"Data Revised on Soot in Air and Deaths"

by Andrew C. Revkin, *New York Times*, June 5, 2002, p. A23.

"Software Glitch Threw Off Mortality Estimates"

by Jocelyn Kaiser, *Science* (Vol. 296 No. 5575), June 14, 2002, p. 1945.

The Health Effects Institute (HEI), established in 1980, is jointly funded by the Environmental Protection Agency (EPA) and industrial groups. Its mission is to monitor the health effects of motor vehicle and industrial emissions. Under the 1970 Clear Air Act, the EPA has developed regulations concerning acceptable levels of particulate matter in the air. So-called "fine particles" are considered particularly dangerous because they can easily enter the lungs. More information about particulate matter and the regulations can be found online from the EPA's Office of Air Quality.

The present article concerns studies conducted between 1987 and 1994. Time-series data for 90 US cities showed a link between daily changes in fine particle concentration and fluctuations in mortality rates. The original analysis, which appeared in major medical journals, estimated that an increase of 10 micrograms of soot per cubic meter of air was associated with 0.4% increase in mortality. However, a recent reanalysis of the data by researchers at Johns Hopkins University has now cut this estimate in half. A summary of the new findings is available online (the team also maintains extensive research links). It turns out that the error in the original analyses resulted from using the generalized additive models (GAMs) procedures in the statistical software package S-plus (the default convergence settings there were not appropriate). As explained on the summary page, the error changes the mortality numbers but not the principal conclusions, which were:

1. There is strong evidence of an association between acute exposure to particulate air pollution
(PM10) and daily mortality, one day later;

2. this association is strongest for respiratory and cardiovascular causes of death;

3. this association can not be attributed to other pollutants including NO2, CO, SO2 or O3 [nor] to weather.

The Times article concludes with a quote from the Bush Administration's overseer for regulatory effectiveness, who said the errors would "reduce significantly some benefit estimates for reducing fine particle pollution, even though they do not call into question any of the key cause and effect relationships between pollution and premature death."

"'G' Names in Jury Pool Win Suspect a New Trial"

Miami Herald, June 7, 2002

"Letter Perfect: New Jury Finds Ex-Convict Not Guilty"

Miami Herald, July 12, 2002.

Roderick Carter was being tried on federal gun charges in Miami. Because he had a prior felony conviction, he was facing a severe sentence. But his lawyer, David Markus, argued for a new trial on the grounds that his client had been denied the right to a jury of his peers. Carter is black, and Markus maintained that Hispanics were overrepresented in the jury pool.

The jury had been selected by working alphabetically through the list of candidates. For Carter's trial, 21 of the 38 names in the jury pool started with 'G', and 14 of those were Hispanic. By contrast, there were only six blacks in the pool. The Miami Herald says that Markus "didn't use any sophisticated statistical analysis to bolster his point, just the phone book." In fact, the article reports that just five surnames--Garcia, Gomez, Gonzalez, Guerra and Gutierrez--account for more than half of the Miami residential listings under 'G'.

Whether or not Markus is a statistical expert, he appears to have a literary flair. He cited Shakespeare's Richard III in his argument. In this play, Richard, the youngest brother of King Edward, plots to gain the throne for himself. He arranges to have charges of treason brought against another brother, George (the Duke of Clarence)--whose name starts with G. Here is an excerpt from the opening soliloquy:

Plots have I laid, inductions dangerous,
By drunken prophecies, libels, and dreams,
To set my brother Clarence and the king
In deadly hate the one against the other;
And if King Edward be as true and just
As I am subtle, false, and treacherous,
This day should Clarence closely be mewed up
About a prophecy which says that G
Of Edward's heirs the murderer shall be.

The jury selection procedure was presumably less nefarious than this, but Markus' argument won Carter
a new trial. As the second article reports, the second trial resulted in an acquittal.

"Experts Strive to Put Diseases in Proper Perspective"

by Gina Kolata, New York Times, July 2, 2002, p. D5.

"Citing Risks, U.S. Will Halt Study of Drugs for Hormones"

by Gina Kolata, New York Times, July 9, 2002, p. A1.

