 5.25 | .03-20.16 | 2 | 11.8 | 1 | 5.9 |
| 3 | 5 | 9.48 | 16.59 | .73-38.95 | 1 | 20.0 | 1 | 20.0 |
| 4 | 46 | 3.78 | 7.95 | .14-39.12 | 4 | 8.7 | 3 | 6.5 |
| 5 | 17 | 1.72 | 2.18 | .27- 8.29 | 0 | 0 | 0 | 0 |
| 6 | 18 | 4.95 | 12.52 | .22-54.08 | 2 | 11.1 | 1 | 5.6 |
| 7 | 32 | 4.24 | 5.81 | .23-32.62 | 3 | 9.4 | 1 | 3.1 |
| 8 | 32 | 1.70 | 3.52 | .18-20.19 | 1 | 3.1 | 1 | 3.1 |
| 9† | 6 | .45 | .30 | .20- 1.03 | 0 | 0 | 0 | 0 |
| Job Category | | | | | | | | |
| 01 | 21 | 1.55 | 1.33 | .27- 5.47 | 0 | 0 | 0 | 0 |
| 02 | 9 | 11.75 | 12.72 | .79-38.95 | 4 | 44.4 | 3 | 33.3 |
| 03 | 35 | 4.27 | 7.96 | .18-36.08 | 4 | 11.4 | 2 | 5.7 |
| 04 | 14 | 2.98 | 2.89 | .22-10.30 | 1 | 7.1 | 0 | 0 |
| 05 | 43 | 4.18 | 9.85 | .196-54.08 | 2 | 4.7 | 2 | 4.7 |
| 06 | 56 | 1.24 | 1.24 | .03- 6.72 | 0 | 0 | 0 | 0 |
| 07 | 25 | 4.10 | 7.13 | .14-30.18 | 4 | 16.0 | 2 | 8.0 |
| 08 | 6 | 1.05 | 1.20 | .41- 3.47 | 0 | 0 | 0 | 0 |
| 02,03,04 | 58 | 5.12 | 8.42 | .18-38.95 | 9 | 15.5 | 5 | 8.6 |
| Week | | | | | | | | |
| 10/10 | 37 | 4.38 | 8.76 | .14-39.12 | 4 | 10.8 | 3 | 8.1 |
| 10/17 | 22 | 2.73 | 4.65 | .03-20.16 | 2 | 9.0 | 1 | 4.5 |
| 10/24 | 41 | 1.64 | 3.27 | .18-20.19 | 1 | 2.4 | 1 | 2.4 |
| 10/31 | 24 | 4.87 | 10.87 | .23-54.08 | 3 | 12.5 | 1 | 4.1 |
| 11/7 | 20 | 4.63 | 7.03 | .43-32.62 | 2 | 10.0 | 1 | 5.0 |
| 11/14 | 43 | 2.60 | 4.97 | .20-30.18 | 2 | 4.6 | 1 | 2.3 |
| 11/27 | 22 | 3.48 | 8.19 | .27-38.95 | 1 | 4.5 | 1 | 4.5 |
| CONTROLS | | | | | | | | |
| All Samples | 65 | .60 | .56 | .09- 2.56 | 0 | 0 | 0 | 0 |

*Company where elevator operator or state inspector worked the day tested.
†Other - not specified on dust level report from NIOSH.

TABLE II-3

INCIDENCE OF SYMPTOMS DURING SHIFT STUDY
IN GRAIN WORKERS AND CONTROLS

| | Grain Workers (248) | | Control (192) | | |
|---|---|---|---|---|---|
| | # | % | # | % | P |
| Cough | 119 | 48 | 61 | 32 | <.001 |
| Expectoration | 93 | 38 | 36 | 19 | <.001 |
| Wheezing* | 30 | 12 | 17 | 9 | <.001 |
| Dyspnea | 29 | 12 | 10 | 5 | <.050 |
| Fever | 13 | 5 | 6 | 3 | N.S. |
| Eye Sx† | 29 | 12 | 10 | 5 | <.050 |
| Stuffy Nose | 91 | 37 | 48 | 25 | <.010 |
| Throat Sx** | 15 | 6 | 13 | 7 | N.S. |
| One or More Sx | 163 | 66 | 81 | 42 | <.001 |

