

HETA 87-392-2099  
FEBRUARY 1991  
LORAL SYSTEMS GROUP  
AKRON, OHIO

NIOSH INVESTIGATOR:  
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## I. SUMMARY

On August 14, 1987, the International Union, United Automobile, Aerospace and Agriculture Implement Workers of America (UAW) requested that the National Institute for Occupational Safety and Health (NIOSH) conduct a health hazard evaluation to assess whether exposure to asbestos has affected the health of retirees and current workers at Loral Systems Group (formerly Goodyear Aerospace) in Akron, Ohio. Four production areas were identified during this meeting as sites where asbestos exposure was likely: Jupiter Rocket, Vinyl Products, Key and Lining, and Plant F.

Through an agreement with the Union, Loral systems Management, and NIOSH, Loral Systems Group management contacted all currently employed and retired workers asking them to answer and return a short job history questionnaire if they had worked in one of the four asbestos exposure areas. Staff members from the Loral Systems Group personnel department then abstracted employment records, verifying employment history for each respondent. The identification and selection of a study population delayed the beginning of the medical evaluation until July 1989.

During the week of July 7-12, 1989, 129 persons participated in a medical evaluation consisting of a chest x-ray, pulmonary function test, and completion of a questionnaire to detail medical and prior work histories. Participants included currently employed and retired workers, both salaried and hourly.

X-ray findings, pulmonary function test results, and answers to respiratory questions were compared with published results for a group of blue-collar workers unexposed to fibrogenic dust. Seventeen participants had x-ray signs consistent with pneumoconiosis. Loral Systems Group employees were 14 times more likely to show parenchymal signs consistent with pneumoconiosis than workers in the blue-collar control population (relative risk (RR)= 14.36, 95% confidence interval (C.I.) 3.25-63.50). Loral workers were also 33 times more likely to have small irregular opacities (which are suggestive of asbestosis) than the blue-collar control population (RR=33.33, 95% C.I.: 3.25-318.10).

Thirty-nine participants had abnormal pulmonary function results: 30 workers had an obstructive pattern, 3 had a restrictive pattern, and 6 had both an obstructive and restrictive component.

Self-recorded responses to a respiratory health questionnaire showed that non-smoking participants were more likely to report chronic cough (27%) than non-smoking blue-collar controls (3.2%), more likely to report chronic phlegm (27%) than controls (6.4%), and more likely to report chronic bronchitis (13.6%) than controls (3.2%).

This health hazard evaluation was designed to determine if Loral workers had health effects suggestive of asbestos exposure. The results of this evaluation indicate that participants were more likely to exhibit signs and symptoms associated with a pneumoconiosis than unexposed blue-collar workers, although the findings may have been affected by methodologic limitations, including self-identification of eligible participants and the resulting selection bias.

**KEYWORDS:** SIC 3728 (Aircraft brakes), Aerospace, Asbestos, Pneumoconiosis

## II. INTRODUCTION

On August 14, 1987, the National Institute for Occupational Safety and Health received a request for a health hazard evaluation from the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW). Because of a history of worker exposure to asbestos, and the associated risk of lung cancer, representatives from the UAW requested that NIOSH conduct a medical survey of workers and retirees at Loral Systems Group, in Akron, Ohio.

On October 27, 1987, representatives from NIOSH met with union representatives and Loral Systems Group management to discuss the health hazard evaluation request and to determine the feasibility of conducting a medical evaluation of current and past employees. As a result of this meeting, it was determined that asbestos exposure was likely in four areas of the plant: Jupiter Rocket program, Vinyl Products, Key and Lining, and Plant F.

One-hundred twenty-nine persons participated in the health hazard evaluation on July 7-12, 1989. Personal medical results were mailed to each participant on March 9, 1990.

## III. BACKGROUND

Loral Systems Group (formerly Goodyear Aerospace) produces wheels and brakes for civilian and military aircraft and currently employs approximately 1560 persons at the Akron, Ohio plant. Key and Lining, Vinyl Products, and Plant F are all programs where aircraft brake linings were manufactured, handled, and assembled for the Wheel and Brake Division at Loral Systems Group. The Jupiter rocket program was a Defense Department Program in the 1950's and 1960's which produced nose cones composed, in part, of asbestos. At the time of this study there were approximately 2300 living retirees; the number who had worked in one or more of the 4 areas of interest was not known.

