Appendix E

CHAPTER VIII. JUDICIAL FINDINGS

Forensic science and medicine is the art of presenting scientific and medical facts to a judge or jury in a court of justice. As such it is a specialized field in the law of evidence and trial advocacy.   It should come as no surprise that this art has been used to deal with a question so controversial as artificial fluoridation of public water supplies, which may be defined as a public imposition upon human beings, seeking to alter the level of fluoride in public drinking water from a natural level, usually 0.2 to 0.4 parts per million, to a desired level, usually 0.9 to 1.2 parts per million, as directed by statutes, regulations, and ordinances.

Many substances, including fluoride, can be used to serve medicinal, nutritional, or poisonous purposes, depending of dosage, administration, and other considerations. And if the objective of artificial fluoridation of public water supplies were distribution of claimed medical or dental benefits, it is obvious enough that a pure pharmaceutical grade of fluoride would be used, the same as when a physician or dentist prescribes fluoride tablets for patients in a clinical setting.   Fluoride is a part of nature, in that sense like many substances refined for use as medications, and physicians or dentists should be trusted in dealing with the ailments of their individual patients, in regulating dosage and administration

according to acquired expertise and judgment, in monitoring progress, and in making proper adjustments along the course of treatment.

But there is a telling fact, revealing that human health has never been the real objective of artificial fluoridation of public water supplies. The process consists in most cases of machine-regulated dripping of hydrofluoselicic acid into public drinking water. But hydrofluoselicic acid is an industrial waste product which would never be prescribed by a physician or dentist for a patient in a clinical setting, because it contains, aside from low-grade fluoride as a primary component, secondary trace amounts of arsenic, lead, and other impurities. In all remaining cases, the process consists of machine-regulated infusion of sodium silicofluoride in public drinking water. But sodium silicofluoride is hydrofluoselicic acid, only neutralized by sodium hydroxide or caustic soda, then transformed into a powder which likewise contains low-grade fluoride as a primary component, together with secondary trace amounts of arsenic, lead, and other impurities. And this alternative would never be prescribed by a physician or dentist for a patient in a clinical setting. It so happens that no more convenient and economical way to dump these highly toxic industrial waste protects has ever been devised than artificial fluoridation of public water supplies.

It is, therefore, obvious that the real purpose of artificial fluoridation of public water supplies has, from the beginning, been nothing other than a cost-

effective method of dumping an industrial waste product, otherwise difficult and expensive to dispose of, all done on false pretenses, behind an elaborate façade of public relations gimmicks. When people learn this cynical reality, they naturally react with indignation, for their intelligence has been insulted, not to mention adverse effects on their health. And so over the course of many decades, there has developed an enormous corpus of litigation undertaken to defend against forced imposition upon protesting citizens, or brought by protesting citizens to enjoin it by injunction.[1] The courts have generally sided with governments pushing, and corporations benefiting from artificial fluoridation of public water supplies, but more needs to be said.

We shall attempt to accomplish several objectives here:

 We shall first distill the key judicial decisions on applicable principles of law from a large corpus of reported cases both American and Canadian. We shall then expound these decisions in broad philosophical terms.

We shall next consider the forensic evidence that has been or can be used in court to prove that artificial fluoridation of public water supplies actually induces large-scale cancer in man.

From there, we shall focus upon critical phases of the two most important court trials cases on the adverse impact of artificial fluoridation of public water supplies on human heath.

We shall then review the express findings of American judges after hearing the foremost experts in the world on both sides. Three judges have condemned artificial fluoridation of public water supplies as an important causal factor in inducing large-scale cancer and other ailments in human populations. We shall here consider two of these three cases, from which we have ample trial records.

Finally, we shall discuss the legal and political fallout from these judicial findings. We shall also look into the approaching future.

We begin with a decision still frequently cited and argued whenever questions arise concerning rights unenumerated, yet protected by constitutional provisions. In *Meyer v. Nebraska*, 261 U. S. 390 (1923), the United States Supreme Court struck down a law which forbade the teaching of German in the primary grades of public schools. The guiding formula was stated with graceful clarity on pages 399-400 of the opinion:

> While this court has not attempted to define with exactness the liberty thus guaranteed, the term has received much consideration, and some of the included things have been definitively stated. Without doubt, it denotes, not merely freedom from bodily restraint, but also the right of the individual to contract, to engage in any of the common occupations of life, to acquire useful knowledge, to marry, to establish a home and bring up children, to worship God according to the dictates of conscience, and, generally, to enjoy privileges long recognized at common law as essential to the orderly pursuit of happiness by free men

In this connection, Sir William Blackstone listed as among the "absolute rights of individuals" at common law the "preservation of a man's health from such practices as may prejudice and annoy it."[2]

It should be evident from these authorities that legislation protecting public health, while generally valid so long as fair and reasonable, is always subject to the right of citizens to prove in a satisfactory manner that application to them would seriously threaten life and health and would thus be unlawful.

The seminal judicial decision on regulation of public health, never overruled and frequently cited, is *Jacobson v. Massachusetts*, 197 U. S. 11 (1905). A citizen challenged the constitutionality of a statute imposing mandatory smallpox vaccinations to deal with a threatened epidemic. At the time there was, and ever since there has been responsible dissent in the medical profession concerning the efficacy and safety of this practice. Even so, respectable opinion in the medical profession, right or wrong, has long regarded the practice as an important means of protecting public health. The United States Supreme Court held that, under these circumstances, the law was on its face a legitimate exercise of legislative authority. The court reasoned on page 35 of its opinion that the possibility dissenters might finally be proven right did not render the statute invalid, because the legislature had authority to enact laws based on reasonable belief to prevent the spread of contagious disease.

The court then went on to qualify its holding on page 39 of the opinion, saying the statute could never be interpreted to compel a vaccination whenever it could be shown "with reasonable certainty" that application to any objecting citizen "would seriously impair his health or probably cause his death."

