

## Hopelessness tied to heart, cancer deaths

Bleak expectations about oneself and the future bode ill for physical health, a new study finds. Men who cite an abiding sense of such hopelessness die at higher than average rates from heart disease, cancer, and other causes, assert Susan A. Everson, an epidemiologist at the Western Consortium for Public Health in Berkeley, Calif., and her colleagues.

Hopelessness also exhibits a strong statistical link to the emergence of new cases of heart disease and cancer. Moreover, the link holds up regardless of the presence of other major risk factors for disease and death, including depression, cigarette smoking, high blood pressure, frequent alcohol use, and lack of social support, Everson's group argues.

"We were astonished by these findings," remarks epidemiologist George A. Kaplan of the California Department of Health Services in Berkeley, a coauthor of the report. "It looks like people who experience a pervasive sense of hopelessness are at increased risk for a variety of serious health problems and require careful medical surveillance."

The findings contradict the widespread notion that hopelessness represents an extreme form of depression, writes C. David Jenkins, a psychologist at the University of North Carolina at Chapel Hill School of Medicine, in an accompanying comment. In the new study, hopelessness incurred different, more serious types of damage than depression did, he states.

The study consisted of 2,428 men age 42 to 60 living in Finland and participating in an ongoing study of psychological contributions to cardiovascular disease. Volunteers' hopelessness was ranked according to the extent to which they agreed or disagreed with the statements "It is impossible to reach the goals I would like to strive for" and "The future seems to me to be hopeless, and I can't

believe that things are changing for the better."

Over the next 4 to 10 years, a Finnish national registry recorded 174 deaths in the study sample. Half the deaths were caused by cardiovascular disease; most of the rest resulted from cancer, violence, or injury. The registry also noted 73 new cancer cases and 95 first-time heart attacks.

Men reporting moderate to high hopelessness died from all recorded causes at two to three times the rate of those reporting low or no hopelessness; the former group also developed cancer and heart attacks more frequently, Everson's group reports in the March-April *PSYCHOSOMATIC MEDICINE*. The team plans further research to distinguish among the types of cancer, Kaplan says.

Among men in good physical health at the study's start, those scoring high on the hopelessness questions displayed five times the overall death rates of those in the other hopelessness rankings, the researchers report. In contrast, among those with heart disease or other health problems, even moderate levels of hopelessness boosted the likelihood of dying.

Physiological effects of prolonged hopelessness that contribute to physical disease remain poorly understood, Kaplan contends. Hopeless men may experience surges of stress hormones, which can undermine the heart or other internal organs, or they may undergo immune changes leading to cancer, the Berkeley researcher theorizes.

Over the course of the study, he adds, hopeless men may have increased their cigarette smoking or otherwise endangered their health.

Much previous research indicates that optimism in the face of losses and failures promotes mental and physical health, whereas pessimism does the reverse, notes Michael F. Scheier, a psychologist at Carnegie Mellon University in Pittsburgh. — *B. Bower*

## More B vitamin benefits

Because ordinary diets often fail to provide a pregnant woman with enough folate—a B vitamin that aids cell growth—to prevent her fetus from developing potentially devastating neural tube defects (SN: 3/30/96, p. 198), obstetricians usually prescribe folate-rich supplements. Now, researchers have uncovered another benefit of extra folate: reduced risk of premature birth, the leading cause of death among black newborns in the United States.

Theresa O. Scholl of the University of Medicine and Dentistry of New Jersey in Camden and her colleagues followed

832 pregnant inner-city women, 60 to 65 percent of them black. Women consuming 60 percent or less of the recommended daily allowance of folate 28 weeks into pregnancy had twice as many preterm and low-birthweight babies as women getting the full 400 micrograms daily, Scholl's team reports in the April *AMERICAN JOURNAL OF CLINICAL NUTRITION*.

