in every age group, the greatest increase was in the age group of 45 years and over. More than 80 per cent of these deaths occurred among individuals with known heart disease and respiratory disease. As in other disasters reported, the symptoms produced were associated with irritation of the respiratory tract.

The British Ministry of Health concluded: "The fog was, in fact, a precipitating agent operating on a susceptible group of patients whose life expectation, judging from their pre-existing diseases, must even in the absence of fog have been short."

A study of the four disasters reveals these similarities:

1. People died, and many more became ill.
2. Each area was subject to an unusually long period of inversion.
3. Each area was subject to natural fog.
4. There was no new or unusual activity in the community prior to the disaster. Each area (except Poza Rica) had been essentially the same for many years with no unusual effect on the people.
5. The symptoms experienced were similar to those caused by a respiratory irritant.
6. Older people, and especially those with previous heart and respiratory disease (except in Poza Rica), were more severely affected than the younger age groups and normal health groups.
7. With the exception of Poza Rica, the agent or agents that caused the deaths are unknown.

It is apparent that the first step necessary to prevent more disasters is to determine the causative agent or agents. Until this is done, the exact procedures to be used to prevent such occurrences will be only "educated guesses." Until this knowledge is available, it is unreasonable to expect industry and other sources of pollution to control emissions to a level that would prevent a disaster under such a chance or freak meteorological occurrences. However, it is desirable to have a plan for each urban area that could be put into effect if a prolonged temperature inversion did exist. Such a plan could include requesting people with heart and respiratory disease to move from the affected area and placing those who could not leave the area in an auditorium equipped with proper air-cleaning devices.

B. CHRONIC EFFECTS ON PEOPLE

The preceding section has dealt with the acute effects of air pollution. The other facet of this health problem is the chronic effects, which are more insidious. In order to ascertain these effects, answers must be found for such questions as:

1. What effect does atmospheric pollution have on persons with pre-existing maladies, such as disease of the respiratory tract, heart disease, and possibly others?

2. What effect does air pollution have on elderly people who, by the aging process, naturally develop degenerative diseases of the lungs and heart?

3. What effect does air pollution have on children, who have an increased respiratory rate, as well as increased metabolism?

4. To what extent does air pollution lower the resistance of persons so as to predispose them to infectious diseases, particularly of the respiratory tract?

5. Does air pollution have any effect on the mental health of individuals?

To answer such questions, one must know more about the properties and effects of the contaminants themselves, such as:

1. What concentration of contaminants is required to produce acute and chronic effects?

2. Does a combination of contaminants act individually, is the effect additive, or is the effect greater than the summation of the individual effects?

3. Under what meteorological conditions would contaminants increase to harmful concentrations?

These determinations must be made before one can adequately evaluate the "long-term" effects of atmospheric pollution on the health of the general population. Only general knowledge is presently available, such as the fact that atmospheric pollution does decrease the quantity of the germicidal rays of the sun and, in this way, may indirectly produce adverse effects. It is also known that irritating gases and large amounts of particulate matter present in the atmosphere may reach concentrations that would have an adverse effect. The extent of such injurious effects is not known.

The maximum allowable concentrations of many toxic substances have been established for protecting the health of employees in industrial plants. However, these concentrations have been established for an 8-hour day and for the type of personnel normally employed in industry, in relatively good health, aged 18 to 60. Hence, the maximum allowable concentrations familiar to industrial hygienists throw little light on amounts that can be breathed safely 24 hours a day by the general population, including the very young and the aged, as well as persons with organic diseases, and those with special sensitivity to respiratory irritants.

To date, information available on the toxicological effects of mixed irritant gases is meager, and data on possible enhanced action due to sorption of gases on particulate matter are also limited. Obtaining the necessary data will require both laboratory and field work on an extensive and time-consuming scale. Although these long-range studies are essential to the solution of the problem of atmospheric pollution, this does not mean that practical control procedures cannot be carried forward in the interim. It does mean, however, that careful thought and planning are necessary if orderly progress is to be made.

There have been two attempts on the part of official agencies to determine the chronic effects of air pollution on health. First, in 1955 the California State Department of Public Health studied the Los Angeles smog and its health effects.[5]

[5] *Clean Air for California*. California State Department of Public Health, San Francisco, Calif., March, 1955.