

919 This Week in *Science*

Editorial

921 The Epidemiology Issue

Letters

923 Risk from Exposure to Asbestos: J. AROESTY AND K. WOLF; L. BRESLOW, S. BROWN, J. VAN RYZIN ■ The Vinogradov Expedition: Why Did the United States Miss the Boat?: R. K. SOREM ■ Symbiosis: T. W. CULLINEY ■ Basic Energy Research: D. K. STEVENS

News & Comment

927 United States Floats Proposal to Help Prevent Global Ozone Depletion
929 Changing of the Senate Guard
930 Qualified Approval for Binary Chemical Weapons
932 Office of Naval Research Marks 40th Anniversary
933 Elections Bring Some Financial Relief for British Scientists
934 Congress to Investigate Charges That OMB Is Obstructing Data Collection
France to Keep New Research Degree
935 Division, Confusion Found on Campus
Briefing: California Ballot ■ NASA Looks to Ariane ■ Soviet Nuclear Plans

Research News

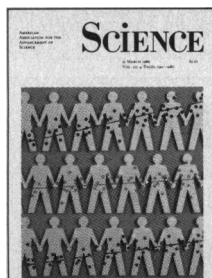
936 Myths and Methods in Ice Age Art
938 Debate About Epilepsy: What Initiates Seizures?
941 Self-Interest in Politics Earns a Nobel Prize

Articles

Frontiers in Biology: Epidemiology

951 New Prospects for Epidemiologic Investigations: R. I. GLASS
955 AIDS in Africa: An Epidemiologic Paradigm: T. C. QUINN, J. M. MANN, J. W. CURRAN, P. PIOT
964 Drug-Resistant *Salmonella* in the United States: An Epidemiologic Perspective: M. L. COHEN AND R. V. TAUXE
970 Epidemiology of Drug Abuse: An Overview: N. J. KOZEL AND E. H. ADAMS
975 Leishmaniasis and Malaria: New Tools for Epidemiologic Analysis: D. F. WIRTH, W. O. ROGERS, R. BARKER, JR., H. DOURADO, L. SUESEBANG, B. ALBUQUERQUE

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COVER Epidemiology, a field concerned with understanding health and disease in humans, focuses on health problems in populations rather than in individual patients. Advances in clinical medicine, laboratory science, statistics, and data handling in our basic understanding of the pathogenesis of disease have enabled epidemiologists to better examine causes of disease and to propose more effective strategies for prevention and control. See page 951. [Cover illustration by Alan Kahan, Washington, D.C.; photography by Donna K. Cantor, Washington, D.C.]

Reports

- 980 Hydrothermal Plume Measurements: A Regional Perspective: E. T. BAKER AND G. J. MASSOTH
- 982 A Common Mechanism of Chromosomal Translocation in T- and B-Cell Neoplasia: L. R. FINGER, R. C. HARVEY, R. C. A. MOORE, L. C. SHOWE, C. M. CROCE
- 985 Long-Term Potentiation in Dentate Gyrus: Induction by Asynchronous Volleys in Separate Afferents: J. WINSON AND D. DAHL
- 988 Expression and Characterization of the *Trans*-Activator of HTLV-III/LAV Virus: C. M. WRIGHT, B. K. FELBER, H. PASKALIS, G. N. PAVLAKIS
- 992 Distribution of Airborne Radon-222 Concentrations in U.S. Homes: A. V. NERO, M. B. SCHWEHR, W. W. NAZAROFF, K. L. REVZAN
- 998 CNS and Hypoderm Regulatory Elements of the *Drosophila melanogaster* Dopa Decarboxylase Gene: S. B. SCHOLNICK, S. J. BRAY, B. A. MORGAN, C. A. MCCORMICK, J. HIRSH
- 1002 From Stimulation to Undulation: A Neuronal Pathway for the Control of Swimming in the Leech: P. D. BRODFUEHRER AND W. O. FRIESEN

Technical Comments

- 1005 Aromatic Interactions: T. BLUNDELL, J. SINGH, J. THORNTON, S. K. BURLEY, G. A. PETSKO
- 1005 Brain "Identifier Sequence": A. V. FURANO; G. P. OWENS, N. CHAUDHARI, W. E. HAHN