Because the concern expressed by the union was the potential health effects associated with asbestos exposure that had occurred in the past, no environmental or industrial hygiene samples were collected during this health hazard evaluation.

## IV. EVALUATION DESIGN AND METHODS

Work records (3x5 job cards) detailing job histories were filed by the employee's name. Since the names of potentially exposed workers were unknown to us, a joint letter signed by Loral Systems Group management and representatives from the local union was sent to each active and retired employee in November 1988. Workers were asked if they had been employed in the Jupiter, Vinyl, Key Lining, or Plant F programs, and were asked to complete the brief questionnaire to indicate if they would be interested in participating in a health hazard evaluation. Records for each of the responding employees were then individually abstracted by personnel specialists from Loral Systems Group (March 1989) who verified employment history for each respondent.

One-hundred-sixty-six persons were found eligible for inclusion in this health hazard evaluation (15 or more years of potential asbestos exposure in at least one of the 4 identified programs, and still residing in the state of Ohio). One-hundred twenty-nine persons participated in the

health hazard evaluation on July 7-12, 1989. Personal medical results were mailed to each participant on March 9, 1990.

### Referent Population

Results from the pulmonary function test, X-rays, and respiratory questionnaire, were compared with published results from blue-collar workers who were considered to be free from occupational respiratory hazards. These workers included representatives from food and kindred products, synthetic textile mills, and electrical equipment and supplies. Selection criteria for the blue collar referent groups has been previously described.<sup>1</sup>

### Pulmonary Function Tests

Pulmonary function tests were conducted using Ohio Medical Model 822 dry rolling seal spirometers, equipped with a Codonics graphics terminal 1550 and a HF4 microprocessor. Pulmonary function test procedures conformed with the American Thoracic Society's criteria for screening spirometry.<sup>2</sup> One-second forced expiratory volume (FEV<sub>1</sub>) and forced vital capacity (FVC) were measured, and the ratio FEV<sub>1</sub>/FVC calculated for each participant.

Predicted pulmonary function values were determined according to Knudsen's regression equations as described by Hankinson.<sup>3</sup> Results of pulmonary function tests were reported as normal or as mild, moderate, or severe restriction or obstruction.<sup>4</sup>

In addition to evaluating pulmonary function results using Knudsen's equations (to calculate predicted values), results were compared to data obtained from a group of previously studied blue-collar workers.<sup>5</sup> Prediction equations derived from this group have terms for age, smoking status, height, and race. Applying multi-variable linear regression techniques, blue-collar predicted FEV<sub>1</sub> and FVC were calculated for Loral workers. Observed results from each participant were compared with blue-collar predicted FEV<sub>1</sub> and FVC results, and differences were analyzed by Student's T-test.

### Chest X Rays

Chest X rays were taken of each participant with the use of a General Electric power unit modified for use in a mobile (trailer) unit. An upright chest stand allowed use of a dual format (14x17 or 17x14) orientation. Standard techniques were used for each x-ray, ie, 110 kvp (kilo-volt pressure) with a back-up time of 32 MAS (milli-amp-second). Posterior anterior (PA) films were processed on location using a Kodak MN-7 film processor. Chest X rays were sent to at least two "B-readers", radiologists trained in the use of the International Labor Organisation's standardized classification of radiographs for pneumoconiosis.<sup>6</sup> When interpretation of an x-ray differed between two radiologists, a third radiologist was asked to review the x-ray and the majority interpretation and median profusion score was used for analysis and for reporting to each participant. X-ray results from participants were compared with a non-exposed blue-collar workforce<sup>7</sup> for the prevalence of signs compatible with pneumoconiosis.

### Respiratory Symptom Questionnaire

Participants completed a questionnaire, the respiratory portion of which was based in part on the questionnaire prepared by the American Thoracic Society (ATS).<sup>8</sup> The prevalence of several respiratory outcomes were compared with prevalence rates for the previously mentioned group of unexposed blue-collar workers.<sup>1</sup> These respiratory outcomes included: cough, which was defined as cough on most days for 3 consecutive months or more during the year for a least two years; chronic bronchitis, defined as cough with phlegm on most days for 3 consecutive months or more during the year for at least 2 years; and shortness of breath (a) when hurrying on level ground, and (b) when walking with others of the same age on level ground.