The court did not define exactly what was meant by the phrase "with reasonable certainty." Yet the phrase has long been a term of art in the law of damages in civil proceedings, for judges have traditionally said that a plaintiff cannot recover unless he proves harm "with reasonable certainty." The meaning is that a plaintiff cannot rest his case on speculation or guess, yet it will be enough for him to show the approximate degree of harm by fair preponderance of the evidence, or balance of probabilities, adduced from competent and material evidence in a judicial hearing.[3] And in such case, injury may be proved by the opinions of experts who have demonstrated that they are well informed on the subject under investigation, as such opinions are applied to the facts of the case.[4]

Gallant attempts have been made to distinguish *Jacobson v. Massachusetts* by argument that artificial fluoridation of public water supplies does not address contagious disease. But the great weight of judicial decisions since handed down all apply the rule of *Jacobson* to any regulation of public health, whether or not addressed to contagious disease. The contrary might be devoutly wished or intelligently supposed, yet the law remains that any regulation of public health

imposed by legislative authority is valid *on its face,* notwithstanding responsible dissent in science and medicine, so long as such regulation has been approved by legislative authority, and is based on respectable opinion in the established health professions.

Even so, if *in a particular case* it is proved beyond speculation and guess, by fair preponderance of the evidence based on expert testimony, that application of the regulation would create a likely danger to health or life, then in such case the regulation in question *may not be enforced* over the protest of those endangered, and in such event citizens affected may have an injunction or other remedy to protect their interests.

Another important qualification to *Jacobson* is found in the judgment of the Supreme Court of Canada in *Toronto v. Forest Hill*, [1957] S. C. R. 469, in which the majority held that a statute regulating public health should be strictly construed so as not to authorize mandatory medical treatment of human beings, not unless the language of the statute is unmistakable. Therefore, the court held, an organic law allowing municipal regulations to make public drinking water "pure and wholesome" did not in and of itself authorize fluoridation.

And the Supreme Court of Canada has very recently held in *Chaoulli v. Quebec*, [2005] 2 S. C. R. ---, that the right of citizens to preserve health and life must be given such solicitous judicial protection that a government monopoly in

medical care, established to assure equal access to all, may not be allowed to interfere with individual exercise of such right in securing care urgently necessary.

Chaouli thus serves to reinforce the qualification in *Jacobson* that, although the legislative power has broad discretion in enacting laws to regulate public health, such laws must give way to the "absolute rights of individuals" to protect health and life. Whenever individuals can show "with reasonable certainty" that the execution of such laws would tangibly endanger health or life, the courts may and should intervene to protect the individuals adversely affected.

In this light it is easier to appreciate the proper scope and meaning of the leading case on artificial fluoridation of public water supplies. In *Paduano v. New York*, 257 N. Y. S. 2d 531 (S. Ct. N. Y. County 1965), subsequently affirmed or left standing in all appellate tribunals, the court cited and *Jacobson* with approval, then said at page 542 of its opinion,

> *Until the scientific evidence as to the deleterious effects of fluoridation reaches beyond the purely speculative state now existing*, decisional law mandates holding that the controversy should remain within the realm of the legislative and executive branches of government. While the courts do not have a right to impose fluoridation on anyone, judicial restraint requires us to adhere to the uniform decisions holding that the executive and legislative branches of government do -- *at least until some proof is adduced that fluoridation has harmful side effects* and therefore is not in the interests of the community." [Emphasis added]

In 1965 when *Paduano* was decided, fluoridation enjoyed immense prestige in the United States. Since 1950, it had been endorsed by the United States Public

Health Service, the American Dental Association, and many other prestigious organizations, and at the time, so far as then known and understood by most physicians and dentists, the weight of the evidence seemed to support the measure as an effective and economical way to reduce dental caries without danger to the general public. And so the court dismissed a suit seeking an injunction prohibiting fluoridation in New York City.

The same reasoning has resulted in a mountain of precedent so that citizen protests have been overwhelmed in the most cases. Today 170 million people drink fluoridated water in the United States, nor has Congress ceased to make large appropriations every year to continue promoting this program through the United States Public Health Service. In Canada, fluoridation has also been aggressively promoted, so that now about 7 or 8 million drink fluoridated water.

It is now known that the glowing reputation of fluoridation in 1965 was not deserved, but at the time of *Paduano* the facts were not yet known, in part because important evidence had not yet been gathered and reported by competent scientists, and in part because telling evidence then existing had been covered up by corrupt bureaucrats.

The claim of cover up may seem extravagant, but can be illustrated easily enough, for examples are abundant and significant. Probably the most important of

these episodes concerns the work of Dr. Alfred Taylor, a fellow in the Clayton Biochemical Institute at the University of Texas.

In the early 1950s, Dr. Taylor undertook a series of preliminary experiments in which it appeared that cancer-prone mice consuming water containing sodium fluoride at concentrations as low as 1.0 per million had shorter life spans than such mice drinking distilled water. Because the mice ate chow containing measurable fluoride, probably combined with calcium, as he learned after his initial runs, Dr. Taylor replicated his earlier work, this time using chow containing negligible fluoride. He ran twelve experiments using 645 cancer-prone mice, a very large study including enough data to assure meaningful results. He found that cancer-prone mice drinking water containing fluoride at 1.0 and 10.0 parts per million had significantly shorter life spans than such mice drinking distilled water. His work was peer reviewed and published in a learned journal when the dental profession was becoming excited about the possibility of fluoridation as a universal public health program across the United States and Canada.

Dr. Taylor's article, *Sodium Fluoride in the Drinking Water of Mice*, 60 Dental Digest 170 (1954), was historic and important. For mice are mammals like human beings, and their susceptibility to cancer from drinking water containing water containing fluoride even at concentrations as low as 1.0 per million, artificially introduced as ions freed when sodium fluoride dissociates, is a

clear warning that human beings might also be susceptible to contracting cancer when public water supplies are treated with hydrofluoselicic acid or sodium silicofluoride, likewise releasing free ions to achieve a fluoride level of about 1.0 part per million.