Book Reviews

- 1015 Farm Women, reviewed by P. F. BARLETT ■ Ion Channel Reconstitution, C. F. STEVENS ■ Origin of the Moon, D. J. STEVENSON ■ Workshop on Unified String Theories, P. G. O. FREUND ■ Books Received

Products & Materials

- 1018 Video Image Analysis ■ Tabular Grain Black-and-White Film ■ Pulse Controller for Electroporation ■ 159-Megabyte Hard Disk ■ Laser Printer ■ Siliconized Glass Sample Containers ■ Literature

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The Epidemiology Issue

The word "epidemic" conjures up a picture of the Black Death sweeping across Europe in the 14th century. That epidemic is estimated to have reduced the population by a fourth and destroyed economies and village life. Ironically, the disease was so devastating that it also stopped wars, lowered rents, and brought some fluidity to an ossified society. Epidemics in the Middle Ages were often facilitated by unsanitary water conditions, insect or animal vectors, and such human contacts as sneezing and sexual intercourse. Improved sanitation has made it possible to protect water supplies. Knowledge of insect and animal vectors and the use of insecticides have vastly reduced the second major route for spreading disease, and human interchange can be localized in the modern world. Thus the threat of another epidemic like the Black Death seems unlikely. Nevertheless, the ancient dangers still exist in much of the developing world, and new varieties of epidemics occur in the developed world. Epidemics may threaten a smaller fraction of the total population than in the past, but the increased world population today means large numbers of people are affected. This issue of *Science* focuses on some recent problems in widespread diseases and modern techniques for combating old enemies.

In the first article, Roger Glass discusses the basis of the new epidemiology, now defined more broadly to include all the major causes of death. In the traditional way of accounting for leading causes of death in the United States, heart disease and cancer are in first and second place, with practically no other cause in the same quantitative category. However, if one looks only at the causes of premature death ("premature" meaning any death before age 65), the list becomes unintentional injuries, cancer, heart disease, and violence (suicide and homicide), in that order.

AIDS is an epidemic in the classical tradition, affecting only a small fraction of the population at present, but growing steadily. It is already a major health problem, and it clearly figures in the premature death category. In this country its transmission has been identified predominantly with homosexual males and drug users, but Quinn, Mann, Curran, and Piot point out that, in Africa, AIDS is linked predominantly to heterosexual practices. The reasons for the difference are significant and may be important in helping prevent the spread of this quite terrifying disease.

A modern twist on an ancient battle is the emergence of drug-resistant bacteria. As one strategy in the unending warfare between the species, humans abandoned boiled water and developed antibiotic missiles. The bacteria then initiated a strategic defense based on an impenetrable—or almost impenetrable—shield of antibiotic resistance. As described by Cohen and Tauxe, this battle has been complicated by the widespread use of antibiotics in food animals, which has, in turn, led to new strains of *Salmonella* now resistant to the drugs needed to treat human infection.

Drug abuse would not have been considered a disease in ancient times, but the current widespread use and increasing number of innocent victims clearly justify study in epidemiologic terms. Kozel and Adams report that peak marijuana use among high school seniors occurred in 1978 when the perception of risk was low (35 percent saw great risk from regular use). Use in 1985 has declined significantly when the perceived risk has risen to 70 percent. Thus education campaigns can diminish drug abuse.

Classical epidemics exist today in the less wealthy tropical countries. Malaria is endemic—annual acute cases numbering about 100 million—in areas inhabited by 365 million people. Controlling it and the less prevalent leishmaniasis is hampered by difficulties in culturing the organism and laborious diagnoses. Wirth and her co-authors describe the development of DNA probes, which make it possible to diagnose directly from lesion tissue, a great advance.

The evolution of the science of epidemiology is probably no more dramatically illustrated than by comparing the topics in this issue with those that might have been funded by a Disease Control Foundation in the Middle Ages. They would illustrate how far we have come, not only in saving lives, but also in elevating the human spirit because the ravages of the Middle Ages generated mysticism, xenophobia, and prejudice. We have our problems today, but at least we are not burning witches to stop the spread of disease.

—DANIEL E. KOSHLAND, JR.