

vanced asbestosis (codes 5 or 6). The presence of at least three of these signs was defined arbitrarily as necessary for an epidemiologic diagnosis. By this definition, 11 pipe coverers had "asbestosis"; all 11 had roentgenograms coded 5 or 6, nine had reduced vital capacities, nine clubbing, eight basilar rales, and eight exertional dyspnea. Also, by this definition, one of the controls had "asbestosis" — the worker who had pulmonary fibrosis after smoke inhalation.

Respiratory Gas Exchange

In subsequent surveys, one and three years later, we studied the role of several physiologic tests in defining and detecting this disease. Pipe coverers had significantly reduced single-breath and exercise steady-state diffusing capacities (D_{L1}) whereas airways resistance, specific conductance, ventilation, carbon dioxide tension and dead space were not significantly different. Physiologic evidence of obstructive disease was equally common in both groups. All workers with clinical "asbestosis" had severely reduced D_{L1} , corroborating our clinical criteria (Murphy, R. L. H., Jr., Gaensler, E. A., Redding, R. A., et al: Unpublished data).

Figure 2 shows the relation of data on respiratory gas exchange to our clinical findings. Our diagnostic criteria that focused on marked abnormalities correlated highly with impaired D_{L1} . However, Figure 2 also suggests that clinical findings of lesser severity may reflect interstitial lung disease.

Prevalence of Other Respiratory Diseases

Skin hypersensitivity to 5 tuberculin U of PPD was not significantly different in the two groups. All persons with 5 mm or more of induration submitted

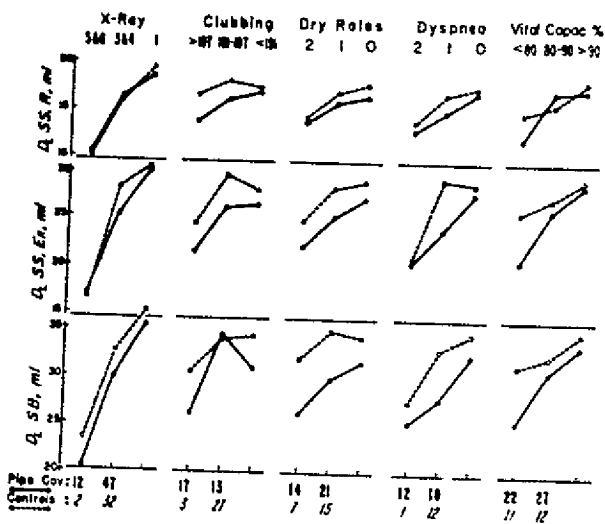


Figure 2. Relation between D_{L1} (Steady State at Rest, D_{L1SS} , R; Exercise, D_{L1SS} , Ex; Single Breath, D_{L1SB}) and the Degree of Five Clinical Abnormalities among Pipe Coverers and Controls (Figures at Bottom Represent Numbers of Subjects with the Indicated Abnormality)

Table 3 Chronic Nonspecific Obstructive Respiratory Disease

CATEGORY	101 PIPE COVERERS	94 SHIPYARD CONTROLS
1 — no obstructive lung disease	71.3	68.1
2 — chronic bronchitis only*	18.8	25.5
3 — asthma only†	0	0
4 — chronic obstructive lung disease only‡	3.0	3.2
COMBINATIONS		
2 + 3	1.0	0
3 + 4	5.9	2.1
2 + 4	0	0
2 + 3 + 4	0	1.1

*Phlegm from chest at least 6 times/day, 4 days/wk for at least 3 mo for past 3 yr

†Asthma diagnosed by a physician & still present

‡Wheezing or whistling most days or nights, or worker has to stop for breath when walking at own pace on the level, or FEV₁ <60% of FVC

three 24-hour sputum specimens, none of which were positive for *Mycobacterium tuberculosis*.

Nonspecific obstructive lung disease was slightly but not significantly more common in the control group and among cigarette smokers (Table 3). Among workers with this syndrome, approximately 75 per cent of the pipe coverers and 65 per cent of the controls smoked cigarettes.

Asbestosis and Its Relation to Dust Exposure

By our scheme, "asbestosis" was never diagnosed in persons with less than 10 years of cumulative exposure, with a progressive increase thereafter (Fig. 3). If uniform exposure over the working careers is assumed, certain conclusions can be reached from dust counts made with the midget impinger. No "asbestosis," as defined above, occurred in men exposed for less than 60 mppcf-years; 20 per cent of those exposed for 75 to 100 mppcf-years were considered to have asbestosis, and the prevalence was 38 per cent in those with exposure for more than 100 mppcf-years.

DISCUSSION

Building-insulation workers move from site to site and are confronted by varying situations and specifications, making supervision and assessment of dust exposure difficult. An important study confined to such workers by Selikoff, Churg and Hammond¹ showed that almost 1/2 of 1117 workers were considered to have roentgenologically evident asbestosis; prevalence was directly related to duration of exposure. By contrast, shipboard pipe coverers engaged in new vessel construction have a more uniform exposure. Fleischer et al.² in a study already alluded to, found only three cases of asbestosis among 1074 pipe coverers, and these three had been exposed for 20 or more years. Therefore, the authors thought that such pipe covering was not a