Dr. Taylor's article in the Dental Digest was published at a politically sensitive time, because the last stages of the boasted surveys in Newburgh and Kingston, New York, were then underway. These surveys were expected to demonstrate that fluoridation would dramatically yet safely reduce tooth decay. An elaborate and comprehensive report on anticipated results was planned for publication under prestigious circumstances as the beginning of a giant public relations campaign. Soaring hopes were rudely blunted by the bad news from Dr. Taylor, because the obvious meaning of his results was that widespread implementation of fluoridation would have to be delayed until further time-consuming investigation could be done to clarify the situation.

The official reaction to the crisis induced by Dr. Taylor is seen in the *Newburgh/Kingston Caries-Fluorine Study: Final Report*, 52 Journal of the American Dental Association 290 (1956). Since the facts were inconvenient, a "policy decision" was made, and the truth was thus grossly misrepresented on page 313 of the *Final Report*:

> The reports by Alfred Taylor, a biochemist at the University of Texas, on the increased incidence of cancer in mice drinking fluoride-treated water

have been show to be unfounded, since the food that he was giving the mice had many times the fluoride content of the drinking water, and the food was supplied both to the control and experimental groups. Subsequent tests did not confirm the differences.

Ever since those words were printed, officials of the United States Public Health Service have insisted, contrary to known facts, that Dr. Taylor's reruns were never done, that his results were never confirmed, that his work was never peer-reviewed, that his work was never published, and that no other qualified scientists have ever reported comparable results. Hence, in a standard history of the National Institute of Dental Research, published thirty-five years after Dr. Taylor's work first appeared in a refereed journal, it was said, "Alfred Taylor, an investigator with a doctorate in biochemistry, indicated that he would not publish his findings, because he was unable to confirm those results in a second experiment," and further, "A literature search of scientific journals failed to show any publication of this work by Dr. Taylor -- an indication that it was not subjected to review by his peers."[5]

The importance of Dr. Taylor's work is best measured, all things considered, by the strenuous efforts of the United States Public Health Service to conceal it.

After his first study, Dr. Taylor and his wife Nell, who also held a doctorate in biochemistry, published the results of yet another large-scale study in a peer-reviewed journal. The article appeared as *Effect of Sodium Fluoride on Tumor Growth*, 119 Proc. Soc. Exptl. Biol. & Med. 252 (1965), and reported 54 runs with

991 laboratory mice implanted with malignant tumors. As compared with control mice, experimental animals were exposed to sodium fluoride in varying concentrations by injection into implanted tissue, in drinking water, and by subdermal injection. In all runs, mice exposed to fluoride experienced significantly faster growth in tumors. A rapid and pronounced increase in the weight of tumors was observed in mice exposed to fluoride in drinking water at concentrations of 1.0 and 2.0 parts per million, comparable to amounts artificially introduced into the drinking water of man, but the rise began to level off as concentrations of fluoride increased to 5.0 and 20.0 parts per million and higher. Such leveling off is typical of biomedical data, for nature does not invariably move in straight lines.

Far from being isolated results, the work of Dr. Taylor has been confirmed many times by many scientists publishing in flag ship journals.[6] Even so the United States Public Health Service still pushes an official line that artificial fluoridation of public water supplies is perfectly safe, and has no tendency whatever to cause or contribute to the cause of cancer in man.

The work of Dr. Taylor and those confirming his results raises the question whether, in keeping with *Jacobson* and *Paduano*, it can now be proved by a fair preponderance of the evidence in judicial proceedings that fluoridation is dangerous to human health by causing large-scale cancer and other ailments in man.

The answer to this question is that, not only can such danger be so proved in courts of justice, it has already been thus proved, and eminent trial judges, after hearing the evidence over many days of strenuous adversarial combat, have found that fluoridation in fact causes cancer and other ailments in man. And certainly such proof can be offered again, and, if adequately presented by qualified witnesses examined by well-prepared counsel, and the judges hearing such evidence are independent and upright, such judicial findings based upon a fair preponderance of the evidence can again be secured. The fulfillment of this possibility depends on determination, intelligence, knowledge, skill, discipline, character, and resources.

Two kinds of information can be presented by experts properly qualified, guided by counsel skilled in forensic science and medicine.

Laboratory studies enable us to view a disease at the molecular and cellular levels, and to consider reactions in living plants, insects, and animals. The advantage of laboratory studies is that precise experimental conditions can be designed and controlled for known and unknown variables. The work of Dr. Taylor has been done, peer-reviewed, published, and confirmed by others. And the same work can be rerun and reconfirmed.

The disadvantage of laboratory studies is that caution is required in extrapolating results to human beings. In order to remedy the need to speculate

from laboratory studies, epidemiology must come into the picture. Epidemiology is the branch of medicine which studies the human diseases in human populations and environments with an view to finding causes. If controls in epidemiological surveys cannot in the nature of things be as precise, the results are more pertinent to human experience. Therefore, both laboratory studies and epidemiological surveys should be considered together, and, when parallels between them become striking, causal relationships between agents in the environment and human disease can more readily be identified by scientists and proved up in courts.

   Thus the question: Has the carcinogenic potential of fluoride observed in laboratory studies also been observed in human experience? The answer, based on very extensive epidemiological data, is certainly in the affirmative, and this fact has removed the speculative character of objections expressed by certain physicians and scientists against fluoridation as a public health practice.

The leader among scientists gathering pertinent epidemiological data and organizing it in usable form was Dr. Dean Burk, who retired in 1974 as the head of the cytochemistry section of the National Cancer Institute of the United States. In his time, he was one of the most famous and decorated cancer research scientists in the world. He was a pioneer in both chemotherapy and metabolic therapy for the treatment of cancer. And from his retirement in 1974 to his death in 1988, he directed the retrieval of data and analysis of the relationship between water

fluoridation and human cancer, particularly as expressed by the cancer death rates set forth in Tables 1A and 1B in Chapter IV.[7]

All necessary data, including everything required for demographic adjustments in Dr. Burk's later work, can be obtained from published reports of the United States Census Bureau, the National Center for Health Statistics, and the United States Public Health Service. All analysis has been done according to orthodox methods.[8] And so the main corpus of Dr. Burk's epidemiological work can be recapitulated by anyone willing and able to retrieve the data from published government records and apply standard techniques of medical statistics.

