dinosaur skull into a CT scanner and all will be revealed," Witmer says. "It's not that simple." If a fossil is very dense or large, for example, x-rays have trouble passing through it and the signal may be quite noisy. The type of matrix matters, too; a calcium-rich bone encased in calcium carbonate–rich sediment may appear as nothing more than hazy shadows. As a result, trading the preparator's dental pick for the image processor's computer mouse may not mean a decrease in workload. Horner has spent years trying to decipher fuzzy images and decide where to draw boundaries between rock and bone.

Once the bone is located, the most challenging work has just begun. Witmer points out that physicians need years of training to read x-rays of human anatomy. Interpreting scans of extinct animals is far more difficult, especially if the specimens have been damaged after death or during fossilization.

All this means that interpreting CT images demands a tremendous amount of time. "You can make many images in an afternoon. Actually working on the images takes forever," notes Spoor, who uses CT scans to study details of hominid ear bones. "Ultimately, it will remain quite a specialized operation."

That's likely to remain true even as computers grow faster and software for image processing and data analysis ever more sophisticated. In the end, "it's not going to be the technology that provides the insight," Witmer cautions. "It comes down to humans who can understand the complicated and voluminous information that comes out of the scanner." –ERIK STOKSTAD

SOCIAL SCIENCE

Stress: The Invisible Hand in Eastern Europe's Death Rates

The end of communism opened up a life of economic uncertainty in the Eastern Bloc. And that, say scientists, may be exerting a deadly effect on residents

BUDAPEST—Soon after the former Eastern Bloc nations tossed off communist rule in the late 1980s and the Soviet Union imploded, people throughout Eastern Europe began dying in droves. Life expectancy plummeted. By 1994, for example, reaching the age of 57 was enough to put Russian men on the right side of the Bell curve. Even more frightening are the demographics: The groups experiencing the highest rates of premature death are young and middle-aged men. Traditional risk factors such as bad diet, smoking, excessive alcohol consumption, and infectious diseases all claim a share of the rising mortality in this part of the world, but they can't explain the growing disparity in life expectancy between East and West, researchers say. So what could be preying on a generation that should be in prime health?

On one level, the main culprit is clear: coronary heart disease. "What's killing them is diseases of the heart," says Gerdi Weidner, a psychologist at the State University of New York, Stony Brook. But Weidner's diagnosis—offered to a select group of 40 scientists from a range of disciplines at a NATO workshop convened here from 21 to 23 May to discuss Eastern Europe's epidemic of heart disease—wasn't based on physical symptoms alone. She and other presenters made the case that many Eastern Europeans may be dying from broken hearts. "The key words are 'giving up,' " says conference co-director Maria Kopp, a behavioral scientist at Semmelweis University in Budapest. When Eastern Europeans gained their freedom more than a decade ago, Kopp says, "people had very high expectations" that their lives would improve. For many, those hopes were dashed quickly by the bumpy transition to a market economy. Disillusionment led to stress and depression. And depression was a harbinger of death.

For gene jocks, that may be hard to swallow. "That social change can affect health is a fairly novel idea to a lot of biomedical scientists," says demographer Virginia Cain of the Office of Behavioral and Social Sciences Research at the U.S. National Institutes of Health (NIH). But for social scientists the hypothesis is in vogue. For instance, the European Science Foundation has just launched a 4-year project involving some 50 scientists to probe the link between psychology and mortality in Eastern Europe. Such a major research effort makes sense, says Cain: "The change to market economies provides a natural experiment to look at the impact of rapid social change on health."

Life Expectancy at Birth (in years) 1995–2000

	Women	Men	Difference
Russia	72.8	60.6	12.2
Estonia	74.5	63.0	11.5
Hungary	74.9	66.8	8.1
France	82.0	74.2	7.8
Germany	80.2	73.9	6.3
USA	80.1	73.4	6.7
Canada	81.8	76.1	5.7
Sweden	80.8	76.3	4.5
Cuba	78.0	74.2	3.8

Gender gap. In many Eastern European countries, a chasm in life expectancy has opened up between men and women.