The first article discusses need for better ways to present statistical information to the public. The frequently cited "one in eight lifetime risk" figure for breast cancer is given as a prime example of how medical statistics can be hard to interpret. The article covers issues such as relative risk versus absolute risk and probability versus frequency methods for presenting odds. It also discusses how individuals should interpret population risks.

The article features a chart entitled "Assigning Numbers to Health Risks", adapted from the June 5 issue of the Journal of the National Cancer Institute. For age groups in 5 year increments, the chart shows the number of people per 1000 who are be expected to die over the next 10 years from various causes, including cancers, vascular disease and accidents. Men and women are treated separately, with the data further broken out for smokers and nonsmokers. Because the chart presents frequencies rather than percentages, the information seems less abstract. Also, the 10-year figures are easier to interpret than lifetime risks.

The second article demonstrates how complicated all of can become when there are competing risks. A major study on the benefits of hormone replacement therapy for women was recently stopped when the risks appeared to be greater than the benefits. A major concern is that the decreased risk of heart disease and osteoporosis was outweighed by an increased risk of breast cancer. Illustrating the frequency approach, Kolata writes:

The data indicate that if 10,000 women take the drugs for a year, 8 more will develop invasive breast cancer, compared with 10,000 who were not taking hormone replacement therapy. An additional 7 will have a heart attack, 8 will have a stroke, and 18 will have blood clots. But there will be 6 fewer colorectal cancers and 5 fewer hip fractures.

Women in the study had been taking combined estrogen and progestin drugs for an average of 5.2 years, according to Dr. Jacques E. Rossouw, the director of the study. At that point, he noted, "The breast cancer risk exceeded the predefined boundary for safety."

"Science Needs a Healthy Negative Outlook"

by Gina Kolata, New York Times, July 7, 2002, Sect. 4, p. 10.

Research journals seem to have a bias against publishing negative results. The exceptions tend to be large studies on widely recognized issues; one recent example was the failure to find an association between cellphones radiation and brain cancer. More often, however, the wider scientific community
and the general public are not informed when studies fail to find significant effects.

Several efforts are now underway to balance the picture. Dr. Bjorn Olsen of the Harvard Medical School is establishing the new *Journal of Negative Results in Biomedicine*. Dr. Leon Gordis of Johns Hopkins advocates a different approach. Rather than creating publications exclusively for negative results, he would like to see all journals focus more on the quality of the design and the importance of the research area, and less on positive results. He acknowledges, however, that things are not always so simple: "On certain controversial or emotionally charged issues, when do we decide that no further studies are needed?" For example, the article notes that scientists are continuing to investigate possible health risks from cellphones.

In any case, Dr. Scot Kern of the Johns Hopkins University School of Medicine points out the traditional journals are not solely to blame for withholding negative studies. In areas where researchers are in competition, a team that has already explored a blind alley might be just as happy to let others waste time wandering down it.

"The Odds of That"

by Lisa Belkin, *New York Times*, August 11, 2002, Sect. 6, p. 31.

"Scientists' Deaths are Under the Microscope"

by Alanna Mitchell, Simon Cooper And Carolyn Abraham, *The Globe & Mail* (Toronto), May 4, 2002.

The Times article, which appeared around the time of the Joint Statistical Meetings in New York, gives an absorbing discussion of coincidences. It begins with an account of a conspiracy story that was widely circulated on the Web and in the news. The Globe & Mail coverage conveys the sensational tone:

It's a tale only the best conspiracy theorist could dream up.

Eleven microbiologists mysteriously dead over the span of just five months. Some of them world leaders in developing weapons-grade biological plagues. Others the best in figuring out how to stop millions from dying because of biological weapons. Still others, experts in the theory of bioterrorism.

Throw in a few Russian defectors, a few nervy U.S. biotech companies, a deranged assassin or two, a bit of Elvis, a couple of Satanists, a subtle hint of espionage, a big whack of imagination, and the plot is complete, if a bit reminiscent of James Bond.

Naturally, the anthrax scare makes this look all the more ominous. In her *Times* article, Lisa Belkin explains that upon closer examination it turns out that not all of the researchers were microbiologists. Furthermore, when the circumstances were viewed objectively, not all the deaths were as mysterious as originally reported. The theme of the article is that coincidences often turn out to be less surprising when viewed in larger perspective.

