

## Health and the Urban Environment

---

JAMES R. McCARROLL, M.D.; ERIC J. CASSELL, M.D.

WILLIAM INGRAM, M.P.H.

AND

DORIS WOLTER, R.N., M.P.H.

NEW YORK

# Health and the Urban Environment

## *Air Pollution and Family Illness: I. Design for Study*

JAMES R. McCARROLL, MD; ERIC J. CASSELL, MD;  
WILLIAM INGRAM, MPH; AND DORIS WOLTER, RN, MPH, NEW YORK

A dominant theme of human history is the consolidation of populations into ever larger social units. Acceleration of this trend in industrialized societies has concentrated 75% of the population of the United States onto 10% of the land. Although the pressures, tensions, crowding, and dirt of the urban environment are commonly stigmatized as injurious to health, astonishingly little objective evidence is available to support this belief. As measured by every vital index available our major cities are very likely the healthiest and most beneficial environments for human habitation ever developed. Despite the apparent advantages of urban populations compared to rural ones, certain features of the urban environment undoubtedly exact a toll on the health of its citizens and may indeed be direct or indirect causes of disease. Certainly the seeding of our environment with a host of new and complex chemical agents may influence health in subtle ways not immediately apparent. The most widespread

chemical agents to which city dwellers are exposed are products of the combustion of organic compounds; since this combustion is rarely complete and since chemical by-products and even substantial amounts of the fuel itself are released continually into the atmosphere, our urban populations are exposed to a constant stream of chemical agents of varying concentrations and shifting composition.

The respiratory tract contains 1,200 square feet of highly absorptive endothelium which enables it to function as an efficient mechanism for absorbing into the body various substances present in air. Absorption of harmful air pollutants has exacerbated pre-existing pulmonary disease during "acute" air pollution episodes both in the urban United States and in various European cities. Evidence for the initiation of permanent disease in previously well persons is fragmentary. To study this relationship we have undertaken a careful longitudinal study of a significant group of normal city dwellers together with simultaneous monitoring of the environment to which they are exposed. Our goal is to follow daily variations in health of a group of urban families of diverse backgrounds living in the same geographic area and to correlate these over a period of time

Submitted for publication Sept 4, 1964.

Read before the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Feb 10-11, 1964.

From the Department of Public Health, Cornell University Medical College.

Reprint requests to 1300 York Ave, New York, NY 10021 (Dr. McCarroll).

with variations in the atmosphere to which they are exposed.

### Study Area

Manhattan Island is the geographic center of the New York metropolitan area with its 16,000,000 inhabitants. Pollution of its air is from heating plants and incinerators of several million dwelling units, a diversified industrial complex within and outside the city, and from 4,500,000 motor vehicles registered in the area. Packed onto 22.2 square miles are 1,698,281 people representing every major racial, ethnic, and cultural group in the world. The immediate juxtaposition of rich and poor, Negro and white, tenement and substantial apartment building results in suitably small units for study which contain all the elements of the larger population.

The study area chosen was on the lower east side near the East River. Bisected by 14th St, the area includes a middle-income private housing project on the north, a tenement slum on the south, and a low-income public housing project on the east. Each of these sections is a separate census tract occupying from six to ten square blocks representing a characteristic type of urban housing.

*Housing in the Study Area.*—The first census tract stretching across the northern quarter of the district is composed entirely of a middle income privately owned housing project of 3½ to 5½ room apartments in identical 9 to 14-story buildings. The second section forms the eastern border of the study area and consists entirely of a low-income public housing project. Apartments of 2½ to 5½ rooms are located in 6 to 14-story brick buildings closely resembling the middle income housing project. Except for somewhat smaller rooms in the lower income project, the apartment buildings are similar in both areas and are of about the same age. Apartments in both are modern with adequate heating, lighting, and toilet facilities. Air conditioners are prohibited in both. Located almost midway between the two housing projects is a ten-square-block area of

“old-law” tenement houses, four to six story walk-up tenement apartment houses, built before modern building codes. Bathroom and toilet facilities are not always within the apartments and may be shared by several families. Although central heating is required it is often inadequate and not all apartments have hot water. Most of the buildings are dark, dirty, and in poor repair. Very few of these apartments have air conditioners and not all rooms have windows.

Rising in the geographic center of the study area is a single tall building of 16 stories. The air pollution study monitoring station is located on the top floor through the courtesy of the New York City Department of Welfare which occupies this building.

Just outside the study area on the north-east are the tall smoke stacks of a major electric power plant of the Consolidated Edison Company. The prevailing winds usually carry the effluent away from the study area. The influence of these stacks appears to be diffuse, affecting all sections of the study area to approximately equal degree. The study area totals less than half a square mile and is included in a circle with a radius of 2,000 feet centered on the air pollution monitoring station.

*Population of the Study Area.*—The population of Manhattan is a mixture of white and Negro, native and foreign born, and in recent years a substantial number of citizens from Puerto Rico. All these groups are represented within the project area.

The middle-income apartment project contains a relatively homogeneous group of middle to upper-middle income younger families engaged principally in professional and technical jobs. In this tract the total census for 1960 lists 22,405 persons of whom 22,315 are classified as white. Only the southern portion of this project is included in the study area.

The low income tenement section has two large population groups, the larger consisting of older foreign born or first generation white families most of whom speak English in the home. The smaller group consists of younger families of Puerto Rican back-

