References and Notes

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Probability of the Pittsburgh Deaths

In attempting to decide whether the three deaths following swine flu vaccination in Pittsburgh were coincidental, Mitchell Gail (Letters, 11 Mar., p. 934) infers on the basis of a simple probabilistic calculation that "the chance that some clinic would experience three or more deaths on some day during the first week of the inoculation program is appreciable and could easily be as high as 10 percent, even if the vaccine is perfectly safe."

Gail's calculation is perfectly correct as far as it goes, but what needs to be stressed is that the result is extremely sensitive to the assumptions one makes and to the numbers one substitutes in the formulas. Furthermore, he has ignored three significant features of the Pittsburgh incident, all clearly indicated in the very first paragraph of Philip M. Boffey's article (News and Comment, 5 Nov. 1976, p. 590): the deaths were sudden, the three individuals were all inoculated within an hour of each other, and all died within 6 hours of being inoculated.

To make the discussion clearer, let us consider a 10-hour working day of a clinic divided into time intervals of duration τ (for example, 1 hour) and denote by $n(\tau)$ the number of patients of the appropriate age group who visit the clinic during one of the designated τ intervals. Let α be the mortality rate (per person per day) of the age group in question, so that $\alpha n(\tau)$ is the expected number of deaths during the day of those (in the appropriate age group) who came to be inoculated during the specified time interval of duration τ. The probability that the number of deaths will be less than three is

$$\{1 + \alpha n(\tau) + \tfrac{1}{2}[\alpha n(\tau)]^2\}e^{-\alpha n(\tau)}$$

which is approximately [for small $\alpha n(\tau)$]

$$1 - [\alpha n(\tau)]^3/6$$

and the probability that three or more deaths will be recorded in one of 1000 clinics on one day in a week is

$$1 - \{1 - [\alpha n(\tau)]^3/6\}^{700\times 10/\tau}$$

Assuming with Gail that 1000 people visit a clinic every day we can set

$$n(\tau) = 100\tau$$

and the desired probability comes out (approximately) to be

$$\tfrac{7}{6}\,\alpha^3 10^9 \tau^2$$

Gail sets $\alpha = 10^{-4}$ and $\tau = 10$, that is, a day is taken to be the basic unit, which yields 11.6 percent. This is larger than the 10.3 percent that Gail gets because the approximation used above is a little too crude in the numerical range he considers.

Since the Pittsburgh inoculations preceding the three deaths were given within an hour, a good case can be made for taking $\tau = 1$, thus decreasing the probability by a factor of 100. Also, Gail's α is an overall death rate which includes lingering causes of death such as cancer. If one focuses on the fact that the deaths in question were sudden, a decrease of α by a factor of 2 seems not unreasonable. Moreover, since the deaths occurred within 6 hours of the visits to the clinic, it seems justifiable to take α to be the death rate per 6 hours, thereby decreasing it by an additional factor of 4, which would reduce the probability by another factor of 512. Hence, we conclude that the chance that the three Pittsburgh deaths occurred by coincidence is about 1 in 500,000, rather than 1 in 10 as Gail concludes.

We are, of course, well aware that by taking $\tau = 1$ we can be accused of using selectively a posteriori information (that is, that the three who died have all been inoculated within an hour). However, by the same token, taking $\tau = 10$ constitutes selective disregard of a given piece of information.

It all boils down to a definition of coincidence, and our calculation shows that the result depends very sensitively on the definition. Our calculation can be looked upon as a simple statistical test of the hypothesis that the batch of vaccine used during the crucial hour was faulty. This justifies the use of hourly intervals as units. All in all we think that, since a reasonable definition could yield a very low estimate of the probability of an accidental coincidence, it would have been only prudent to investigate very carefully the Pittsburgh deaths.

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Labeling Theory

Jane M. Murphy's article, "Psychiatric labeling in cross-cultural perspective," (12 Mar. 1976, p. 1019) severely criticizes the "sociological" or "relativistic" approach to mental disorders. Although the article contains some valid points, the author has ignored crucial evidence which supports the "sociological" approach. Contrary to Murphy's claims, a certain percentage of American patients who have "problems in living" are labeled psychotic. These individuals would not be reliably diagnosed as psychotic in transcultural comparisons. The treatments (for example, hospitalization) which follow from their being labeled psychotic may at times be damaging. The following evidence tends to support these contentions.

1) It should be emphasized that the author's central thesis is correct: the major psychoses (schizophrenia and manic-depressive psychosis) appear to be found universally (*1*). Murphy, however, claims that "sanity appears to be distinguishable from insanity by cues that are very similar to those used in the Western world." This statement implies a universality of signs and symptoms and a reliability of diagnoses which do not exist. Recent cross-national studies of psychiatric diagnosis have demonstrated that the recognition and diagnosis of symp-