## V. HEALTH EFFECTS OF ASBESTOS

Detailed accounts of the hazardous effects of asbestos exposure have appeared in the scientific literature since the early 1900's.<sup>9,10</sup> First accounts of illness appeared as case reports in which physicians described lung scarring and fibrosis among textile workers exposed to asbestos. Building upon the evidence supplied by case reports, epidemiologic evaluations were conducted which showed strong associations between asbestos exposure and lung cancer.<sup>11,12,13</sup> As a result of these case reports, epidemiologic studies, and results of animal studies, asbestos is now known to cause: asbestosis (a diffuse interstitial pulmonary fibrosis), lung cancer, malignant mesothelioma, and gastro-intestinal cancer.

Asbestosis is a non-cancerous lung disease caused by breathing relatively high concentrations of asbestos over long periods of time.<sup>14</sup> Tissue surrounding the alveoli (air sacks of the lungs) becomes scarred and thickened, thereby restricting the ability of the lungs to inflate to full, normal capacity. Severe cases of asbestosis will lead to debilitating shortness of breath and may result in death. Asbestosis has been observed in workers with as few as five years of exposure, but it is more typically seen after 15 to 20 years of exposure.

Asbestos-induced lung cancer typically develops 20 or more years after first exposure and is usually fatal.<sup>15</sup> The risk of lung cancer has been shown to increase with increasing duration and concentration of exposure (dose- response effect).<sup>16</sup> Additionally, the risk of lung cancer in an asbestos-exposed worker is strongly related to cigarette smoking. Although the exact disease rates are debated, estimates suggest (assuming a non-smoker has a risk of lung cancer of 1) that the risk of lung cancer is 10 times greater for smokers, 5 times greater for asbestos-exposed workers and 50 times greater for asbestos-exposed workers who also smoke.<sup>17,18,19</sup>

Malignant mesothelioma, an invasive tumor affecting the pleura (the membranes around the lungs and abdominal organs), can occur 15-47 years after first exposure to asbestos. This is a relatively rare form of cancer and has been (with few exceptions) linked exclusively to asbestos exposure. Intervention techniques such as surgery, radiation, and chemo-therapy, have been ineffective in prolonging the life of those with mesothelioma. Unlike asbestosis, there does not appear to be a dose-effect relationship between the amount of exposure to asbestos and the risk of malignant mesothelioma.

NIOSH considers asbestos to be a carcinogen and recommends that exposures be reduced to the lowest feasible limit.<sup>20</sup> For asbestos fibers > 5 micrometers in length, the NIOSH

recommended exposure level (REL) is 100,000 fibers per cubic meter of air, which is equal to 0.1 fiber per cubic centimeter of air, as determined by a 400-liter air sample and NIOSH Analytical Method #7400.

The Occupational Safety and Health Administration (OSHA) permissible exposure level (PEL) for asbestos fibers (longer than 5 micrometers and having a length-to-diameter ratio of at least 3 to 1) is an 8-hour time weighted average (TWA) airborne concentration of 0.2 fibers per cubic centimeter, as determined by the membrane filter method at approximately 400X magnification with phase contrast illumination.<sup>21</sup> An "action" level of 0.1 fiber/cm<sup>3</sup> as an 8-hour TWA was established as the concentration above which employers must initiate compliance activities such as worker training and medical surveillance.

## VI. RESULTS

One-hundred-thirteen persons who met the eligibility criterion participated in the health hazard evaluation at Loral Systems Group. Sixteen other, self-selected participants also took part, but were excluded from the analyses because they had less than 15 years of potential asbestos exposure. Since the actual target population for this study was unknown, a participation rate could not be calculated. Participants had a mean age of 64 years (range 44-80). One-hundred-nine participants (97%) were male, 96% were white, and 2% were black. Of the 113 participants, 58 (51%) were retired hourly employees, 35 (31%) were currently employed hourly employees, 11 (10%) were retired salaried employees, and 9 (8%) were currently employed salaried employees.

Participants averaged 37.8 years of employment at Loral Systems Group/Goodyear Aerospace (range 15.1-56.0). Thirty-five participants (31%) had worked only in Plant F, and another 35 had worked only in Vinyl Products. The others worked in more than one area. Only 15% of the participants had ever worked in Jupiter Products, and only 15% ever worked in Key/Lining (Table 1).

### Pulmonary Function Test

Normal pulmonary function patterns were recorded for 75 participants (66%). Twenty-nine persons (26%) had a mild obstructive lung function pattern, 2 persons (2%) had a restrictive pattern, and 6 (5%) had both obstructive and restrictive effects.

