

towns, inhabited by about 1,000 persons each, are approximately 4 miles apart, with a soft-coal-burning electric power plant between them. The prevailing wind pattern was such that the town of Seward was subject to much higher levels of air pollution than New Florence. Thus, for the period of the study, the level of dustfall in Seward was three times that of New Florence, the level of sulfation was seven times as high, and the level of SO_2 was at least nine times as high. Nevertheless, the SO_2 level in Seward was below that generally found in London (25).

The purpose of the study was to determine the long-term effects of low concentrations of air pollutants. An attempt was made to include the entire adult population of both sexes 30 years old and over. In addition to X-rays, the study used the long Medical Research Council questionnaire, with slight revisions, chiefly in terms of a much more detailed work-experience history. A battery of pulmonary function tests, including the body plethysmograph, was administered to the study group. The analysis, which was scheduled for completion in the summer of 1962, takes into account such variables as smoking and occupational and residence exposure of the townspeople.

In the preliminary report, one significant finding was that the average airway resistance (measured by the body plethysmograph) was higher in Seward than in New Florence even after differences in height and age were taken into account.

A curious finding was that the male population of the polluted area was almost 1 inch shorter than that of New Florence. One would rightfully hesitate to attribute this difference in height to the difference in the environment. Yet this possibility should not be dismissed arbitrarily because of its apparent implausibility. One may only say that differences of this sort would have to be documented in many other communities before we could accept the hypothesis that the stature of the inhabitants was related to exposure to air pollutants rather than to ethnic or socioeconomic differences.

Since this study was completed, considerable effort has been made by the industry to reduce the pollution in the area. A restudy some time in the future might prove of considerable interest in evaluating the possible benefits of such reduction in pollutant levels as may have been achieved.

The long-term effects of the Donora disaster have also been studied in the United States (26). The resurvey of Donora 10 years after the disastrous smog of 1948 has shown that the persons who became ill during the outbreak have had a less favorable morbidity and mortality experience than the persons who were not affected in 1948. While it is true that those who became ill were probably less healthy to begin with than those who did not, it is quite likely that chronic effects due to unusually high levels of air pollution have been manifested in the affected group. Further, it is possible that repeated exposure to air pollution, even at very low levels, may have contributed to the long-term unfavorable experience.

The responsibility of air pollutants for the increasing frequency of lung cancer in the United States is at the moment a matter of some disagreement. Authoritative quantitative estimates of the role of air pollution as an etiologic agent do not exist, and only informed guesses can be made. Nevertheless, it is our thesis that, without decrying the importance of cigarette smoking as a factor, air pollution is also an important etiologic agent. This is not a novel idea. The World Health Organization report on lung cancer mentioned a number of possible etiologic agents and noted the prominence of air pollution in the list (27). Once again the sharp urban-rural differential in mortality rates for this disease is manifested. Also, lung cancer mortality rates appear to be related to the size of the urban area, the larger areas having the higher age-standardized mortality ratios.

The studies by Dean (28) and Eastcott (29) on migrants from Britain to South Africa and New Zealand suggest the role of air pollution as a causative factor in lung cancer. Unfortunately, there is no completed comparable study as yet in the United States. A study of British and Scandinavian migrants to the United States is underway, but we will have to wait several years for the results.

CONCLUSIONS

The great volume and variety of air pollutants in the United States offers unparalleled opportunities to study the chronic effects of low-level air pollution on health. In what other country is there amassed the concentration of automobiles found in Los Angeles with its resultant oxidant type of smog? The lethal concentration of pollutants in Donora in 1948 created a far different air pollution