SOURCE: WORLD POPULATION PROSPECTS: THE 1998 REVISION. UNITED NATIONS, 1999

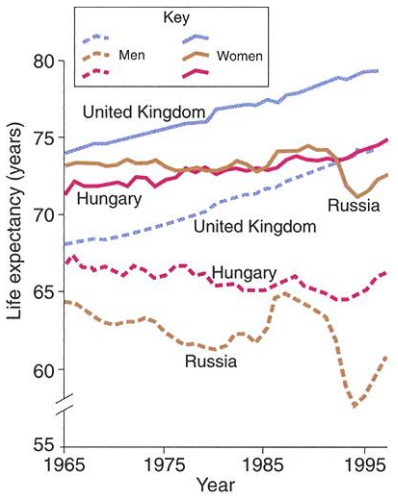
Death behind the Iron Curtain. A gap in life expectancy between Eastern and Western Europe opened up more than half a century ago in the aftermath of World War II. "In Eastern Europe, you had a disastrous transition from one type of mortality to another, from infectious diseases to noncommunicable diseases," explains epidemiologist Martin Bobak of University College, London. Life expectancy stagnated in Eastern Europe until the late 1980s, apart from an uptick in the Soviet Union around 1985 in the wake of Mikhail Gorbachev's short-lived antialcohol campaign, says Vladimir Shkolnikov of the Center for Demography and Human Ecology in Moscow. In the meantime, Westerners, eating better and exercising more, were living longer with each passing year.

In 1989, Poland, Hungary, and Czechoslovakia all overthrew their oppressive communist regimes, and other Eastern European countries began following suit. Euphoria, however, soon gave way to uncertainty. People were in control of their own lives, but life was like walking a tightrope with no social safety net. Death rates skyrocketed and life expectancy plummeted, bottoming out about 6 years ago depending on the country. "The crisis goes along with the relative success of the transition to a capitalistic society," says Clyde Hertzman, an epidemiologist at the University of British Columbia in Canada. "Countries like Russia are relative basket cases."

Researchers seeking to unravel this trend discovered a multitude of causes. Smoking was the culprit in some countries, while poor diets—a lack of fruits and vegetables—led the way in others. Studies showed that the region's health care systems, while frayed, are not to blame for the life-expectancy gap, says Margareta Kristenson of Linköping Universi-

ty in Sweden. Nor is pollution the answer: Industrial emissions fell sharply in the late 1980s and early 1990s as state-controlled factories floundered.

The Baltic blues. Some of the most telling studies have compared the former Soviet countries of Estonia and Lithuania with Sweden, across the Baltic Sea. Margus Viigimaa of Tartu University Hospital in Estonia and his colleagues, for instance, sought to understand why Estonians are on average three times more likely than Swedes to die of coronary heart disease. They examined 274 Estonian and 271 Swedish men and women, aged either 35 or 55, and had them fill out questionnaires. Diet didn't appear to be the key to the puzzle: The researchers found almost no difference between the groups in total cholesterol and triglycerides or body fat, although the Estonians generally had lower levels of "good" cholesterol, high density lipoprotein.



East-West gap. While average life-spans of Westerners have risen steadily, Eastern European life expectancy has generally stagnated or declined.

The big behavioral difference, they concluded, was smoking habits. Half the Estonian men aged 35, for example, were smokers, more than three times as many as in Sweden. (To tackle this scourge, the Estonian government in 1998 instituted a total ban on tobacco advertising—the only Eastern European country so far to do so.) But even this striking difference could not explain the sharp disparity in heart disease rates, so the researchers had to look elsewhere for clues. What they have found, Viigimaa says, is that "psychosocial stress is very important."