*Wheezing and/or chest tightness
†Eyes burning, watering or itching
**Throat sore or burning

TABLE II-4

INCIDENCE OF SYMPTOMS DURING WORK SHIFT IN GRAIN HANDLERS BY SMOKING CATEGORIES AND SUBJECTIVE APPRAISAL OF DUST EXPOSURE

| Symptom | All (248) | | Smoker (118) | | Exsmoker (76) | | Nonsmoker (54) | | Subjective Appraisal of Dust Exposure[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Average (76) | | Less Than Average (158) | | More Than Average (14) | | Exposure Heavy Yes (48) | | No (200) | |
| | N | % | N | % | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| Cough | 119 | 47.9 | 66 | 55.9 | 28 | 36.8 | 25 | 46.2 | 44 | 57.8† | 64 | 40.5 | 11 | 78.5 | 30 | 62.5** | 89 | 44.5 |
| Expectoration | 93 | 37.5 | 51 | 43.2 | 26 | 34.2 | 16 | 29.6 | 32 | 42.1 | 54 | 34.1 | 7 | 50.0 | 30 | 62.5** | 63 | 31.5 |
| Wheezing and/or Chest Tightness | 30 | 12.0 | 17 | 14.4 | 11 | 14.4 | 2• | 3.7 | 10 | 13.1 | 15 | 9.4 | 5 | 35.7* | 14 | 29.1** | 16 | 8.0 |
| SOB | 29 | 11.6 | 19 | 16.1 | 6 | 7.8 | 4 | 7.4 | 8 | 10.5 | 16 | 10.1 | 5 | 35.7* | 15 | 31.2** | 14 | 7.0 |
| Fever | 13 | 5.2 | 5 | 4.2 | 5 | 6.5 | 3 | 5.5 | 8 | 10.5† | 4 | 2.5 | 1 | 7.1 | 4 | 8.3 | 9 | 4.5 |
| Eye Symptoms | 29 | 11.6 | 14 | 11.8 | 7 | 9.2 | 8• | 14.8 | 9 | 11.8 | 13 | 8.2 | 7 | 50.0* | 14 | 29.1** | 15 | 7.5 |
| Stuffy Nose | 91 | 36.6 | 42 | 35.5 | 23 | 30.2 | 26 | 48.1 | 27 | 35.5 | 55 | 34.8 | 9 | 64.2* | 23 | 47.9 | 68 | 34.0 |
| Throat Symptoms | 15 | 6.0 | 6 | 5.0 | 1 | 1.3 | 8 | 14.8 | 7 | 9.2 | 8 | 5.0 | 0 | --- | 4 | 8.3 | 11 | 5.5 |
| One or More Symptoms | 163 | 65.7 | | | | | | | | | | | | | | | | |

*Significantly different incidence between average and more than average P < .05.
†Significantly different prevalence between average and less than average P < .05.
**P value < .05 - Significant difference between "yes" and "no."
•P < .05 - Significant difference between nonsmokers and smokers.

Total dust level $\bar{x} \pm 1$ SD = 14 ± 12 for "more than average"
4 ± 8.6 for "average"
1.8 ± 4 for "less than average"

[1]Obtained by post shift answers to "In your opinion, the amount of dust you were exposed to today was a) average, b) less than average, c) more than average." "Were you exposed to heavy dust at any time today?" 1) Yes 2) No