Each program area where asbestos exposure could have occurred was analyzed using multiple logistic regression techniques to determine if ever having worked in either Jupiter Rocket, Vinyl Products, Key and Lining, or Plant F, was associated with either a restrictive or an obstructive lung function pattern. No such associations were found.

Percent predicted FEV<sub>1</sub>, percent predicted FVC, and the percent predicted ratio of FEV<sub>1</sub>/FVC for each participant were evaluated by linear regression techniques to determine whether years in any of the 4 potential asbestos exposure areas or total years in asbestos exposure areas could predict an effect on these parameters. No association was found between years of service in any of the programs (or combinations of the programs) and the prevalence of obstructive or restrictive lung function of the participants.

Since workers can arguably be expected to have, as a group, better lung function than members of the general population, the blue-collar comparison might more closely

approximate, and provide a better comparison group for, Loral workers. Group mean (average) results for employed salaried, employed hourly, and retiree hourly and salaried workers are presented in Table II. All 4 groups of workers evaluated had mean values well within the 'normal' range (defined as being within the 95% confidence interval of the predicted value).

### X-Rays

X-ray films from all 113 participants were submitted to certified B-reader radiologists. Seventeen x-rays contained radiographic signs consistent with pneumoconiosis: 9 persons with pleural thickening only, 5 persons with parenchymal opacities only, and 3 persons with both parenchymal and pleural signs of pneumoconiosis. The prevalences of these findings were compared with those of an unexposed blue-collar workforce.<sup>7</sup> Our results indicated that Loral workers were more likely to exhibit irregular opacities of profusion 1/0 or greater (3.5%) than the unexposed blue-collar population (0.21%) (RR=14.36, 95% CI: 3.25-63.50). In addition, Loral workers were more likely to have irregular opacities of profusion 1/1 or greater (2.6%) than in the external control population (0%). Bilateral pleural thickening was more common in Loral workers (12.3%) than controls (0.21%) (RR = 58.85, 95% CI: 17.16-201.78). The prevalence of parenchymal or pleural signs of pneumoconiosis was not found to be significantly associated with total years of Loral employment, employment in any one of the 4 asbestos associated programs, or years of smoking.

We used Student's T-test to compare risk factors between those with radiographic signs suggestive of pneumoconiosis (17 persons) and the remaining participants (96); and found no significant difference in mean age (63.5 vs 64.0, p=.90), mean years with the corporation (39.8 vs 37.5, p=0.12), mean years in the Jupiter program (0.8 vs 0.5, p=0.57), mean years in Vinyl Products (11.6 vs 9.0, p=0.39), or mean years in Plant F (8.10 vs 12.0, p=0.13). Those with radiographic signs consistent with pneumoconiosis, however, had fewer years of exposure in Key and Lining Division (mean of 0.002 years vs 1.80, p<0.05) and fewer asbestos exposure years (20.65 vs 23.20, p=0.03) than other participants.

### Respiratory Questionnaire

Eight questions concerning the frequency with which a worker experiences cough, phlegm, wheezing, and shortness of breath, were adapted from the American Thoracic Society's respiratory questionnaire<sup>8</sup> to compare responses from Loral System Group workers with those from an external control population of unexposed blue-collar workers.<sup>9</sup>

Since the Loral Systems Group participants were older (median 64 years, range 44 to 80 years), their answers were compared to white, blue-collar workers who were aged 60 or greater. With few exceptions, Loral Systems group workers had higher prevalences of respiratory difficulties than the referent group. Loral workers who had never smoked were more likely than the non-smokers in the referent population to report chronic cough (27% vs 3%) and periods of shortness of breath with wheezing (32% vs 10%) (Table III B). They also had higher prevalences of chronic phlegm (27% vs 6%) and breathlessness when walking at a self-selected pace on level ground (23% vs 3%) (Table III B) although these differences were not statistically significant. The proportions of smokers and ex-smokers reporting many of these symptoms were also elevated when compared to the unexposed blue-collar workers. (Table III A,C)

To determine if years of exposure to asbestos, years of work in specific departments, and years of cigarette smoking could predict adverse respiratory outcome, (ie. chronic cough, chronic phlegm, chronic bronchitis, wheezing, and breathlessness) each factor was evaluated using unconditional multiple logistic regression. Only years of cigarette smoking and age significantly predicted whether or not a participant would report having respiratory difficulty. Smoking was more prevalent among those reporting chronic cough (odds ratio (OR)=5.13, 95% CI: 1.78-14.79), chronic phlegm (OR=5.56, 95% CI: 1.86-16.68), and wheezing (OR=3.04 95% CI: 1.10-8.40) than among the other participants. Neither years of employment at Loral Systems Group nor years of work in programs with presumed asbestos-exposure was associated with the reporting of respiratory symptoms.