The year-by-year average cancer death rates (so many cancer deaths for all sites per 100,000 persons) in ten large central cities (corporate limits, excluding suburbs) of the United States, which served as the control group and remained unfluoridated from 1940 through 1968,[9] were compared for the years 1940 through 1968 with corresponding year-by-year average cancer death rates in ten large central cities of the United States which served as the experimental group and remained unfluoridated from 1940 through 1951, but fluoridated from 1952 through 1956, and remained fluoridated through 1968 and thereafter.[10] The experiment came to an end in 1968 ironically because the United States Public Health Service, the American Dental Association, and other allied organizations were so successful in promoting fluoridation by persuading city councils to go

along, or coercing them to submit by force of law. From and after 1969 control cities began to fluoridate their respective public water supplies.[11] Even so, by 1968 it had been possible to gather enough data from impeccable public records, and the unmistakable truth was established, never to be erased from the eyes of scientific history.

Not enough data were available to construct rates for 1951 and 1952, but rates could be constructed for all twenty cities in all other years from 1940 through 1968.

In order to assure comparable cancer experience in both groups before fluoridation began in the experimental cities, it was stipulated that every city in both groups had to have a cancer death rate in 1953 of at least 155 cancer deaths per 100,000 persons.

The aggregate population of the control cities was about 5.3 million in 1940, about 6.3 million in 1950, about 7.1 million in 1960, and about 7.3 million in 1970. The aggregate population of the experimental cities was about 11.0 million in 1940, about 11.9 million in 1950, about 11.5 million in 1960, and about 10.8 million in 1970. The size of this survey was, therefore, enormous, covering cancer mortality for 16-18 million people in twenty large central cities spread out across the United States over thirty years. There has hardly ever been a published

epidemiological study using so much data, over so long a period of time, and arranged in such powerful experimental design.

The cancer deaths for each city were taken as reported each year.[12] The populations figures for census years were taken as reported, and population figures between census years were estimated by linear interpolation in relation to census years. This procedure postulates that population increases or declines year by year in equal increments between census years.

The cancer death rates for each group of cities were expressed both as unweighted averages, giving each city equal weight regardless of population size, or weighted averages, giving each city weight according to population size. The use of weighted averages means in effect that all cancer deaths and all populations in all ten cities in each group must be pooled for each into one gross fraction which is then reduced a common denominator of 100,000 for purposes of comparison. The pattern of the data is virtually same whether unweighted or weighted averages are used, and the differences between the two is trivial, as should be visually evident from Figures 1A and 1B in Chapter IV. In this particular case, it is of no practical consequence whether unweighted or weighted averages are used for causal inference, statistical treatment, or any other technical purpose. And since weighted averages are mathematically more convenient to use, and were preferred

by Dr. Burk and his critics alike, the discussion here will be confined to weighted averages, which are set forth and analyzed in Tables 1B and 2B in Chapter IV.

These basic data, gathered and organized under the supervision of Dr. Burk, are arranged in standard experimental design, comparing like with like along a base line from 1940 in which weighted-average cancer death rates grew equally, then continuing the comparison after fluoridation was introduced in the experimental cities. After fluoridation began, a pronounced and rapid acceleration in human cancer mortality in the experimental group (+F), as compared with the control group (-F).

The resulting association between fluoridation and cancer can be conveniently quantified by linear regression, which is a standard statistical technique for characterization of a field of points on a two-dimensional graph as a straight line which is called a line of best fit. The line is so drawn that the sum of the squares of the distances of the several points to the line is the lowest possible number. Such lines were drawn through the data for observed weighted-average cancer death rates (CDRo) from 1940-1950 to achieve values for 1940 and 1950, both for control (-F) cities and experimental cities (+F), and again through such data for 1953-1968 then extended to achieve values for 1950 and 1970. Hence, the figures in Table 2B in Chapter IV:

	1940	1950	1950	1970

CDRo (+F)	154.2	181.8	186.3	222.6
CDRo (- F)	153.5	181.3	183.6	188.8

The size of the association can then be calculated: $[(222.6 - 188.8) - (186.6 - 183.6)] + [(154.2 - 153.5) - (181.8 - 181.3)] = 31.3$ excess cancer deaths per year per 100,000 persons exposed after 15-20 years from the introduction of fluoridation in the experimental cities. The epidemiological data closely parallel and thus confirm the laboratory studies, and establish a causal relationship between artificial fluoridation of public water supplies and dramatic increases in human cancer mortality.

Consequently, there now exists and long has existed enough evidence to make out a prima facie case in courts of justice that fluoridation causes a dramatic increase in human cancer. And not only can a prima facie case be made out, but attempted rebuttal can be refuted.

In this connection it is important to keep in mind that judges must be instructed in scientific conventions, for the mentality of the law properly rests upon conventional standards in dealing with virtually any subject. And in this setting, attention should be given to principles of inductive logic which are properly used in weighing empirical evidence and identifying causal relationships in the natural sciences.[13]

A *first rule of right reason* is that, in order to find cause, it is necessary to control for known and unknown variables.

Thus Dr. Taylor compared identical strains of mice under identical laboratory conditions, then observed the results when sodium fluoride was introduced into the drinking water of identified groups, as compared to mice drinking distilled water. And Dr. Burk observed the similar cancer mortality of two similar groups of cities over many years, then noted the striking rise in cancer mortality when fluoridation was introduced in one group of cities as compared to the unfluoridated cities.