TABLE II-5

SHIFT STUDY

INCIDENCE OF RESPIRATORY SYMPTOMS* BY JOB CATEGORY
AND PLACE OF EMPLOYMENT

| Job | | COMPANY 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9-10 | Total with Symptoms | | % Studied of Study |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | N=34 | N=21 | N=6 | N=44 | N=17 | N=14 | N=31 | N=19 | N=62 | N | % | |
| 01 | 19 | 5 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 0 | 11 | 58 | 95 |
| 02-03-04 | 73 | 3 | 4 | 1 | 18 | 4 | 4 | 7 | 2 | 0 | 43 | 59 | 81 |
| 05 | 37 | 6 | 3 | 1 | 4 | 3 | 1 | 3 | 3 | 0 | 24 | 65 | 90 |
| 06 | 83 | 3 | 1 | 1 | 5 | 0 | 0 | 1 | 2 | 36 | 49 | 56 | 94 |
| 07 | 25 | 2 | 1 | 0 | 4 | 4 | 1 | 4 | 1 | 0 | 17 | 68 | 81 |
| 08 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 20 | |
| Total in Shift Study | 248 | 20 | 9 | 3 | 33 | 11 | 7 | 16 | 9 | 36 | 145 | 58 | |
| % with Symptoms | | 59 | 43 | 50 | 75 | 71 | 50 | 52 | 47 | 58 | | | |
| % Studied of Study I | | 97 | 95 | 50 | 90 | 100 | 82 | 79 | 79 | 91 | | | |

* Cough on expectoration or wheezing or dyspnea during the shift.
** % of the workers studied in Study I that participated in Study II.

TABLE II - 6

LEUKOCYTE COUNT AND DIFFERENTIAL COUNTS
BEFORE AND AFTER A WORK SHIFT
IN GRAIN WORKERS (G) AND CONTROLS (C)

| | | Pre-Shift | | Post-Shift | | Difference Pre-Post Shift | |
|---|---|---|---|---|---|---|---|
| | | $\bar{x}$ | ±SD | $\bar{x}$ | ±SD | $\bar{x}$ | ±SD |
| Total number per $mm^3$ | G | 6.9 | 1.7 | 7.8 | 1.5 | .91 | 1.2 |
| | C | 6.8 | 1.7 | 7.8 | 1.8 | .99 | 1.15 |
| Neutrophils Segmented % Total | G | 53.5 | 9.9 | 59.1 | 8.1 | 6.4 | 9.9 |
| | C | 55.9 | 9.2 | 58.5 | 9.8 | 2.6 | 9.2 |
| Neutrophils Bands % Total | G | .75 | 1.13 | .37 | .98 | - .42 | 1.44 |
| | C | 1.43 | 1.74 | .39 | .90 | -1.06 | 1.87 |
| Eosinophils % Total | G | 2.9 | 2.4 | 2.4 | 2.2 | - .62 | 2.6 |
| | C | 2.9 | 2.1 | 1.8 | 1.9 | -1.06 | 2.5 |
| Basophils % Total | G | .49 | .73 | .02 | .16 | - .50 | .74 |
| | C | .43 | .67 | .01 | .07 | - .41 | .67 |
| Lymphocytes % Total | G | 41.5 | 9.7 | 37.6 | 8.3 | - 4.5 | 9.7 |
| | C | 38.7 | 8.8 | 39.2 | 9.8 | .46 | 9.2 |
| Monocytes % Total | G | .75 | 1.10 | .21 | .88 | - .55 | 1.32 |
| | C | .67 | .91 | .13 | .42 | - .54 | 1.05 |

The range for leukocyte counts from grain workers was: pre-shift 4.2-14.7 and post-shift 4.7-14.1. The range of leukocyte counts from control city workers was: pre-shift 3.9-12.2 and post-shift 3.2-14.5.

TABLE II - 7

COMPLEMENT LEVELS ON GRAIN WORKERS AND CONTROLS

| | Grain Workers (N=248) | | Controls (N=191) | |
|---|---|---|---|---|
| | Pre-shift | Post-shift | Pre-shift | Post-shift |
| Total C3* (B1A/B1C) mg/% | 106 ± 29 | 104 ± 33 | 101 ± 28 | 98 ± 23 |
| Range mg/% | 66 - 266 | 58 - 294 | 54 - 256 | 51 - 167 |
| Activation Classical Pathway | 0 | 0 | 0 | 0 |
| Activation Alternate Pathway | 0 | 0 | 0 | 0 |

*Results expressed as the Mean ± 1 SD.