Conducted in one of the nation's poorest communities, this study suggests that fortifying inadequate diets with vitamins "could make a big difference," Scholl says. However, she adds, "you can buy candy and chewing gum with food stamps, but you aren't allowed to buy vitamins." — *J. Raloff*

## Ancient metal mines sullied global skies

As Socrates took in the latest tragedy at his local theater, little did he realize that Athenian smelters were sending showers of fine metallic dust into the sky. Yet deep ice drilled from Greenland now provides clear evidence that a variety of heavy metals polluted the global atmosphere during ancient times—and in quantities far larger than expected.

Sungmin Hong of Domaine University in Saint Martin d'Hères, France, and his colleagues measured the copper concentrations in ice that dates back through the last 7,000 years to the beginning of the Bronze Age. As the Greenland glacial cap builds up year by year, each layer, like a ring of a tree, retains a chemical signature of the precipitation and dust that settle out of the atmosphere.

Unmistakable signs of copper emissions from smelting started showing up in Greenland around 2,500 years ago, during the Golden Age of Greece, the researchers report in the April 12 *SCIENCE*. Copper concentrations in the ice rose during the heyday of the Roman Empire, dropped during the Middle Ages, and then climbed again with the start of the Industrial Revolution.

The researchers also compiled records of copper mining and smelting around Europe and Asia to estimate how emissions into the atmosphere changed with time. These data dovetail with the measurements made in Greenland, they report.

Although most people consider air pollution an invention of modern society, the new results "provide strong evidence that pollution was a global problem even in ancient times," comments Jerome O. Nriagu, an environmental geochemist at the University of Michigan in Ann Arbor.

In previous studies, Hong and his colleague Claude F. Boutron, as well as another team, had documented lead pollution reaching Greenland and northern Europe during Greek and Roman times (SN: 3/26/94, p. 198). But the copper results indicate that many by-products of smelting were wafting across the Northern Hemisphere and perhaps the globe.

In a preliminary analysis of Antarctic ice, Todd Hinkley of the U.S. Geological Survey in Denver and his colleagues found hints of air pollution from smelting going back as far as 4,000 years. Because Greenland lies closer to the location of these early societies, he suspects that Arctic ice will show clearer signs of the first widespread industrial activities.

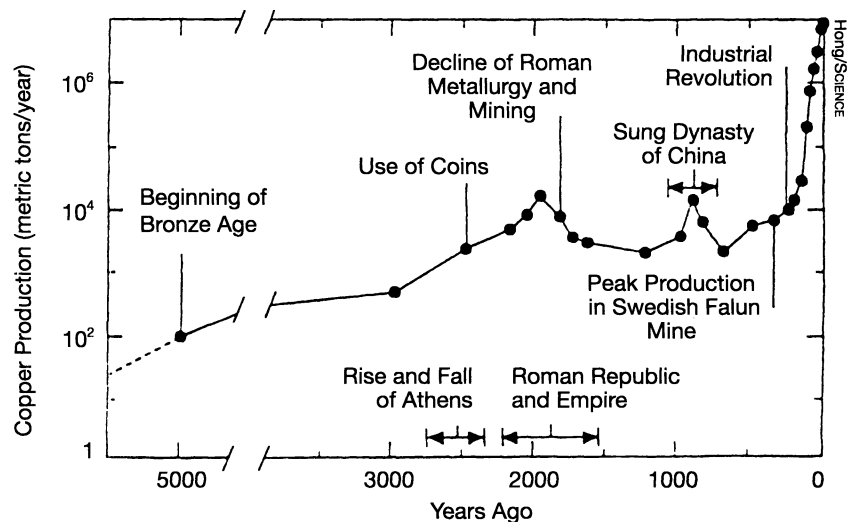
The health effects of these pollutants remain unclear. During Roman times,

officials banned mining near some cities in Italy, perhaps because of the noxious vapors from smelting, which some Roman writers mentioned, says Nriagu. As a result of inefficient techniques, early metallurgy emitted by-products in much higher concentrations than did practices adopted in the 19th century.

Analysis of glacial ice can provide unique insight into how much metal the ancient world used, says Boutron. "Archaeologists have a lot of problems being quantitative for this early period. Here is a new, promising way to get quantitative data for archaeologists."