A *second rule of right reason*, often called Ockham's razor, is that, in dealing with empirical facts which display characteristic trends, assign the simplest and most fitting explanation as the cause, whether the mechanism is fully understood or not, and take such explanation is the cause. And that cause remains established unless and until the contrary be demonstrated.

Especially in light of Dr. Taylor's work on mice, the simplest and most fitting explanation for the sharp rise in human cancer mortality in the fluoridated cities is that the artificial addition of fluoride is the cause of the increased cancer, and such conclusion should be deemed established unless and until the contrary be demonstrated.

It is true that human cancer is influenced by countless demographic, environmental, dietary, socio-economic factors, some causing cancer incidence and

mortality to increase, others causing cancer incidence and mortality to decease. Older people generally experience more cancer, for example, yet proper diet and exercise, or a better environment, can significantly offset the adverse impact of aging. Applying Ockham's razor to Dr. Burk's basic data, it is proper to conclude, unless and until the contrary be demonstrated, that all cancer-influencing factors counterbalanced each other during the long base line period before 1950; that all these factors continued to counterbalance each other after 1950, except for the one factor known to be new, viz., fluoridation; and, therefore, that the entire association between fluoridation and cancer, i. e., 31.3 excess cancer deaths per 100,000 after 15-20 years, is attributable to fluoridation as the cause.

And a *third rule of right reason* is that, once a causal relationship is properly established from empirical facts at a certain time and place, subject to necessary controls and precautions, it is proper, unless and until the contrary be demonstrated, to generalize the same causal relationship throughout all like situations at all times and places in the universe.

Thus the causal relationships established in the laboratory at the University of Texas and the epidemiological survey of 20 American central cities from 1940-1968 may be generalized to all parts of the world whenever and wherever fluoridation is implemented. Let us say, then, that at least 130 million Americans have been drinking fluoridated water for at least 15-20 years. That number is

steadily increasing as time rolls by. It is reasonable to reckon the casualty in the early years of the 21st Century as 31.3 excess cancer deaths per 100,000 multiplied by 130 or more million Americans ever year, which works out to a stupefying figure of at least 40,000 excess cancer deaths in the United States every year. A casualty of some thousands of excess cancer death caused by fluoridation can properly be reckoned for Canada.

Dr. Burk memorably expressed such a conclusion in a hearing before Congress on April 6, 1976:

> Oliver Wendell Homes Sr., M. D., of Civil War medical fame, and professor of anatomy at Harvard University, in 1843 and 1855 described then prevailing treatment of puerperal fever in lying-in hospitals as criminal manslaughter. It was only manslaughter, however, not murder, because the physicians of that day did not have, and could not have had a sufficiently knowledgeable idea of the bacteriological basis of the doctor-nurse-patient transmission of the disease until the work of Pasteur and Lester decades later.
>
> The scientific and medical status of artificial fluoridation of public water supplies has now advanced to the stage of the possibility of socially imposed mass murder on an unexpectedly large scale of literally tens of thousands of cancer deaths of Americans annually.[14]

In order to illustrate how this causal relationship can be proved up as a prima facie case in a court of justice, we shall draw from actual testimony given in two of three famous trials in which the presiding judges found that fluoridation is causally related to large-scale human cancer.

One of these cases was tried in segments of days from March through July 1978 before Hon. John Flaherty, then President Judge of the Civil Division of the Allegheny County Court of Common Pleas and Chairman of the Board of the Pennsylvania Academy of Science, later Associate Justice then Chief Justice of the Pennsylvania Supreme Court. The case was entitled Paul Aitkenhead et al. v. Borough of West View, filed of public record as No. GD-4585-78 on the docket of the Allegheny County Court of Common Pleas in Pittsburgh.

The other case was tried in January 1982 before Hon. Anthony Farris, Judge of the District Court of Texas in Houston. The case was entitled Safe Water Foundation of Texas v. City of Houston, No. 80-52271 on the docket of the District Court of Texas in Harris County, 151st Judicial District.

In proceedings before Judge Flaherty, a famous physician and scholar laid the foundation of the plaintiffs' case. Dr. George Waldbott was asked whether, from his general knowledge of medicine, he believed that fluoridation can cause cancer in man. Dr. Waldbott answered affirmatively, then said,

> There are three reasons why I go for this opinion. One, contrary to former views which held that fluoride accumulates only in bones and teeth, we know that fluoride is and can be present in every single cell of the body. The second point is that fluoride is that fluoride is by far the most active of all chemicals in the body with the exception, perhaps, of hydrogen. Number three, since it is present in every cell, it is liable to produce damage in every cell, and if that damage continues as long-term damage, it is bound to produce cancer in certain individuals. -- Transcript, April 11, 1978, pages 288-289.

In proceedings before Judge Farris, inquiry was made of Dr. Pierre Morin who had served as director of medical research at major university hospital, on how fluoride could injure human cells and cause cancer:

THE COURT: Doctor, do you have an opinion as to whether fluoride can damage chromosomes?

DR. MORIN: Yes, your Honor. For quite some time now the actual damage being done to the chromosomes of cells by fluoride was based on laboratory studies. Mohamed's work and some other work were good indications that something was happening with the cells. And the latest publication, a very recent publication by Emsley has added a degree of confidence to the fact that fluoride, due to its very strong hydrogen bonding capacity, is capable of either distorting chromosomes or even breaking them, and this a subject which I believe might need a small additional explanation.

In biology what we call active substances need to retain their characteristic spatial arrangement, which means that, if a structure is winding around three times in a certain length of time, and if some reason due to chemical reaction or some such thing, that structure is not winding this time, it may have lost all biological activity. An example of this would be insulin, which can be denatured by exposure to about fifty percent oxygen for a period of a few hours. It becomes denatured in the sense that, if the substance is injected inside the body, it will not do its biological function. This is due to a very, very minute change on what, in biology, we call the active site of the substance. I think that the work of Emsley points to the fact that, through hyrdorgen bonding of fluoride, the double helixes of DNA are entering into a chemical reaction which tends to break some of the bridges, and, therefore, to interfere with the total structure. Therefore, it is not surprising to find that, as the cell replicates itself and this structure replicates itself into the next generation, there has been a change in the global characteristic of the cell. And this is what we call a teratogenic effect. In other words, we create an effect which is carried out in cells from then on.

