A METHODOLOGICAL PROBLEM IN INVESTIGATION OF PNEUMOCONIOSIS EPIDEMIOLOGY

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Pneumoconiosis epidemiology has brought to more and more people's attention. A problem frequently faced in statistical analysis to determine the significance of incidence reduction is the paucity of population data for exposure, as met by Hill in his investigation on chromicim chemical manufacture. Under the enlightenment of "Probability window analysis," author advanced a method of contrast analysis combining "the calendar year of beginning exposure" and "the exposure standing up to diagnosis"—the length of exposure years from beginning exposure to the date of diagnosis of pneumoconiosis which is abbreviated "exposurestanding contrast analysis." It proved that the method had certain significance in analyzing effects of dust prevention, evaluating dust harmfulness and handling health surveillance.

METHOD

According to the following conditions, selected plants A and B from the data of Liaoning Provincial Penumoconiosis Epidemiology Investigation as observation targets,

1. Time record was certain before and after a major change of dust prevention.
2. There were systematic data on health examination and environmental survey.
3. There were complete records of pneumoconiosis cases.

Then, draw "exposure-standing contrast" figures according to the following method:

1. On the common standard lattice paper, draw an abscissa and an ordinate which show "the calendar year of beginning exposure" and "the exposure standing up to diagnosis", respectively.
2. According to the two parameters mentioned above. Each pneumoconiosis case is plotted on the figures.

Contrast Method

Figure 1 shows the contrast between two periods. Each observation period included 20 years.

1. Draw three erect lines A, B and C upward from 1945, 1965 and 1985 on the abscissa.
2. Drow two oblique lines toward ordinate from 1965 and 1985 which intersect the lines A, B. Thus two triangular windows with equal size are drawn.
3. Count the number of pneumoconiosis cases in the triangular windows, then, do statistical test by binomial probability distribution.

Figure 2 shows the contrast among many periods including 5 years.

1. On the absicissa, from 1945, 1950, 1955, 1960, 1965, 1970, 1975, draw erect lines A, B, C, D, E, F, G, and I upward.
2. From 1965, 1975, and 1980 draw oblique line toward A,B,C, D, and E. Thus, five triangular windows with equal size are drawn.
3. Count the number of pneumoconiosis cases in the trapezoidal windows and do statistical test to avoid recounting to these same cases.

RESULTS

The history of dust prevention was divided into four periods in plants A and B:

- 1945—period of no dust prevention.
- 1950—period of poor dust prevention.
- 1955—period of wet drill and closed ventilation.
- 1960—period of comprehensive dust prevention.

Figures 1–4 provide plots for each pneumoconiosis cases in plants A and B by "calendar year of beginning exposure" versus "exposure standing up to diagnosis."

DISCUSSION

In Figure 1, 3, the left triangular windows contain pneumoconiosis cases who were first employed between 1945 and 1965. There were a total of 320 cases in plant A and 291 in plant B. The right triangle contains cases who were first employed between 1965 and 1985, no cases in plant A and 7 in plant B. The decline in cases before and after comprehensive dust prevention in 1965 is statistically significant ($p < 0.01$).

In Figure 2, 4, the equal sized windows contain cases who entered the plants A and B in the period of 1945–1959, 1950–1954, 1955–1959, 1960–1964, 1965–1969, 1970–1974, 1975–1979, respectively.

The number of reported pnuemoconiosis cases falling within the windows are 140, 182, 14, 1, 0, 0 in plant A and 216, 196, 30, 3, 4, 0 in plant B, respectively.

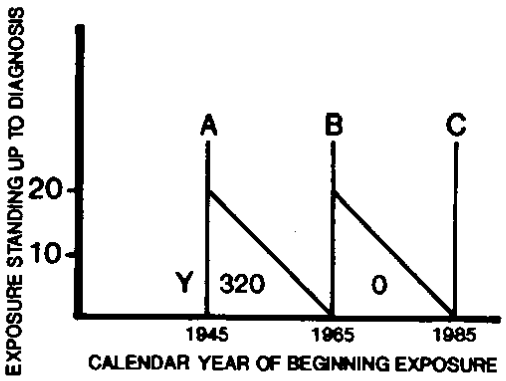

Figure 1. A comparison of pneumoconiosis incidence in equal size observational windows before and after a major dust prevention change in 1965 in A plant.

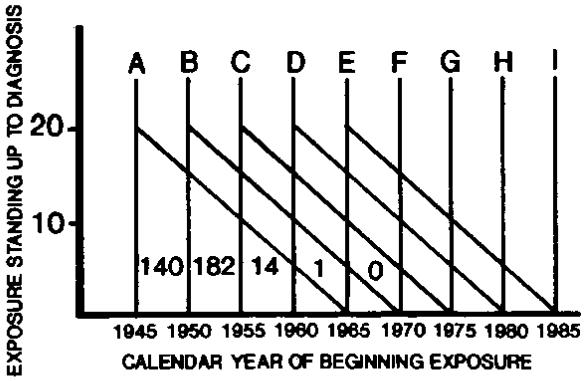

Figure 2. A comparison of pneumoconiosis incidence in equal sized observational windows before, between, and after major dust prevention change in 1960–1965 in A plant.