## TABLE II - 8

## BODY TEMPERATURE DURING DAY OF SHIFT STUDY

| | 800 Hrs | | 1200 Hrs | | 1600 Hrs | | 2000 Hrs | |
|---|---|---|---|---|---|---|---|---|
| Grain Workers | | | | | | | | |
| $\bar{x} \pm 1$ SD | (245) | 97.7 ± .9 | (244) | 98.3 ± 1.1 | (245) | 98.2 ± .9 | (212) | 98.3 ± .8 |
| Range | | 96.0 - 99.8 | | 96.0 - 104.2 | | 96.0 - 100.0 | | 96.0 - 102.2 |
| Controls | | | | | | | | |
| $\bar{x} \pm 1$ SD | (191) | 97.9 ± .9 | (167) | 98.6 ± .8 | (191) | 98.5 ± .8 | (167) | 98.6 ± .7 |
| Range | | 96.0 - 100.4 | | 96.2 - 100.2 | | 96.4 - 100.6 | | 96.8 - 100.0 |

TABLE II - 9

PULMONARY FUNCTION BEFORE AND AFTER WORK SHIFT
IN GRAIN WORKERS (G) n=241 AND CONTROLS (C) n=191

| | | Pre | | | Post | | Pre-Post Difference | | | Pre-Post % Difference | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x ± SD | | P | x ± SD | | x ± SD | | P* | x ± SD | | P* |
| $FEV_1$ ml | G | 3474 | 828 | NS | 3466 | 868 | -8.0 | 271 | NS | -.25 | 9.31 | NS |
| | C | 3874 | 746 | <.05 | 3911 | 718 | 36.3 | 236 | | 1.41 | 8.25 | |
| FVC ml | G | 4725 | 917 | <.02 | 4679 | 948 | -46.3 | 280 | NS | -.95 | 6.45 | <.05 |
| | C | 4830 | 776 | NS | 4827 | 730 | -2.8 | 265 | | .25 | 5.80 | |
| $Vmax^{50}$ L/sec | G | 3.70 | 1.47 | NS | 3.65 | 1.52 | -.06 | .65 | <.05 | -1.05 | 17.7 | <.01 |
| | C | 4.54 | 1.60 | NS | 4.60 | 1.55 | .06 | .40 | | 3.62 | 17.5 | |
| $Vmax^{75}$ L/sec | G | 1.34 | .66 | NS | 1.32 | .65 | -.03 | .31 | <.001 | .15 | 23.4 | <.001 |
| | C | 1.66 | .72 | <.001 | 1.74 | .72 | .08 | .24 | | 8.0 | 22.5 | |

P* Significance of pre-post differences in grain workers versus city workers.
P Significance of pre versus post values in grain workers and in controls by paired t tests.

TABLE II - 10

PULMONARY FUNCTION CHANGES DURING WORK SHIFT IN GRAIN WORKERS (G) AND CONTROL WORKERS (C) BY SMOKING CATEGORY

| | | Smoker | | | | Ex-smoker | | | | Nonsmoker | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pre mean ±1SD | Post mean ±1SD | Diff mean ±1SD | $P^1$ | Pre mean ±1SD | Post mean ±1SD | Diff mean ±1SD | $P^2$ | Pre mean ±1SD | Post mean ±1SD | Diff mean ±1SD | $P^3$ |
| $FEV_1$ ml | G | 3473 ±859 | 3481 ±865 | -.92 ±280 | | 3395 ±819 | 3352 ±897 | -43.4 ±253 | | 3576 ±773 | 3601 ±815 | 31.3 ±271 | |
| | C | 3795 ±846 | 3835 ±809 | 40.1 ±289 | | 3837 ±601 | 3870 ±592 | 32.7 ±206 | | 4040 ±678 | 4003 ±860 | 33.4 ±153 | |
| FVC ml | G | 4732 ±943 | 4695 ±978 | -48.1 301 | | 4623 ±883 | 4582 ±949 | -41.5 ±278 | | 4835 ±920 | 4771 ±879 | -47.6 ±234 | |
| | C | 4804 ±813 | 4807 ±801 | 3.5 ±169 | | 4782 ±693 | 4783 ±603 | .74 ±396 | | 4919 ±790 | 4812 ±991 | -17.1 ±235 | |
| $FEV_1$/ FVC | G | 73.2 ±9.7 | 73.8 ±9.4 | | | 73.2 ±9.9 | 72.6 ±10.5 | | | 74.2 ±9.3 | 75.3 ±8.7 | | |
| | C | 78.6 ±9.7 | 79.5 ±9.0 | | | 80.6 ±8.2 | 80.9 ±6.2 | | | 82.2 ±5.8 | 81.6 ±12.7 | | |
| $Vmax^{50}$ L/sec | G | 3.61 ±1.51 | 3.59 ±1.53 | -.03 ±.66 | | 3.60 ±1.42 | 3.54 ±1.54 | -.05 ±.56 | | 4.05 ±1.41 | 3.99 ±1.51 | -.08 ±.79 | |
| | C | 4.46 ±1.64 | 4.43 ±1.62 | -.03 ±.44 | <.02 | 4.43 ±1.77 | 4.62 ±1.71 | .19 ±.59 | | 4.77 ±1.32 | 4.77 ±1.35 | .09 ±.48 | |
| $Vmax^{75}$ L/sec | G | 1.31 ±.63 | 1.26 ±.57 | -.06 ±.28 | | 1.26 ±.59 | 1.25 ±.66 | -.01 ±.32 | | 1.54 ±.77 | 1.55 ±.73 | .02 ±.35 | |
| | C | 1.65 ±.78 | 1.67 ±.74 | .02 ±.21 | <.01 | 1.55 ±.68 | 1.68 ±.71 | .13 ±.22 | | 1.78 ±.64 | 1.88 ±.71 | .13 ±.29 | <.02 |

