

**Figure 5.8. PROBABILITY MODELLING: An Application of the Normal Distribution**EM9029: **The Globe and Mail, March 17, 1990, page A6**

# Experts challenge U.S. report on AIDS forecasting decline

Associated Press and Reuter  
CHICAGO

A study indicates that the number of new AIDS cases each year will decline in the United States, but two federal researchers say the conclusion is flawed.

The study, carried in yesterday's *Journal of the American Medical Association*, says emerging cases will continue to decrease "to a still-to-be-determined but probably low endemic level before the year 2000."

The work of Dennis Bregman and Alexander Langmuir of the University of Southern California was criticized in two editorials in the journal written by researchers for the federal Centers for Disease Control and the National Cancer Institute.

The editor of the journal, Dr. George Lundberg, said yesterday that while it is unusual for the journal to carry two editorials criticizing a study, experts in the field felt the Bregman-Langmuir study warranted consideration.

"Three world-class peer reviewers urged us to publish the Bregman paper," Dr. Lundberg said. "We think there's at least a possibility that this historic approach could be right. Only time will tell!"

The Bregman-Langmuir study used a statistical model called Farr's Law of Epidemics, first used in 1840. The model states that epidemics tend to rise and fall symmetrically in a normal, bell-shaped curve.

Using data from the Atlanta-based CDC, the report says 920 cases of AIDS were reported in 1982, followed by increases in new cases each year until 1987, the last complete year available for statistics, with 19,333 new cases.

Using Farr's Law, they then project 21,978 new cases in 1988, 21,604 in 1989 and 18,363 in 1990. Following the same curve, they say the number of new cases would continue declining, reaching 921 in 1995. By this time, they project that the total number of U.S. cases of the deadly disease will have reached 200,000.

Through January, the CDC has reported 121,645 cases in the United States since AIDS reporting began in 1981. The disease has killed 72,580 of those patients.

Dr. Bregman said the findings suggest a need for re-evaluating AIDS strategy.

"If you continue to focus on the increasing number of cases, then it draws attention away from focusing on the emerging, persistent endemic problem in our community," he said in a telephone interview from Los Angeles.

In Geneva, meanwhile, Dr. Jonathan Mann, who ran the World Health Organization's fight against AIDS, resigned in a dispute with the United Nations agency's chief.

Dr. Mann said he and Hiroshi Nakajima, WHO's Japanese director-general, disagreed strongly on a series of vital issues.

Dr. Mann, an American, had directed the \$109-million-a-year program since its inception in June of 1986. His resignation, which takes effect in June, shocked many.

**REFERENCE:** Bregman, D.J. and A.D. Langmuir: Farr's Law Applied to AIDS Projections. *J. Amer. Med. Assoc.* **263** (#11): 1522-1525, March 16 (1990); see also the two editorials: Gail, M.H. and R. Brookmeyer: Projecting the Incidence of AIDS (pp.1538-1539), and Morgan, M., Curran, J.W. and R.L. Berkelman: The Future Course of AIDS in the United States (pp.1539-1540). Another article on AIDS projections appears on pp. 1497-1501. [DC Library call number: PER R15.A48]

- ① Outline the *use* that is made of the normal model, as described in the article EM9029 reprinted above.
- ② Outline a plausible basis for the *criticism* of the model in the two editorials by the CDC and NCI researchers.
- ③ In the third paragraph of the middle column of the article EM9029, a number of 19,333 new cases of AIDS is mentioned, and three numbers of similar size are then given in the following paragraph. What is a fundamental *difference* between the sources of these numbers?
  - Which of the numbers is likely to be the more accurate? Explain briefly.
- ④ From the information given in the article EM9029, estimate the year in which the normal model would predict the *greatest* number of new cases of AIDS; briefly explain your reasoning.
  - Can you estimate the *standard deviation* of the normal model that Drs. Bregman and Langmuir used? Explain briefly.
- ⑤ In the first paragraph of the *third* column, the article EM9029 gives the total number of cases of AIDS reported in the U.S. and the number of these cases who have died. Comment briefly on whether the number of significant figures used in the article for these numbers is likely to be justified.
  - Is any inaccuracy in the two numbers likely to make them too *high* or too *low*? Explain briefly.
- ⑥ From your knowledge of the spread of infectious diseases, account briefly for the normal' shape of the distribution of the number of new AIDS cases over time; *i.e.*, a low initial number which increases to a maximum and then declines again in a roughly symmetrical manner.

(continued overleaf)

Fourteen years after the publication of the article referenced overleaf, data are available to compare to the 1990 predictions:

	Year								
	1993	1994	1995	1996	1997	1998	1999	2000	2001
Living	173,772	196,452	214,711	237,735	265,464	289,709	312,804	337,017	362,827
Incidence				60,805	49,646	42,832	41,165	40,766	41,311
Deaths	45,850	50,842	51,670	38,296	22,245	18,823	18,249	16,672	15,603

The one-word identifiers in the left-hand column of the table have the following meanings:

- Living:** These numbers do not represent the actual numbers of persons living with AIDS; rather, they are point estimates of the number of persons living with AIDS derived by subtracting the estimated cumulative number of deaths in persons with AIDS from the estimated cumulative number of persons diagnosed with AIDS. Estimated AIDS incidence and estimated deaths are adjusted for reporting delays but *not* for incomplete reporting.
- Incidence:** These numbers do not represent actual cases among persons with AIDS diagnosed; rather, they are point estimates adjusted for reporting delays of AIDS cases and for redistribution of cases initially reported with no identified risk, but *not* for incomplete reporting of cases.
- Deaths:** These numbers do not represent the actual numbers of deaths among persons with AIDS; rather, they are point estimates adjusted for delays in the reporting of deaths and for redistribution of cases initially reported with no identified risk, but *not* for incomplete reporting of deaths.

**REFERENCE:** HIV/AIDS Surveillance Report: U.S. HIV and AIDS cases reported through December 2001. Year-end edition, Vol. 13, No. 2. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, Atlanta, Georgia 30333.

The url is: <http://www.cdc.gov/hiv/stats/haslink.htm>

The data above are from Tables 29, 27 and 33, and the following matters are from the Commentary on pages 5 and 6 of the Report.

- \* AIDS prevalence has increased steadily over time; at the end of December, 2001, an estimated total of 362,827 persons in the United States were living with AIDS; through December, 2001, 807,075 adults/adolescents had been reported as having AIDS and, of these, 462,653 (57%) had died.
- \* Since the use of highly active antiretroviral therapy became widespread during 1996, trends in AIDS incidence have become less reflective of underlying trends in HIV transmission.
- \* In 1996, sharp declines in AIDS incidence occurred for the first time; from 1998 through 1999, declines in AIDS incidence began to level, and essentially no change occurred from 1999 (41,165) through 2001 (41,311).
- \* From 1996 through 1997, the number of deaths among persons with AIDS declined sharply and continued to decline each year through 2001.