And another thing, too, which is very important, is that some of the reasons why fluoride interferes with enzymes were not understood.

Enzymes have active sites, and these are usually animo acids, and these, if they do hydrogen bonding, will lose their biological activity. So this is why I am really quite relieved to find that Emsley has published his work, because it is really the clinching work necessary to understand the process of fluoride toxicity for a living cell. -- Transcript, pages 542-545 (January 15, 1982).

In the same case, Dr. Morin was asked by counsel to explain the meaning of the laboratory studies and epidemiological surveys, taken together as an intelligible whole:

Q. Doctor, is the work of Taylor that you have just discussed consistent with the work of Mohamed on mutagensis?

A. Yes, it is.

Q. Why is that?

A. You see, Taylor is working on complete structures, transplanted tumors and complete organisms, and the other studies are individual cells, and it is, I would say, a continuous step-by-step process of trying to understand what is happening, so that each one adds to the other, and adds comprehension to the mechanism of what is going on.

Q. Is there a relationship between carcinogenesis and mutagenesis?

A. Mutagenesis, being a random process, affects all different aspects of the cell. Therefore, in a very large number of substances, I would say up to ninety percent of the substances known to be mutagenic turn out to be carcinogenic.

Q. Is the work of Taylor and Mohamed consistent with the work of Emsley?

A. Yes, Emsley did the work on what I would call the molecular level, and enables one to understand how the mechanism from beginning to end.

Q. Is the work of Taylor and Taylor, of Emsley, and of Mohamed and Chandler consistent with the work of Burk and Yiamouyiannis at the epidemiological level?

A. Yes.

Q. How is it consistent?

A. It is a progression from the molecular level to the human being. So we go up from the molecular level to the cellular and animal level, then to the human level. -- Transcript, pages 837-839 (January 20, 1982).

Upon this foundation, the epidemiological data can be better understood. In the proceedings before Judge Flaherty, Dr. Burk described the meaning of the basic data gathered and organized under his direction. He testified,

> There is a principle in science known as Ockham's razor. Now he lived at the time of Chaucer in 1400, and this principle is almost as well known and important as Newton's law of gravity. It says that, if you are trying to assess cause and effect, you must take the most probable cause as the first best judgment. Now if somebody thinks that there is some better cause, it is up to him not only to say what he thinks it is, but to show that it is. He's got to show that it's better than the first cause. So here we have, in our opinion, an almost self-evident demonstration that fluoridation is causing a tremendous increase in cancer death rate." -- Transcript, April 10, 1978, pages 132-133.

In proceedings before Judge Farris, Dr. Burk amplified his position,

> Q. Doctor, you have already testified that, in your opinion, the basic data, when construed in light of Ockham's razor and general principles of science, yields a fair inference that fluoridation of public water supplies is causing cancer. Do you have an opinion, based on a reasonable degree of scientific probability, as to why fluoride could have such a carcinogenic effect?

> A. Yes, I do.

Q. What is the opinion?

A. But I would give it far less weight in my thinking than the mere fact that those are the facts, but fluoride is the most electronegative element, or to put it in more understandable terms, it is known to inhibit at least fifty enzyme reactions in the body and the enzymes, of course, are like the governors on a car, they control the direction and extent of reactions. So it is no mystery to me that fluoride should have such a violent effect, all adding up to cancer and death. Now as a biochemist, that is all I really wish to talk about as to an explanation of the cause. It is facts of the matter set forth in this graph which, I consider, have the deepest and most profound meaning.

Q. Do you have an opinion to a reasonable degree of scientific probability as to whether the fluoride ion is an enzyme inhibiter?

A. It has been widely published as inhibiting at least fifty known enzymes, you could look up which in fifty in standard books, all at relatively low concentrations that are involved in the fluoridation of public drinking water.

Q. Would that be consistent or inconsistent with this graph picturing your basic data?

A. It would certainly be consistent with it and a potential explanation for it if you are interested in explanations. -- Transcript, pages 46-48 (January 13, 1982).

When asked in proceedings before Judge Farris whether the crude cancer death rates in his basic data might be misleading if not adjusted for age, race, and sex, Dr. Burk made himself clear:

Q. Which figures do you think more closely represent reality, the adjusted or unadjusted?

A. In this instance it is my opinion that the unadjusted are.

Q. Will you explain to the court why you think the unadjusted more closely represent reality?

A. Well, first of all, they are reality. They are the actual numbers, which is about as close to reality as you can get. Now you wish to add an explanation for understanding those figures. That immediately goes into the world of hypothesis and so forth, and, while there are times when those hypothetical considerations are most important, in my judgment and experience this is not one of those times, for the reason that cancer deaths, as I indicated yesterday, are clearly a function of many variables, some of which can be shown very clearly and numerically and some of which are more nebulous, but there can be anywhere from fifty to several hundred that one could without much trouble list of his head. So, when you are going to correct for three factors such as age, race, and sex, you obviously, by any system of logic, are being incomplete. You should be correcting for all the others, which you should do more or less by the same logic, as you have proceeded to do with those three.

The only thing that can be said in mitigation of that is, if you think one of those factors, or two of them, is more important quantitatively than all the others put together, then what I was just saying was not as pertinent as might be. But I can only say from experience in the cancer field that all those other factors could easily be more important than any one, two, or three of the ones commonly used, which are used mainly because they are the data available, not because they are really the best ones. -- Transcript, pages 105-107 (January 14, 1982).

