Epidemiological studies proved that fluoride helps reduce tooth decay.

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Hypotheses can also be tested by experimental trials in which different groups of people are exposed to differing amounts of the test substance. A classic example is the use of fluoride to reduce dental caries.[10] A practicing dentist noticed that children with mottled teeth, caused by a high concentration of fluoride in the water supply, seemed to have less tooth decay than usual. This prompted the Public Health Service to initiate epidemiological surveys of children from cities where the fluoride concentration varied considerably. The results indicated that dental caries decreased with increasing content of fluoride in the water. But final proof was only obtained through an epidemiological experiment in which fluoride was added to the water supply of one community and the subsequent dental experience of school children compared with another town with little or no fluoride in the water.

An early epidemiological experiment is said to have ended the fashionable practice of bleeding as a medical treatment.[11] In 1835, Pierre Louis studied the outcome of pneumonia in patients hospitalized in Paris and discovered that bleeding *increased* the death rate. Until then, millions of leeches were imported into Paris every year.

Experimental epidemiology provided compelling proof of the link between oxygen treatment and retrolental fibroplasia, a condition where fibrous tissue proliferates behind the lens of the eye causing blindness. It was noticed

that the disease occurred much more commonly in premature babies who had continuous oxygen therapy during the first few days of life. The observation led to trials with reduced amounts of oxygen, when the disease completely disappeared.[12]

More recently, US researchers led by Dr Dean Ornish at the University of California, have carried out experiments to see whether lifestyle changes normally suggested as preventive measures can also be effective in treating people with heart disease. They found that if patients with advanced heart disease adopt a low fat vegetarian diet, stop smoking, take moderate exercise and use relaxation techniques, the plaques in their arteries actually start to disappear, the changes occurring in only a year and without the use of drugs.[13]

Although epidemiologists prefer planned experiments, this is not always possible. Nevertheless a great deal can be learned from critical analysis of unplanned "experiments" such as natural or man-made disasters. For example, much of our knowledge concerning methylmercury toxicity comes from the notorious outbreaks of poisoning at Minimata Bay in the 1950s and in Iraq during 1971-72. In what came to be known as "Minimata disease", a total of 121 people living in villages around Minimata Bay were poisoned by eating contaminated fish: 46 died. The poisonings were traced to release of methylmercury compounds from plastics industries into the waters of Minimata Bay.[14] According to Dr Dewar of the Shell Center in London,[15] such studies have given "infinitely more relevant knowledge than even the most careful and elegant animal tests."

The Atomic Bomb Casualty Commission has monitored the long-term effects of radiation following the Hiroshima and Nagasaki explosions and, as Gilbert Beebe of the National Cancer Institute explains,[16] "we have learned more about the human effects of ionizing radiation from the experience of the A-bomb survivors than any other source." Epidemiological studies of soldiers exposed to atom bomb