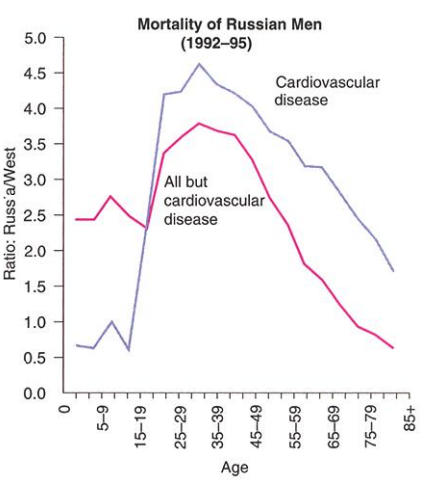
Following this up, psychophysiologist Sarah Knox of the NIH's National Heart, Lung, and Blood Institute in Bethesda, Maryland, and her Swedish colleagues found that in general, the Swedes reported feeling more self-confident, more in control of their lives, less depressed, and enjoying a higher quality of life than their Estonian counterparts. And they found some corroborating physiological evidence. After accounting for confounding variables from diet to health care, Knox told the meeting, the younger set of Estonian women in the group Viigimaa studied—the 35-year-olds—who report feeling "less valued" tended to have higher heart rates. A chronically elevated pulse increases the risk of damage to the endothelium of blood vessels, Knox says. And such injury is the first step toward atherosclerotic lesion formation, she says.

A similar study comparing Swedish and Lithuanian men points to psychosocial stress as a contributor to the fourfold higher heart disease risk in Lithuania. A group led by Kristenson and Zita Kucinskienë of Vilnius University found that Lithuanians in Vilnius, by their own measure, feel less in control and more exhausted and depressed than Swedes in Linköping. Kristenson's group devised a lab stress test in which subjects were asked to recall a disturbing event. The Swedes, they found, had a stronger biological reaction to the stress: Blood levels of two steroid hormones—cortisol and prolactin—shot up during 6 minutes of brooding. The Lithuanians, meanwhile, had higher baseline levels of the stress hormones and showed an attenuated response—suggesting that their bodies are perpetually stressed. "When you're chronically stressed, you're more likely to give up on life," suggests Kristenson.

That jibes with recent findings tying psychosocial stress to coronary heart disease in Western Europe and the United States. Two years ago, for example, the Whitehall II study reported that British civil servants in low-level jobs who claimed to work hard with little reward were twice as likely to develop coronary heart disease as were higher ranking civil servants with more job satisfaction. (Both groups of civil servants had similar biomedical profiles, suggesting that diet, at least, did not account for the difference in heart disease rate.) And a study published in the 8 May issue of the *Archives of Internal Medicine* links depression to elevated risk of heart disease. After analyzing data on 7893 men and women enrolled in a major U.S. nutrition study, a group led by Amy Ferketich of Ohio State University School of Public Health in Columbus reported that people rated as depressed were 70% more likely than nondepressed individuals to develop coronary heart disease.

Like losing a loved one? One researcher at the meeting compared the stress felt by Eastern European men to the loss of a spouse. Many studies have shown that widowers are more likely to die soon after the loss of their wives than are widows, says psychologist Camille Wortman of the State University of New York, Stony Brook, and widowers aged 25 to 64 are most vulnerable to an early death—from suicide, alcohol-related illness, accidents, or heart disease. Men tend to cope more poorly than women with the sudden loss of a spouse, she says, and "it's always the young men who are most at risk." A similar pattern shows up in Eastern Europe, points out Wortman, who suggests that there's something "toxic" about a strong violation of expectations. Other meeting participants said they are impressed with this apparent connection and intend to pursue it. "This bereavement, this giving up, seems to be the most important thing," says Kopp.

Researchers are now struggling to help people at risk, particularly young men, whom Hertzman calls "socially sensitive canaries." Eastern European scientists need to persuade their governments to make health a top priority: "We need to convince the parties that this is not an issue for political debate," says epidemiologist Peter Jozan of Hungary's Central Statistical Office. But it won't be easy to help residents regain a sense of control over their destiny. "You can't just tell a 15-year-old girl who's overweight and hates herself and thinks nobody loves her that she should give up smoking and lose weight," says Kristenson. "You need to make life worth living."



Generation gap. Young Russian men—especially those in their 30s—are much more likely to die than young Western men.

If these analyses are correct, the key to improving life expectancy in Eastern Europe lies with the region's economy. "Now that the free-for-all is over," says Hertzman about the shift from a command to a market-driven economy, "it's time for recovery."

–RICHARD STONE