University of Massachusetts Medical School in Worcester.

Copeland and his coworkers analyzed data from a study of 1,420 children living in 11 predominantly rural counties of North Carolina. Initial psychiatric assessments of the youngsters, based on home interviews with each child and his or her parents, occurred at age 9, 11, or 13. Annual follow-up interviews were conducted through age 16. The researchers consulted court records to identify any criminal offenses committed by each volunteer between ages 16 and 21.

Nearly one-third of the participants committed one or more crimes in young adulthood. These acts included minor offenses, such as shoplifting; moderate offenses, such as drug-related crimes; and serious offenses, such as sexual assault and armed robbery.

Overall, 51 percent of male offenders and 44 percent of female offenders had one or more childhood psychiatric disorders.

Childhood delinquency exerted no special influence on the tendency to break laws as an adult. Youths who had a criminal record in addition to a mental disorder committed no more offenses as adults than did those who had a mental disorder but no juvenile criminal record.

Combinations of childhood emotional and behavioral disorders showed a particularly strong relationship to serious forms of adult lawbreaking. For instance, 13 percent of depressed children who also abused drugs committed serious offenses as young adults.

Mental-health treatment targeted at such children may reduce crime rates, the researchers suggest. Fewer than half of children with multiple psychiatric disorders receive any mental-health care.

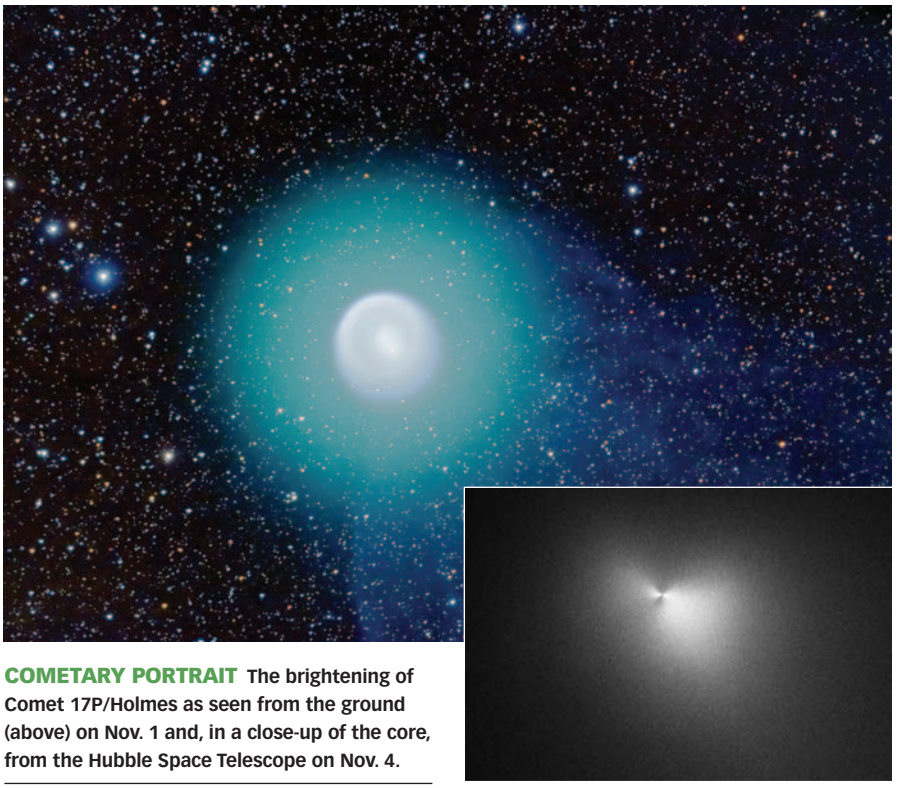
Copeland's team cautions that childhood mental disorders are only one of many influences on criminal behavior. More than half of the study participants who committed crimes as young adults displayed no psychiatric problems as children. And most participants with a childhood mental disorder did not get arrested as young adults. —B. BOWER

Flare-Up

Comet Holmes' surprise bloom

In less than 24 hours, a small, faint comet became 400,000 times brighter late last month, blossoming into a fuzzy, starlike apparition visible to the naked eye. Now, 3 weeks after its spectacular flare-up, Comet 17P/Holmes remains visible to the naked eye in the constellation Perseus, which stands nearly overhead from the United States soon after midnight.

