ENV[illegible]NTAL POLLUTION AND CHRONIC [illegible]E

R.J. Hickey

In a part of a final report for a PHS Grant, Dr. Richard J. Hickey has included a section entitled Smoking and Disease; it is a low keyed argument against the PHS's representation of Smoking and Health.

Dr. Hickey is associated with the following institutions:

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Dr. Hickey works with grants from:

The Public Health Service (two separate grants)

The Council for Tobacco Research - U.S.A.

Resources for the Future, Inc.

His field of research is developing the theories and techniques to study the relationships between environmental variables, predominantly air pollutants, and human health. This also involves the etiology of chronic diseases as sub-categories of senescence, which in itself is a basic age-related degenerative disease.

This report to the PHS is titled Environmental Pollution and Chronic Health. Dr. Hickey uses the techniques of multivariate analysis on data from 38 cities. The data are dependent variables of mortality rates for various categories of cancer and heart disease together with stroke and congenital malformations for the period 1961-1964 and independent variables of means of mean annual atmospheric concentrations of several specific chemicals based on data available from 1957-1964. His results show that "Environmental chemicals have been found to be highly significant statistical predictors for mortality rates for many cancer categories, for heart disease, for congenital malformations, and also for median age of SMSA populations (SMSA populations are his cities used for study)." "The present studies report mortality rates of cancer and heart disease being highly significantly positively correlated with atmospheric concentrations of both SO_2 and NO_2 (sulphur dioxide and nitrogen dioxide)."

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In review of Section 7, Smoking and Disease and Section 8, Historical Disease Mortality Trends, Hickey presents four arguments to remind the PHS that "Since statistics do not and cannot prove causality, further investigation is necessary to provide enlightenment.", i.e., on smoking and chronic diseases.

He beings by accenting the positive of the 1964 Surgeon General's Report on "Smoking and Health:"

> "It is an axiom of statistics that correlation does not and cannot establish causality. The 1964 Surgeon General's Report on 'Smoking and Health' disclaims conclusions of this nature. This Report states 'statistical methods cannot establish proof of a causal relationship in an association. The causal significance of an association is a matter of judgement which goes beyond any statement of statistical probability...'"

His first point is on the "Constitutional Genetic Characteristic:"

> "With reference to 'constitutional genetic characteristic'... it should be mentioned that genotype hypothesis concerning the statistical relationship between smoking and lung cancer has been advanced by a number of investigators since about 1955."

He goes on to list twenty-one references. His second point concerns the lack of SO_2 and the small amount of NO_2 in cigarette smoke:

> "In view of the results of multivariate statistical analyses presented in this report showing frequent recurrence of SO_2 and NO_2 as significant positively correlated statistical predictors for mortality rates for a number of chronic diseases, the question of the content of these gases in fresh cigarette smoke is of interest. The Surgeon General's 1964 Report lists the primary gases found in cigarette smoke and their concentrations. In this group, SO_2 is not listed...The table does list NO_2 at a concentration of 250 ppm in the smoke.
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> It is of interest to note that, in 1964 Norman and Keith reported that experimental studies demonstrated the presence of nitric oxide (NO) in fresh tobacco smoke, but little or no nitrogen dioxide (NO_2)...the biochemical activity of NO differs from that of NO_2 ... although nitric oxide does not have the irritant properties of nitrogen dioxide, it...is somewhat comparable to the effects reported for carbon monoxide."

His third point is on the high correlation of lung cancer to other cancer. The PHS neglects or fails to see this when it singles out lung cancer and applies cigarette smoking to its etiology:

"Recently the Public Health Service stated: 'Cigarette smoking is a major cause of lung cancer and the major cause of lung cancer in men. The incidence of lung cancer would be reduced dramatically if people stopped smoking cigarettes.' regarding cancer other than lung cancer, this report did not claim that smoking caused breast cancer or was the primary cause of cancer generally...

It is of interest to consider the preceding comments in relation to the rather high degree of intercorrelation of the mortality rates of the various categories of cancer, including lung cancer...it is also of interest to consider that mortality rates for the cancer categories correlated rather highly with mortality rates for arteriosclerotic heart disease, which suggests the possibility of common etiological factors in this group of age-related chronic diseases."

Dr. Hickey's fourth and last point is under Section 8, Historical Disease Mortality Trends. He interprets the increase in cancer and heart disease as follows:

"Clearly, if the risk of death from infectious diseases is reduced, the risk of death and thus the death rate for chronic diseases should be increased. The causes of increases in the mortality rates for non-infectious chronic diseases over time are obviously complex. Further study is necessary to account for the statistical relationships between chronic disease mortality rates and (a) reduced mortality risk over time to infectious disease, (b) atmospheric pollution, (c) drinking water characteristics, (d) demographic variables, (e) smoking, (f) increased use of drugs of pharmaceuticals, (g) ethological influences, (h) food utilization and malnutrition, (i) genetic damage by mutagens at the germinal level, and (j) other variables.

Hickey's arguments are low-keyed and with respect. He emphasizes the objective approach and the need for more research on the question of environmental pollution and chronic diseases.