By unpaired t-test: $P^1$ smokers vs. ex-smokers; $P^2$ ex-smokers vs. nonsmokers; $P^3$ smokers vs. nonsmokers. Blanks: no significance

TABLE II - 11

MULTIPLE REGRESSION ANALYSIS USING PRE-POST-SHIFT PERCENT DIFFERENCE IN LUNG FUNCTION AS THE DEPENDENT VARIABLE AND GRAIN HANDLING, AGE HEIGHT, SMOKING AND EX-SMOKING AS INDEPENDENT VARIABLES

| | | Independent Variables | | | | |
|---|---|---|---|---|---|---|
| | | Grain Handling | Age | Height | Smoking | Previous Smoking |
| $FEV_1$ | b | - .0162 | - .00038 | .0004 | .0017 | - .0124 |
| | t | -1.88 | -1.01 | +.24 | + .16 | -1.03 |
| FVC | b | - .0118 | - .00041 | -.0004 | - .0005 | + .0035 |
| | t | -1.96* | -1.55 | -.38 | - .07 | + .41 |
| $V_{MAX}50$ | b | - .0486 | -.00007 | .00009 | - .0104 | + .0142 |
| | t | -2.84* | - .10 | .29 | - .49 | .61 |
| $V_{MAX}75$ | b | - .0801 | .0016 | .0023 | - .0653 | - .0186 |
| | t | -3.62* | -1.67 | .56 | -2.36* | - .01 |

b = regression coefficient
*P < .05 (two tail)

TABLE II - 12a

NUMBER OF WORKERS WITH PRE-POST SHIFT REDUCTIONS
IN FUNCTION OF VARYING DEGREES

| | | Grain Workers (241) | City Workers (191) |
|---|---|---|---|
| $FEV_1$ | ≥ 10% | 26 | 0 |
| | ≥ 15% | 14 | 1 |
| | ≥ 20% | 4 | 0 |
| | ≥ 30% | 2 | 0 |
| FVC | ≥ 20% | 2 | 1 |
| $V_{MAX}50$ | ≥ 25% | 13 | 1 |
| | ≥ 35% | 5 | 1 |
| | ≥ 50% | 3 | 0 |
| $V_{MAX}75$ | ≥ 25% | 23 | 4 |
| | ≥ 35% | 13 | 0 |
| | ≥ 50% | 3 | 0 |