Many comets brighten as they near the sun. Heat vaporizes volatile ices on a comet's surface, throwing out fine, highly reflective dust particles in the process. But Holmes, which has a 6.88-year orbit, never gets any closer to the sun than twice Earth's distance. Even more puzzling, the brightening took place about 5 months after the comet's closest approach.



COMETARY PORTRAIT The brightening of Comet 17P/Holmes as seen from the ground (above) on Nov. 1 and, in a close-up of the core, from the Hubble Space Telescope on Nov. 4.

A. DYER; WEAVER ET AL., NASA, ESA

The rapid brightening suggests that a layer of material lifted off the comet and disintegrated, says Zdenek Sekanina of NASA's Jet Propulsion Laboratory in Pasadena, Calif. The resulting dusty halo may be "microscopic dust grains originating from the cataclysmic breakup of the jettisoned layer," he notes in the Nov. 3 circular of the International Astronomical Union.

The entire nucleus of the comet may consist of many such fragile, stacked layers, cemented by ice, Sekanina speculates. In support of his model, he cites observations by ground-based telescopes of parallel streaks of material at some distance from the comet's nucleus. The streaks could be dust trails left behind by a disintegrating layer, he suggests.

The 5-month delay between the comet's closest approach and the outburst may represent the time required for the outer layer to soak up solar heat and transmit it to an underlying region of ice, Sekanina says. Only when the ice explosively vaporizes does the outer layer fly off.

An English astronomer discovered the comet in the fall of 1892, when it had undergone a similar sudden brightening about 5 months after its closest approach to the sun. About 2.5 months later, in January 1893, Holmes had an additional outburst. It then remained quiet until recently. For decades, the comet was so faint that astronomers lost track of it between 1906 and 1964.

Could the newly brightened Holmes, now fading, get a second wind this January, as it did 114 years ago?

Brian Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., thinks the 1892–1893 events and the current outburst may be linked. One possibility is that some debris from the older set of outbursts fell back onto the comet, choking off activity for more than a century. Last month, internal pressure from vaporizing ice might have finally become strong enough to eject the fallen debris, says Hal Weaver of Johns Hopkins Applied Physics Laboratory in Laurel, Md.

Recent images of Holmes from the Hubble Space Telescope show three spurs of dust emanating from the nucleus on Oct. 29. An Oct. 31 observation indicates that the comet had another, much tinier, outburst of dust on Oct. 30, notes Weaver. —R. COWEN

Bone Builder

Drug may offer steroid users new protection against fractures

In the half-century since their introduction to medicine, glucocorticoid steroids have been hailed as wonder drugs that have enabled millions of people to combat rheumatoid arthritis, severe asthma, autoimmune diseases, and organ-transplant complications. But the drugs have some seri-

ous risks, notably the bone-loss disease osteoporosis. The steroids hamper—and may even kill—bone-building cells.

To stop bone loss, many people take drugs that preserve existing bone, but a newer drug, teriparatide (Forteo), activates bone-building cells instead. A new study finds that boosting bone growth may be the more effective choice for longtime steroid users who have developed osteoporosis.

Scientists enlisted 428 people who had steroid-induced osteoporosis and randomly assigned half to receive teriparatide. The others got alendronate (Fosamax), a drug that preserves bone mass. Average ages in the two groups were 56 and 57, respectively. The Food and Drug Administration (FDA) has approved both drugs for osteoporosis but has not cleared teriparatide for steroid-induced bone loss.

After 18 months, 150 patients had maintained their teriparatide treatment and 144 had completed their alendronate treatment. During the study, 1 person on teriparatide and 10 on alendronate had vertebral fractures. Moreover, patients getting teriparatide had increases in hip and vertebral bone density that were significantly greater than such gains in people getting alendronate, the researchers report in the Nov. 15 *New England Journal of Medicine*.

"For steroid-induced osteoporosis, teriparatide appears to be a better drug," says Robert Adler, an endocrinologist at Virginia Commonwealth University and the McGuire Veterans Affairs Medical Center in Richmond, who contributed data to the study.