— R. Monastersky

*Fluctuations in copper production, estimated from archaeological sources.*



## Hint of supersymmetry in proton collision

When a proton meets an antiproton head-on in a high-energy collision, the crash can generate a variety of particles. Of the millions of such interactions observed at the Fermi National Accelerator Laboratory's Tevatron collider near Batavia, Ill., one event stands out because it doesn't fit the standard theory describing the fundamental particles and forces of nature.

This intriguing collision produced two electrons, two gamma-ray photons, and little else that could be detected. The four scattered particles carried away a large amount of energy at right angles to the proton beams, yet scientists have been unable to account for much of the energy that went into the collision.

To some theorists, this observation constitutes the first tantalizing hint in collider data that a so-called supersymmetry theory may provide a more complete, unified picture of nature than the widely accepted, but incomplete, standard model of particle physics.

"You don't usually get events like this," says Gordon L. Kane of the University of Michigan in Ann Arbor. "To me, it's very exciting because it's what I would expect from supersymmetry."

"It's just one event, and it may never happen again, but it fits very well with a supersymmetric explanation," says Michael Dine of the University of California, Santa Cruz.

Dine and his coworkers and Kane and his group offer alternative supersymmetrical explanations of this event in two reports accepted for publication in *PHYSICAL REVIEW LETTERS*.

According to the standard model of particle physics, there are two kinds of fundamental particles in nature: force-carrying particles called bosons, which include photons, and matter particles called fermions, which include quarks and electrons (SN: 7/1/95, p. 10). These particles all have antimatter counterparts.

Supersymmetry theory represents an extension of the standard model that brings these two types of particles and antiparticles into one framework. It posits that all known fermions have boson partners and that all bosons have fermion partners. For example, scientists call the electron's hypothetical partner a selectron and the photon's partner a photino. The partners are thought to be so heavy that they would be created only infrequently, if at all, at the energies provided by today's colliders.

Researchers have been studying various types of supersymmetry theories for more than a decade, working out what sorts of events might serve as evidence for the existence of these heavy partners.

For the one distinctive event observed at the Collider Detector at Fermilab (CDF), Kane and his coworkers offer a scenario in which the collision directly created two selectrons, each with a mass

between 80 and 130 gigaelectronvolts. These exotic particles, in turn, would have transformed themselves, via a series of intermediate products, including a photino, into the electrons and photons actually detected and perhaps some other particles.

Dine and his colleagues have been investigating an alternative formulation of supersymmetry theory. In this scenario, particles other than selectrons would have appeared in the CDF event.

If either of these assessments is correct, there might be analogous events not yet recognized in the CDF data now available. Experiments scheduled at the upgraded Large Electron-Positron (LEP) collider at the European Laboratory for Particle Physics near Geneva may provide additional evidence.

"If this is right, there's a good chance that some more [supersymmetrical events] will show up this summer at LEP when they start taking data again," Kane says. "That will be exciting to watch."

— I. Peterson

## Stress undercuts flu shots

The strain of looking after a loved one with a protracted, debilitating illness can impair an elderly caregiver's immunity, a new study indicates.

John Sheridan of the Ohio State University College of Dentistry in Columbus administered flu shots to 64 elderly men and women. Half had been caring for a spouse with Alzheimer's disease or some other form of progressive dementia for about 7 years.

"When you vaccinate somebody, you generally want to see a fourfold increase in the antibodies they have," Sheridan notes. But only about 37 percent of the caregivers mounted such a defense against flu viruses—roughly half the rate seen in the other participants. Several other measures of cellular and antibody-based immunity appeared to be

similarly compromised, he and his colleagues report in the April 2 *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*.

This is the first study to demonstrate significant stress-induced reductions in the apparent efficacy of an important vaccine among the elderly, he says.

"If you're a caregiver and chronically stressed, make sure you get the vaccine every year," he recommends, because marginal responses to the vaccine often improve in succeeding years.

Outside pursuits and friends also help, adds psychologist Janice K. Kiecolt-Glaser of the Ohio State University College of Medicine in Columbus, who led the study. "We know from earlier work in our lab that caregivers who appear to fare best psychologically and immunologically are those who report greater social support and more satisfying social relationships." — J. Raloff