TABLE II 12b

CHARACTERISTICS OF THE 14 SUBJECTS WITH PRE-POST SHIFT $FEV_1$ % DIFFERENCE > 15%

| | | | | | History | | | | SX During Shift | | | Exposed to on Shift | $\frac{FEV_1}{FVC}$ | | | | | | | | Dust Level Resp. Total | Skin Test CAA | Skin Test Grain Dust |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Age | LOE | Smoking | Pkg/Yr | Job Code | Chronic Bronchitis | Wheezing on Exp. | Cough on Exp. | Wheeze | Cough | SOB | | Pre % | Pre | Post | %Δ | Pre | Post | Pre | Post | | | |
| 30 | 43 | 11 | EX | 23 | 05 | 0 | X | X | X | X | 0 | Sunflower | 91 | 3.55 | 2.95 | -17 | NA | NA | 68 | 64 | 5.9 | NA | NA |
| 16 | 48 | 8 | S | 48 | 07 | + | X | X | X | 0 | 0 | Wheat | 55 | 2.45 | 2.05 | -16 | NA | NA | 120 | 96 | .8 | -- | -- |
| 28 | 51 | 25 | EX | 82 | 01 | + | X | X | X | X | X | Wheat, Rye Barley | 44 | 1.65 | 1.05 | -36 | 6.2 | 6.5 | 88 | 80 | 1.4 | -- | -- |
| 43 | 59 | 7 | EX | 25 | 04 | 0 | X | X | X | 0 | X | Wheat | 55 | 2.52 | 1.70 | -32 | 6.7 | 8.6 | 116 | 112 | 1.0 | -- | -- |
| 45 | 48 | 22 | S | 2 | 03 | + | X | X | 0 | X | 0 | Wheat & Barley | 60 | 2.15 | 1.80 | -16 | 6.7 | 7.4 | 150 | 134 | 1.5 | -- | -- |
| 54 | 35 | 13 | EX | 18 | 04 | Asthma | X | X | X | X | 0 | Sunflower | 54 | 2.50 | 2.10 | -16 | 5.8 | 8.6 | 70 | 70 | 2.1 | + | + |
| 70 | 39 | 14 | S | 28 | 03 | 0 | 0 | X | 0 | X | 0 | Not Specified | 63 | 3.35 | 2.65 | -21 | 12.0 | 12.0 | 120 | 128 | 1.0 | - | + |
| 90 | 64 | 18 | M | 0 | 04 | 0 | 0 | 0 | 0 | 0 | 0 | Sunflower | 90 | 3.18 | 2.63 | -17 | 5.9 | 6.4 | 98 | 98 | 1.6 | -- | -- |
| 15 | 43 | 2 | EX | 8 | 05 | 0 | 0 | 0 | 0 | 0 | 0 | Wheat | 89 | 3.09 | 2.53 | -18 | 8.1 | 8.6 | 114 | 294 | 3.3 | - | - |
| 36 | 51 | 5 | EX | 41 | 02 | + | X | X | 0 | 0 | 0 | Wheat & Barley | 68 | 2.26 | 1.87 | -17 | 5.2 | 5.9 | 90 | 94 | 2.9 | - | + |
| 21 | 49 | 29 | M | 0 | 06 | 0 | 0 | 0 | 0 | 0 | 0 | Wheat & Sunflower | 63 | 2.67 | 2.19 | -18 | 5.4 | 5.8 | 87 | 91 | NA | - | - |
| 92 | 58 | 29 | EX | 31 | 05 | 0 | 0 | 0 | 0 | 0 | 0 | Wheat & Sunflower | 62 | 3.00 | 2.30 | -23 | 6.2 | 7.6 | 95 | 90 | 9.3 | - | + |
| 100 | 51 | 20 | S | 30 | 03 | 0 | X | X | 0 | X | 0 | Barley | 64 | 2.10 | 1.70 | -19 | NA | NA | 142 | 111 | 1.8 | + | + |
| 69 | 39 | 16 | S | 39 | 03 | 0 | X | X | 0 | X | X | Not Specified | 83 | 3.75 | 3.20 | -15 | 8.5 | 10.0 | 70 | 74 | .5 | + | + |

TABLE II - 13

CHANGE IN PULMONARY FUNCTION DURING WORK SHIFT IN GRAIN WORKERS WITH AND WITHOUT RESPIRATORY SYMPTOMS DURING WORK

| | Respiratory Symptoms** Yes (N=122) | No (N=87) | P* |
|---|---|---|---|
| $FEV_{1.0}$ % Δ Pre-Post-Shift | - .5 | .08 | NS |
| FVC % Δ Pre-Post-Shift | -1.4 | -.4 | NS |
| $\dot{V}_{MAX}50$ % Δ Pre-Post-Shift | -1.6 | 4.9 | NS |
| $\dot{V}_{MAX}75$ % Δ Pre-Post-Shift | - .67 | 6.0 | NS |

*By t-test.
**Cough and/or expectoration and/or wheezing and/or dyspnea.