QUOTE

"This is exactly the kind of information that the FDA requires."
MICHAEL R. McCLUNG, Oregon Osteoporosis Center

At the cellular level, the findings suggest that teriparatide is blocking the biological mechanism by which steroids thwart bone formation and lead to fractures, says study coauthor Kenneth G. Saag, a physician and epidemiologist at the University of Alabama at Birmingham.

In postmenopausal women, osteoporosis develops gradually over several years, but in people taking steroids, it can appear after as little as 3 months, Adler says.

"Many of us believed that [teriparatide] would be a better treatment, but we didn't have the evidence to support that," says Michael R. McClung, an endocrinologist at the Oregon Osteoporosis Center in Portland.

Eli Lilly, the company that makes teriparatide, funded the new research. In 2002, the FDA approved the drug for limited use in postmenopausal women at high risk of fracture. Earlier studies in rats had linked teriparatide with a rare bone cancer, but no signs of that have shown up in people using it. Even so, the drug comes with a "black box" warning on its label noting this potential risk. As part of the regulatory-approval agreement, Lilly agreed to fund a long-term study monitoring patients for signs of the bone cancer.

On the basis of the new study of steroid users, McClung expects regulatory approval of teriparatide for patients who use steroids regularly. "This is exactly the kind of information that the FDA requires" in sanctioning a new use for a drug, he says.

It would seem tempting to combine the two drugs, so that one could build bone while the other preserves it. However, earlier tests suggested that bone preservers blunt the bone-growth effects of teriparatide, McClung says. —N. SEPPA

Flawed Stem Cells Yield Fragile X Clues

Researchers study genetic disorder via discarded embryos

Scrutinizing the first days of development in abnormal embryonic stem cells, researchers have uncovered a basic mechanism underlying fragile X syndrome, the most common inherited cause of mental retardation in boys.

"It could have important implications for treatment," says W. Ted Brown, cochair of the scientific committee of the National Fragile X Foundation, which helped fund the work.

The research also highlights the value of embryonic stem cells for studying genetic diseases, says Yang Xu, a stem cell researcher at the University of California, San Diego.

Fragile X syndrome is caused by a mutation in a gene called *fmr1*. By stopping the gene from making its protein, the mutation leads to learning disabilities, elongated facial features, speech and language difficulties, emotional problems, and other symptoms. In boys, who have only one copy of the X chromosome, a single bad *fmr1* gene inherited from either parent induces the disorder. Fragile X syndrome more rarely affects girls, who have two X chromosomes.

While researchers have long known that the fragile X mutation shuts down the gene, they were unsure how or at what developmental stage the disruption occurs. To study the shutdown, Nissim Benvenisty and his colleagues at the Hebrew University in Jerusalem created three embryonic stem cell lines carrying the mutation.

The cells came from embryos donated by couples with a family history of fragile X syndrome who visited an Israeli in vitro fertilization (IVF) clinic. Many IVF clinics now offer preimplantation genetic diagnosis (PGD), which identifies genetically flawed embryos.

To do a PGD, technicians pluck one cell out of a 3-day-old, eight-cell embryo. Tests then reveal whether the cell—and hence the embryo—carries specific mutations. If it does, the embryo normally is "discarded immediately," says Benvenisty. But his team instead received consent from the couples to study any embryos carrying the fragile X mutation. The team grew several such embryos for about 5 days—to a stage called a blastocyst—and then teased stem cells out of the structure's inner wall.

Despite carrying the fragile X mutation, the embryonic cells unexpectedly produced the fmr1 protein. "We were extremely surprised," says Benvenisty. But when the team prodded the cells to begin developing into a range of tissues, the gene promptly shut down. "The [mutation] itself is not sufficient for the gene silencing," says Benvenisty. "Something happens during development."

Delving further, the team determined that changes in the gene's wrapper, a structure called chromatin, switched off the gene. Those changes occur only after cells grow out of their embryonic state, presenting a window of opportunity for drug therapy, says Benvenisty. In addition, chromatin is easier to modify than the gene itself. His team is now screening drugs that might prevent the gene silencing by fixing the chromatin.

Other teams have created stem cells from embryos carrying genetic diseases, but Xu says that this is the first time the method has yielded a fundamental disease discovery. The study appears in the November *Cell Stem Cell*. —B. VASTAG