## VII. CONCLUSIONS

Results from the health hazard evaluation show that workers and retirees who worked in the Jupiter Rocket Program, Vinyl Products division, Key and lining, and Plant F had a higher prevalence of x-ray findings consistent with pneumoconiosis than the blue-collar control population. In addition, non-smoking Loral workers were more likely to report chronic cough, chronic phlegm, chronic bronchitis, breathlessness, and wheezing (based upon answers to the ATS respiratory questionnaire) than non-smoking, non-asbestos-exposed blue-collar workers. Pulmonary function testing showed that Loral workers generally performed as well as or better than unexposed blue-collar workers and the general public (Table II).

Although we do not have historical industrial hygiene sample results to verify the specific type or concentration of asbestos that workers were exposed to, both the workers and the management of Loral Systems Group acknowledge that asbestos exposures did occur.

We were unable to show, however, that increased years of exposure to asbestos and/or increased years in specific program areas had a demonstrable effect upon measured health effects. By design, participants had 15 or more years of work in an asbestos exposed area (physical signs of asbestos exposure typically require 15-20 years before they are evident on x-ray). By selecting workers who had 15 or more years of asbestos exposure, we may have removed much of the variability between participants with respect to asbestos exposure and therefore limited our ability to observe the effect of "asbestos exposure years" on these workers. Furthermore, since there was no quantitative assessment of asbestos exposure or weighting of exposure-years by amount of exposure (which may have varied by job and program area), exposure-years may not be a sufficiently accurate estimator of cumulative exposure.

This health hazard evaluation was designed to determine if exposure to asbestos has affected the health of Loral workers. The results indicate that those who participated in the evaluation were more likely to exhibit signs and symptoms associated with pneumoconiosis than unexposed blue-collar workers. However, several study design features may limit the applicability of these findings to non-participants:

1. Since records were not available to identify who may have been exposed in the 4 asbestos exposure areas, we do not know if the participants were representative (age, health status, etc.) of the entire population of asbestos exposed workers and retirees. Those who volunteered for this evaluation may have been those with the most severe health complaints; conversely, participants may have been those who have survived.



Since the participation rate is unknown, the results may or may not be applicable to all workers who have worked in these program areas.

2. The participants were considerably older than those in most occupational studies. For example, the mean age of the participants was 64 years, and many of the participants exceeded 70 years of age. Interpretation of pulmonary function results for participants over 65 years of age is less well validated than for younger workers. To correct for this, we used (when possible) a reference population that included persons who were at least 60 years of age.

#### VIII. RECOMMENDATIONS

1. Processes where asbestos is still in use should be evaluated to determine if proper respiratory protection is being used by workers. In situations where the potential for asbestos exposure remains, Loral Systems Group should insure compliance OSHA requirements for personal protection and medical surveillance.
2. Buildings where asbestos insulation can be found should be assessed to determine if its condition and location pose a health risk to the employees.

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X. AUTHORSHIP AND ACKNOWLEDGMENTS

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are temporarily available upon request from NIOSH, Hazard Evaluations and Technical Assistance Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5282 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Loral Systems Group, Akron, Ohio
2. United Automobile, Aerospace and Agriculture Implement Workers of America
3. Loral Workers and Retirees who participated in the evaluation
4. Occupational Safety and Health Administration (OSHA) Region 5

For the purpose of Informing affected workers, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE I.  
Distribution of Loral Work Experience  
Among Study Participants

Loral Work Experience of 113 Survey Participants				
Program	Ever Worked		Years Worked	
	Number	Percent	Mean	Range
Jupiter Rocket	17	15%	3.6	0.2-7.6
Key/ Lining	19	17%	9.0	0.3-27.0
Vinyl Products	49	43%	21.5	4.0-56.0
Plant F	71	63%	18.4	0.2-38.8

Table II.  
Pulmonary Function Results \*  
Loral Systems Group  
Akron, Ohio  
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Loral Systems Group Employee Results compared to predicted results for the general population and a blue-collar population.