TABLE II - 14

RELATIONSHIP OF TOTAL DUST LEVELS TO SYMPTOMS
DURING WORK AND SUBJECTIVE ESTIMATION OF DUST EXPOSURE

| During Shift Symptom | | N | Total Dust Level ($mg/m^3$) $\bar{X} \pm 1SD$ | | P |
|---|---|---|---|---|---|
| Respiratory Symptoms: | | | | | |
| | Yes | 122 | 4.11 | 8.16 | <.05 |
| | No | 87 | 2.14 | 4.54 | |
| Fever: | Yes | 9 | 2.30 | 3.10 | NS |
| | No | 200 | 3.33 | 7.07 | |
| Eye or Nasal Symptom: | | | | | |
| | Yes | 82 | 3.72 | 7.45 | NS |
| | No | 127 | 3.01 | 6.62 | |
| Subjective Estimation of Dust Exposure: | | | | | |
| Less than Average | | 134 | 1.84 | 3.92 | <.01 |
| Average | | 62 | 4.21 | 8.62 | <.001 |
| More than Average | | 13 | 13.87 | 11.78 | |
| Heavy at Any Time That Day: | | | | | |
| | Yes | 42 | 10.08 | 12.92 | <.001 |
| | No | 167 | 1.58 | 2.15 | |

P = significance by unpaired t-test.

TABLE II - 15a

PROPORTION OF WORKERS AND CONTROLS WITH RESPIRATORY SYMPTOMS BY TOTAL DUST LEVEL EXPOSURE CATEGORY

| Dust Levels Range mg/m$^3$ | A Cough (98) N | % | B Expectoration (81) N | % | C Wheezing (27) N | % | D Dyspnea (25) N | % | A-D One or More (122) N | % | E Fever (9) N | % | F Eye (22) N | % | G Nose (76) N | % | H Throat (10) N | % | A-H One or More (137) N | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Grain Workers (209)** | | | | | | | | | | | | | | | | | | | | |
| 0-5** (179) | 80 | 45 | 63 | 35 | 22 | 12 | 17 | 9 | 100 | 56 | 8 | 4 | 10 | 6 | 64 | 36 | 7 | 4 | 104 | 58 |
| P | NS | | <.1 | | NS | | NS | | NS | | NS | | NS | | <.05 | | NS | | NS | |
| 5-10 (15) | 6 | 40 | 8 | 53 | 1 | 7 | 1 | 7 | 10 | 67 | 0 | - | 5 | 33 | 5 | 33 | 1 | 7 | 11 | 73 |
| P | NS | | <.05 | | NS | | NS | | NS | | NS | | <.05 | | NS | | NS | | NS | |
| 10-15 ( 6) | 4 | 67 | 4 | 67 | 2 | 33 | 3 | 50 | 4 | 67 | 1 | 17 | 3 | 50 | 3 | 50 | 2 | 23 | 4 | 66 |
| | NS | | <.05 | | NS | | <.005 | | NS | | <.01 | | <.005 | | NS | | <.05 | | NS | |
| >15 ( 9) | 8 | 89 | 6 | 67 | 2 | 22 | 4 | 44 | 8 | 89 | 0 | - | 4 | 44 | 4 | 44 | 0 | - | 8 | 89 |
| | <.01 | | <.01 | | NS | | <.005 | | <.05 | | NS | | <.005 | | NS | | NS | | <.05 | |
| **Controls (63)** | | | | | | | | | | | | | | | | | | | | |
| 0-5* | 25 | 40 | 15 | 24 | 7 | 11 | 5 | 8 | 29 | 46 | 1 | 2 | 6 | 10 | 14 | 22 | 5 | 8 | 32 | 51 |

*60 out of 63 had dust levels from 0 to 2 mg/m$^3$
**141 out of 179 had dust levels from 0-2 mg/m$^3$
P = significance of the difference between grain workers to controls