When asked in proceedings before Judge Farris about the fairly short latency period in his basic data -- the noticeable increases in cancer mortality after only five years following the introduction of fluoridation --, Dr. Burk answered,

It is a very popular myth spoken by the unknowing that cancer always takes fifteen to thirty years to develop after the inciting agent was provided. Those unsophisticated people in that sense were thinking of, quite accurately, cancer produced by cigarette smoking and asbestos. But if they knew anything about the literature in the field of cancer, they

would know that far shorter induction periods have been reported in human beings. -- Transcript, page 46 (January 13, 1982).

Dr. Burk then listed several examples of substances inducing human cancer within five years, including nickel, aniline dyes, benzene, and atomic radiation, among others.

And it ought to be expected from Dr. Taylor's work on mice that fluoridation should have impact mainly upon older human beings who are more prone to cancer, and that such impact should be relatively rapid at first, then eventually level off. While Dr. Burk always believed that there was no scientific need for demographic adjustments of his basic data for age, race, and sex in this particular case, he and several colleagues actively investigated demographic variables as a concession of conventional thought.[15]

He and Dr. John Yiamouyiannis discovered that race and sex had no impact, that age was the only demographic variable of any importance, even if immaterial in and of itself, and that the primary rapid impact of fluoridation on human cancer mortality is evidently upon individuals in more cancer-prone age groups, in some degree those over 45, and especially those over 65. The parallels between laboratory experiments and epidemiological data, therefore, are quite striking.

In any event, Dr. Burk concluded his testimony before Judge Farris with powerful emphasis:

Q. In assessing the total percentage of cancer increase in the United States, do you have an opinion, based on a reasonable degree of scientific probability, as to what percentage would be associated with fluoridation?

A. Not in terms of percentage. That would be estimated, but it is my firm opinion that fluoridation contributes very materially to the increase that is observed. I have had that opinion for quite a few years now. In other words, we wouldn't see by any means as much increase in cancer but for this fluoridation, or, to look at it the other way around, I know of absolutely no, and I mean absolutely no means of prevention that would save so many lives as simply to stop fluoridation, to not to start it where it otherwise is going to be started. There you might save 30,000 or 40,000 or 50,000 lives a year, cancer lives. That is an awful lot of lives a year.

Q. At any expense?

A. No, it would save money.

Q. And, at any great effort?

A. No, you just wouldn't bother to put it in the water. And why people don't fully appreciate it, or take action to oppose it, I cannot understand without going into the root of all evil and those things. But scientifically I can't understand any basis. -- Transcript, pages 234-236 (January 14, 1982).

 The same kind of prima facie case was made out for the plaintiffs in both Pittsburgh and Houston. The defense in both trials was similar. A series of witnesses showed up, each with impressive credentials and unctuous speech. Some knew whereof they spoke. Others did not.

In the latter category fell the director of public health for the City of Houston. She held the degrees of doctor of medicine and master of public health, and was a

member of many learned societies. Her appearance was very agreeable. Her background and credentials were impeccable. In an erudite and poised manner she testified in proceedings before Judge Farris. Her demeanor naturally commanded confidence and respect. She had enthusiastically recommended, for the good of little children, especially those in lower socio-economic groups, that the city "adjust the fluoride in the municipal water supply to the optimum level for reduction of dental caries." Then came cross-examination:

Q. Doctor, have you read a report which has been marked as plaintiff's exhibit 23, entitled Fluorides, Fluoridation, and Environmental Quality, a translation of a report prepared for the minister for the environment for the Province of Quebec by an advisory committee for the fluoridation of public water supplies?

A. No.

Q. Doctor, I am showing you what has been marked as plaintiff's exhibit 3, an article by Dean Burk and John Yiamouyiannis, published in the journal Fluoride, entitled Fluoridation and Cancer: Age Dependence of Cancer Mortality Related to Artificial Fluoridation. Have you read that before?

A. No.

Q. Doctor, I am showing you what has been marked plaintiff's exhibit 7, a book by George Waldbott, M. D., and Professors Bergstahler and McKinney, University of Kansas, entitled Fluoridation: the Great Dilemma. Have you read that book?

A. No.

Q. Doctor, showing you what has been marked plaintiff's exhibit 8, a publication by the National Research Council of Canada, entitled

Environmental Fluoride 1977, by Dyson Rose and John Maurier, have you read that report?

A. No.

Q. Doctor, I am showing you what has been marked plaintiff's exhibit 13, a paper entitled Cytological Effects of Sodium Fluoride in Mice by Aly Mohamed and Mary Chandler of the Biology Department at the University of Missouri in Kansas City. Have you read that report?

A. No.

Q. Doctor, showing you what has been marked plaintiff's exhibit 20, a translation of an article in the original German, the translation being entitled Fluoridated Water and Teeth by Rudolf Ziegelbecker in Austria, published in the journal Fluoride, have you read that report?

A. No.

Q. Doctor, showing what has been marked plaintiff's exhibit 9, a paper by Dr. Alfred Taylor in 1954 in the journal Dental Digest, entitled Sodium Fluoride in the Drinking Water of Mice, have you read that report?

A. No.

Q. Doctor showing you want has been marked plaintiff's exhibit 15, a paper by Danuta Jachimczak and others of the Department of Biology in the Institute of Biostructure in the Pomeranian Medical Academy, published in volume 19 of Genetica Polonica, entitled the Effect of Fluorine and Lead Ions on the Chromosomes of Human Leukocytes in Vitro, have you read that report?

A. No.

Q. Doctor, showing you what has been marked plaintiff's exhibit 10, a paper published in the journal Genetics, volume 48, in 1963, by Herskowitz and Norton, entitled Increase Incidence of Melanotic Tumors in Two Strains of Drosophila Melanogaster Following Treatment with Sodium Fluoride, have you read that paper?

A. No.

Q. Doctor, showing you what has been marked as plaintiff's exhibit 24, a paper by John Lee, M. D., entitled Optimal Fluoridation: the Concept and its Application to Municipal Water Fluoridation, it is reprinted from the Western Journal of Medicine, have you read that report?

A. No.

Q. Doctor, showing you what has been marked plaintiff's exhibit 25, a paper by George Waldbott, M. D., Fluoridation: a Clinician's Experience, in volume 73 of the Southern Journal of Medicine, published in March 1980. Have you read that study?