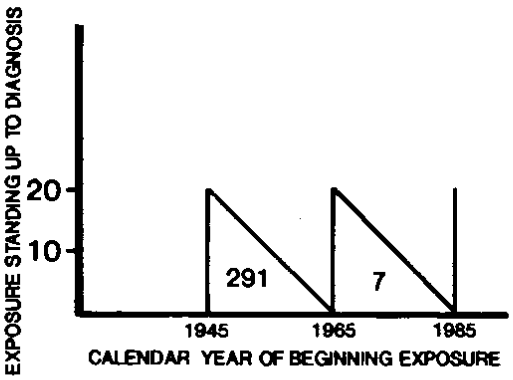

Figure 3. A comparison of pneumoconiosis incidence in equal sized observational window before and after a major dust prevention change in 1965 in B mine.

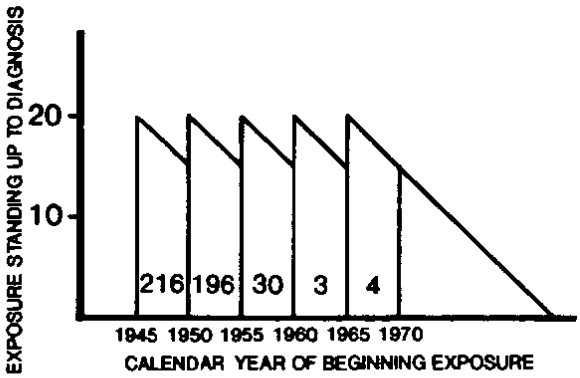

Figure 4. A comparison of pneumoconiosis incidence in equal sized observational windows before, between, and after major dust prevention change in 1960–1965 in B mine.

The results show that dust prevention plays an important role in reducing pnuemoconiosis incidence. The advantage of the method of "exposure-standing contrast analysis" is to be able to assess the probability that a change in the number of cases may have occurred at chosen point in time in the absence of data on exposed population.

When comparing the incidence according to type of works and work standing, it used to be difficult to deal with the following two problem,

1. The calculation was difficult when dividing standing into different groups after having divided types of work, because the divided layer were too many to have even distribution of cases.
2. When calculating the years of standing, it was confounded by the factor of different year of beginning exposure, so that the results might be false and misunderstood. For example, the duration of exposure may be the same of 10 year but the effect of 10 years exposure 20 years ago is different from that of latest 10 years. That is because the environmental and hygienic situation has been changing greatly in recent 20 years.

The method of "exposure-standing contrast analysis" is to do contrast analysis between two periods by combining two parameters of "year of beginning exposure" and "exposure standing up to diagnosis," so as to get a clearer picture that when (in what calendar year) the worker was exposed to dust and how long (years) the workers' standing was since then.

The concept has a important significance not only in assessing the preventing effects but also understanding the harmfulness to workers caused by dust pollution at workplace in different period. Hence, it has a reference value to carry out health surveillance and administration, analysis the results of body's examination and evaluate the trend of pneumoconiosis incidence change.

BRIEF SUMMARY

It is proved through study that the method of "exposure-

standing contrast analysis'' can be used to assess probability that a change in the number of cases may have occurred at a chosen point in time. In the absence of data on exposed population and proved the basis to evaluate preventing effects, medical surveillance, health guardianship and administration conditions.

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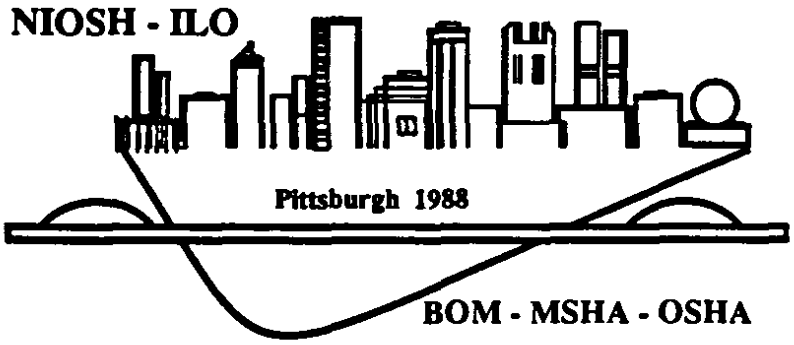

Pittsburgh, Pennsylvania, USA—August 23–26, 1988
Pittsburgh, Pennsylvanie, Etats-Unis—23–26 aout 1988
Pittsburgh, Pennsylvania EE. UU—23–26 de agosto de 1988

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September 1990

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DHHS (NIOSH) Publication No. 90-108 Part I