Group	FEV <sub>1</sub> % Predicted General Population	FEV <sub>1</sub> % Predicted Blue- Collar Population	FVC % Predicted General Population	FVC % Predicted Blue- Collar Population	FEV <sub>1</sub> /FVC% Predicted General Population	FVC/FVC% Predicted Blue- Collar Population
Current Salaried	106%	113%	116%	106%	92%	106%
Current Hourly	112%	111%	120%	106%	93%	105%
Retired Salaried	102%	114%	113%	101%	90%	113%
Retired Hourly	87%	96%	100%	91%	86%	105%
All groups combined	98%	116%	109%	96%	89%	106%

\*Numbers greater than 100% show grouped results which are better than expected when compared to the population indicated.

Table III. (A)  
Respiratory Questionnaire Results  
Loral Systems Group  
Akron, Ohio  
HETA 87-372-2099

Selected Self Reported Respiratory Conditions  
Using Unexposed Blue-Collar Workers as Referent Population  
White Males aged 60 +

Respiratory Condition	Smokers			
	Loral Workers Reporting Symptom	Blue- Collar Workers Reporting Symptom	Risk Ratio	Confidence Interval
Cough on most days for at least 3 mo. per year	63.6%	30.0%	2.12	0.74-6.04
Phlegm on most days for at least 3 mo. per year	54.5%	40.0%	1.36	0.54-3.46
Periods of cough and phlegm lasting at least 3 wks in the past 3 yrs	27.3%	10.0%	2.73	0.34-22.16
Breathless when hurrying on level ground	90.9%	50.0%	1.82	0.95-3.47
Breathless when walking with others of same age on level ground	36.4%	40.0%	0.91	0.31-2.70
Breathless walking at own pace on level ground	9.1%	10.0%	0.91	0.07-12.69
Wheezing on most days and nights	45.5%	0		
Periods of shortness of breath with wheezing	18.2%	0		

Table III. (B)  
Respiratory Questionnaire Results  
Loral Systems Group  
Akron, Ohio  
HETA 87-372-2099

Selected Self Reported Respiratory Conditions  
Using Unexposed Blue-Collar Workers as Referent Population  
White Males aged 60 +

Respiratory Condition	Non-Smokers (never smoked)			
	Loral Workers Reporting Symptom	Blue- Collar Workers Reporting Symptom	Risk Ratio	Confidence Interval
Cough on most days for at least 3 mo. per year	27.3%	3.2%	8.45	1.09-65.37
Phlegm on most days for at least 3 mo. per year	27.3%	6.4%	4.23	0.94-19.02
Periods of cough and phlegm lasting at least 3 wks in the past 3 yrs	13.6%	3.2%	2.11	0.38-11.61
Breathless when hurrying on level ground	45.5%	32.3%	1.55	0.77-3.07
Breathless when walking with others of same age on level ground	27.3%	6.4%	0.85	0.36-1.98
Breathless walking at own pace on level ground	22.7%	3.2%	3.52	0.75-16.53
Wheezing on most days and nights	18.2%	6.4%	5.64	0.68-48.06
Periods of shortness of breath with wheezing	31.8%	9.7%	4.93	1.13-21.52

Table III. (C)  
Respiratory Questionnaire Results  
Loral Systems Group  
Akron, Ohio  
HETA 87-372-2099

Selected Self Reported Respiratory Conditions  
Using Unexposed Blue-Collar Workers as Referent Population  
White Males aged 60 +

Respiratory Condition	Ex-Smokers			
	Prevalence			
	Loral Workers	Blue-Collar Workers	Risk Ratio	Confidence Interval
Cough on most days for at least 3 mo. per year	23.9%	9.1%	2.63	0.38-18.28
Phlegm on most days for at least 3 mo. per year	19.6%	27.3%	0.72	0.23-2.22
Periods of cough and phlegm lasting at least 3 wks in the past 3 yrs	26.1%	27.3%	0.93	0.32-2.82
Breathless when hurrying on level ground	63.0%	36.4%	1.73	0.77-3.91
Breathless when walking with others of same age on level ground	41.3%	9.1%	4.54	0.68-30.39
Breathless walking at own pace on level ground	28.3%	9.1%	3.11	0.45-21.30
Wheezing on most days and nights	21.7%	9.1%	2.39	0.34-16.77
Periods of shortness of breath with wheezing	37.0%	9.1%	2.39	0.34-16.77



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