TABLE II - 15b

PROPORTION OF WORKERS AND CONTROLS WITH RESPIRATORY SYMPTOMS BY TOTAL DUST LEVEL EXPOSURE CATEGORY

| Dust Levels Range mg/m$^3$ | A Cough (98) N | A Cough (98) % | B Expectoration (81) N | B Expectoration (81) % | C Wheezing (27) N | C Wheezing (27) % | D Dyspnea (25) N | D Dyspnea (25) % | A-D One or More (122) N | A-D One or More (122) % | E Fever (9) N | E Fever (9) % | F Eye (22) N | F Eye (22) % | G Nose (76) N | G Nose (76) % | H Throat (10) N | H Throat (10) % | A-H One or More (137) N | A-H One or More (137) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Grain Workers (209)** | | | | | | | | | | | | | | | | | | | | |
| 0-5** (179) | 80 | 45 | 63 | 35 | 22 | 12 | 17 | 9 | 100 | 56 | 8 | 4 | 10 | 6 | 64 | 36 | 7 | 4 | 104 | 58 |
| P | <.05 | | <.001 | | NS | | NS | | <.001 | | NS | | NS | | <.05 | | NS | | <.005 | |
| 5-10 (15) | 6 | 40 | 8 | 53 | 1 | 7 | 1 | 7 | 10 | 67 | 0 | - | 5 | 33 | 5 | 33 | 1 | 7 | 11 | 73 |
| P | <.1 | | <.005 | | NS | | NS | | <.05 | | NS | | <.001 | | NS | | NS | | <.05 | |
| 10-15 ( 6) | 4 | 67 | 4 | 67 | 2 | 33 | 3 | 50 | 4 | 67 | 1 | 17 | 3 | 50 | 3 | 50 | 2 | 23 | 4 | 66 |
| | <.1 | | <.005 | | <.05 | | <.001 | | NS | | <.1 | | <.001 | | NS | | <.05 | | NS | |
| >15 ( 9) | 8 | 89 | 6 | 67 | 2 | 22 | 4 | 44 | 8 | 89 | 0 | - | 4 | 44 | 4 | 44 | 0 | - | 8 | 89 |
| | <.001 | | <.001 | | NS | | <.001 | | <.005 | | NS | | <.001 | | NS | | NS | | <.01 | |
| **Controls (192)** | | | | | | | | | | | | | | | | | | | | |
| 0-5* | 61 | 32 | 36 | 19 | 17 | 9 | 10 | 5 | 71 | 37 | 6 | 3 | 10 | 5 | 48 | 25 | 13 | 7 | 81 | 42 |

*60 out of 63 had dust levels from 0 to 2 mg/m$^3$
**141 out of 179 had dust levels from 0-2 mg/m$^3$
P = significance of the difference between grain workers to controls

TABLE II - 16

MULTIPLE REGRESSION ANALYSIS USING PRE-POST SHIFT PERCENT DIFFERENCE IN LUNG FUNCTION AS THE DEPENDENT VARIABLE AND TIMED WEIGHTED TOTAL DUST CONCENTRATION, AGE, HEIGHT, SMOKING AND EX-SMOKING AS INDEPENDENT VARIABLES

| Grain Workers | | Total dust $mg/m^3$ | Independent Variables Age | Height | Ex-smoking | Smoking |
|---|---|---|---|---|---|---|
| FEV | b | .096 | .096 | - .27 | -2.07 | -.45 |
| % Δ Pre/Post Shift | t | 1.03 | -1.73 | -1.07 | -1.11 | -.26 |
| FVC | b | - .153 | - .063 | - .155 | -1.72 | -2.0 |
| % Δ Pre/Post Shift | t | 2.3* | -1.59 | - .86 | -1.28 | -1.62 |
| $\dot{V}_{max}50$ | b | - .42 | - .148 | - .277 | .41 | .82 |
| % Δ Pre/Post Shift | t | -2.43* | -1.44 | - .59 | .12 | .26 |
| $V_{max}75$ | b | - .537 | - .037 | - .618 | 1.44 | -3.62 |
| % Δ Pre/Post Shift | t | -2.36* | -.28 | -1.0 | .32 | - .86 |

b = regression coefficient
t = t ratio
* = b .05 (using two tail analysis)