The author has clearly researched these points carefully, and the article features quotes from many statistical experts. Here are just a few.
John Allen Paulos: "Coincidence feels like a loss of control perhaps ... Believing in fate, or even conspiracy, can sometimes be more comforting than facing the fact that sometimes things just happen."

Persi Diaconis: "The really unusual day would be one where nothing unusual happens. Given that there are 280 million people in the United States, 280 times a day, a one-in-a-million shot is going to occur."

Brad Efron: "Imagine a meadow and then imagine placing your finger on a blade of grass. The chance of choosing exactly that blade of grass would be one in a million or even higher, but because it is a certainly that you will choose a blade of grass, the odds of one particular one being chosen are no more or less than the one to either side."

Diaconis: "We are hard-wired to overreact to coincidences. It goes back to primitive man. You look in the bush, it looks like stripes, you'd better get out of there before you determine the odds that you're looking at a tiger. The cost of being flattened by the tiger is high. Right now, people are noticing any kind of odd behavior and being nervous about it."

Ruma Falk: "We forget all the times that nothing happens. Dreams are another example. We dream a lot. Every night and every morning. But it sometimes happens that the next day something reminds you of that dream. Then you think it was a premonition."

The full article presents nice discussion of all of these points.

"Prostate Cancer Surgery Found to Cut Death Risk"

by Gina Kolata, New York Times, September 12, 2002, p. A16.

"Dilemma on Prostate Cancer Treatment Splits Experts"

by Gina Kolata, New York Times, September 17, 2002, p. F5.

A man diagnosed with prostate cancer faces a tricky decision. One choice is radical prostatectomy, the surgical removal of the prostate gland. But if the cancer is not very advanced, then "watchful waiting" is an alternative. Since any surgery has some inherent risk, it seems reasonable not to rush to operate. Furthermore, prostatectomy can result in incontinence or impotence, which everyone would naturally prefer to avoid. On the other hand, waiting carries the risk that the cancer may spread and eventually become inoperable. In the US, 189,000 men are diagnosed with prostate cancer each year, and about one-third choose to have the surgery.

The first article describes a Swedish study that conducted a controlled comparison of surgery and watchful waiting. The study ran from October 1989 to February 1999. It involved 695 men, sixty to seventy years old, with newly diagnosed prostate cancer. By randomization, 348 were assigned to watchful waiting and 347 had surgery. The subjects were followed through the year 2000. The primary endpoint was death due to prostate cancer, and secondary endpoints were overall mortality and the spread of the cancer. The median follow-up time was 6.2 years.

During the study 31 of 348 assigned to watchful waiting died of prostate cancer, compared with only 16
of the 347 assigned to radical prostatectomy. This represents approximately a 50% reduction in the death rate from prostate cancer, which was found to be statistically significant. The experiment marks the first time that surgery has been shown to reduce prostate cancer mortality.

However, there is a catch. When deaths from any cause were included in the comparison, 62 of the 348 men in the watchful waiting group died and 53 in the radical prostatectomy group died, a difference that, while not significant, might be seen as less than encouraging. The researchers pointed to the large number of other risks for death in this age group as an explanation. The second article describes the challenges faced by doctors trying to advise patients in light of these findings.

"Less Wealth, More Health?"

by Richard Morin, Washington Post, September 29, 2002, p. B5.

It seems logical that health and wealth would be positively associated. But does a high standard of living make people healthier, or does being healthy allow people to earn more money? A controlled experiment is obviously impossible. But two researchers at the University of Maryland found that a 1977 change in Social Security benefits provided another way to get at the question.

The change meant that people born on or after January 2, 1917 got a 7 to 10 percent reduction in benefits compared to older retirees. The researchers compared the health histories of the group born in the last three months of 1916 with those who were born in the first three months of 1917. There were roughly a quarter of a million people in each group. Up to age 65, the mortality experience of the two groups was not appreciably different. But for the first five years after retirement -- ages 65 to 70 -- the group with reduced Social Security benefits had an approximately two percent lower mortality rate.

The researchers speculate that the benefit reduction encouraged people to remain in the work force, and that this proved to be a healthier choice.