

SKELETAL PLAN FOR A COMPREHENSIVE EPIDEMIOLOGIC STUDY OF POLLUTION: EFFECTS OF EXPOSURE ON GROWTH AND DEVELOPMENT OF CHILDREN

JOHN R. GOLDSMITH
CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH

I. Basis for choosing this association to study

A. An "effect" which could be associated with atmospheric pollution, radiation, nutrition, occult lead or heavy metal poisoning or infectious or parasitic diseases.

B. An "effect" which is not currently under active study, but which is of general interest in that many populations will want to avoid a negative association.

C. An "effect" with some interesting statistical properties, but also possessing the full range of epidemiological complexity.

D. Practical, or apparently so, on an adequate scale.

E. Likely to be sensitive to existing exposure levels. (? sensitive for radiation exposures.)

F. Symposium participants are likely to be similarly familiar and informed relative to, say, chronic respiratory disease morbidity and mortality, or infant mortality, for which some participants are better informed than others.

G. Such a study is likely to attract support from available funds.

II. Background

Wetzel grid used to describe the growth function, based on height, height-weight ratio, age, and "body type."

Kapalin distribution diagram describes "location" of population, variance, and homogeneity. Fiducial limits were not applied. Kapalin has demonstrated apparent association of height, with nutrition, economic status of family, family size, pollution exposure, stature of parents. Similar analyses of RBC count, and hemoglobin. Reversibility suggested with change of location or with nutritional program.

Availability of preliminary data should be good—height and age of children in different schools, with census data, for schools with different climatological and pollution exposures.

Temporo-spatial strategy is likely to be appropriate.

III. Two study plans

Study plan A

Neonatal growth in relation to areas affected by pollution which can be defined for high levels of air pollution and with nitrate pollution of drinking water. Control areas, similar in socioeconomic factors and in climatology can be defined. Other variables are family size, smoking of parents, housing quality, breast feeding—sources of formula or bottle feeding, ethnicity, time of year.

Hypothesis to test: That during the months with relatively high levels of pollution, there is a greater unfavorable difference between polluted and control areas. (Judged by position of distribution, variance or deviant sub-population.)

Questions for discussion: Study size, suitability of various statistical criteria, how to treat replicate observation within same individual. Value of blood tests. Developmental yardsticks. How to treat illness episodes. Duration and nature of follow-up. Treatment of missing data (or data from different sources).

Study plan B

Skeletal growth, bone mineral, exercise capacity, lung function, and hematological levels in relation to pollution among eight to ten year old school children.

Measurements to be made at least four times yearly for two years and with hypotheses like those in Plan A. Height to be measured monthly, exercise capacity, lung function four times yearly and hematological variables and bone mineral (I^{125} scan, less than 10 mr per test) at randomized-within-individual times—yearly per individual, but clustered at 4 times a year.

Pollution estimates to be based on extension of existing air and water monitoring programs. Diet samples may be suitable.

Questions for discussion: Compare absolute values (or difference in central tendency estimate) or rate of change. Statistical test suitable to individual variables and or their combination. Statistical yardsticks for maximal performance test repetitions (lung function, exercise capacity) standardizing motivation. Inter-laboratory and inter-instrument comparability. Meteorological or climatological factors as missing variables. Experimental models for such effects. Relevance of growth and development for health as adult or for aging.

It is of great importance that there be at least one center which demonstrates the utility of a comprehensive approach. It is more important than three or four centers starting at once. It takes a tremendous amount of time for the different disciplines involved to work out their mutual problems. By the time one adds the dimension of geography to disciplinary interactions the problem becomes unreasonably large.

REFERENCE

- [1] V. KAPALIN, "Evaluation of the level of development in children and adolescents," *Children and Adolescents in Collection of Scientific Reports of the Institute of Hygiene, Prague*, Prague, Institute of Hygiene, 1970, pp. 7-82.