A. No.

Q. Doctor, I am showing you what has been marked as plaintiff's exhibit 26, a paper done by John Emsley, published in the Journal of the American Chemical Society, entitled An Unexpectedly Strong Hydrogen Bond: Ab Initio Calculations and Spectroscopic Studies of Amide-Fluoride Systems. Have you read that paper?

A. No.

Q. Doctor, showing you what has been marked plaintiff's exhibit 12, a paper in Plant Physiology, volume 43, by Dr. Chong Chang of the United States Department of Agriculture, entitled Effect of Fluoride on Nucleotides and Ribonucleic Acid in Germinating Corn Seedling Roots. Have you read that report?

A. No.

Q. Have you read anything in the literature by Ionel Rapaport?

A. No. -- Transcript, pages 960-965 (January 20, 1980).

As is said in Texas, counsel "passed the witness." The assistant city attorney then asked.

Q. You are not an expert in fluoride, are you?

A. No.-- Transcript, page 965 (January 20, 1980).

It is a melancholy fact that most advocates of fluoridation know much less than this witness. In her community, the good doctor was considered an authority, held in awe and respect. And civic leaders obediently followed her recommendations.

The technical particulars of defense in Pittsburgh were presented by a distinguished group of witnesses representing the National Cancer Institute and the National Academy of Sciences in the United States, and the Royal Statistical Society and the Royal College of Physicians in the Great Britain. They were all formidable, polished, and sophisticated. The greatest trial lawyer in the world would have been powerless against them if their case had been solid.

As it was, their case was built upon a report presented at a hearing in Congress on October 12, 1977, under the signature of Dr. Arthur Upton, Director of the National Cancer Institute. The report was introduced to Congress by Dr. Guy Newell, Deputy Director, who had supervised the preparation of the document.[16] And this so-called "Upton Statement" was confirmed as to methodological and mathematical correctness in a paper published by the Royal Statistical Society in England.[17] It all seemed very impressive at the time.

The Upton Statement remains to this day the official reply of the United States Public Health Service to the basic data gathered and organized under the supervision of Dr. Burk.[18] And the Upton Statement was put on trial before Judge Flaherty and Judge Farris, and in both cases was found wanting. More important than these particular judicial condemnations are the reasons why the Upton Statement cannot stand up before any impartial tribunal.

The Upton Statement claims that the basic data used by Dr. Burk must be adjusted for age, race, and sex, and that, when properly adjusted, any difference in cancer mortality between the fluoridated and unfluoridated cities is completely wiped away. In effect, the argument was that, among 16-18 million people in twenty large central cities over 30 years, it so happens the experimental cities grew older faster precisely a the time they initiated and continued fluoridation, and this aging occurred precisely to the extent necessary to create a shocking appearance of a huge association between fluoridation and cancer. But this association was said to be an illusion deceiving the ignorant. If the population figures in the two groups are considered over thirty years, and it is assumed changes in population size are an inverse index of population aging, it is reasonable to suppose adjusted figures might display a somewhat smaller association than the crude data. But given the enormous corpus of data involved,

and the great size of the numbers generated, this claim is far-fetched. And truth to tell, it was worse than far-fetched.

The Upton Statement used the so-called indirect method, an orthodox procedure for adjustment of the basic data, which Dr. Burk eventually conceded as a proper tool of adjustment, and used himself in his last published papers.

When this procedure is used, two populations are compared, usually in terms of a ratio of the observed cancer death rate (CDRo) to the "index" or "expected" cancer death rate (CDRe).

In deriving an "expected" cancer death rate, it necessary first necessary to determine the number of persons in each demographic category of each observed population for which an adjusted rate is undertaken. In working up the Upton Statement, the staff at the National Cancer Institute used forty such categories, viz., age groups 0-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, and 85+, each divided into while male, white female, nonwhite male, and nonwhite female.

The next step is selection of a "standard population," drawn from vital statistics and census figures for a certain territory in a certain year: this standard population consists of a set of known cancer death rates for each category of each population for which an adjusted rate is undertaken. The choice of such a standard population requires sound judgment. In this case the staff at the

National Cancer Institute the United States in 1950, which is not unreasonable, because it represents a fair estimate of what cancer experience would be, category by category, in the absence of anything tending to make cancer deaths higher or lower than usual. It serves as a standard of normal cancer mortality.

In each population and year considered, the number of persons in each category is multiplied by the corresponding rate in the standard population. Expected cancer deaths are then added up, then divided by the total population, and reduced to a common denominator of 100,000. The resulting "expected" cancer death rate will then represent what may be anticipated for the population in view of its demographic composition under normal circumstances.

The fraction CDRo/CDRe is called a standardized mortality ratio or SMR. If based on all available and pertinent data and sound judgment, it will indicate the extent to which the observed cancer death rate is higher or lower than what should be expected under normal circumstances, given its demographic structure. It is also possible to express an adjustment in terms of, not a fraction or ratio, but a difference, CDRo – CDRe, which can be more meaningful because it helps quantify adjusted cancer mortality in terms of cancer deaths, instead of a vague percentage.

In any event, the Upton Statement set forth a purported adjustment of the basic data expressed as weighted averages. The SMRs were as follows:

	1950	1970	Change
CDRo/CDRe (+F)	1.23	1.24	+.01
CDRo/CDRe (- F)	1.15	1.17	+.02

Using these figures, the National Cancer Institute asked Congress to believe that, relative to what might be anticipated in light of the demographic structure of the control and experimental groups compared in the basic data, cancer mortality actually grew *1.0% faster in the unfluoridated cities*.

The difficulty was that the CDRo values for 1950 and 1970 in the Upton Statement were simply the rates reported for those years. In 1950, fluoridation had not begun in the experimental group. In 1970, fluoridation was being started in the control group. The data causing all the concern were the CDRo values in both groups as reported for 1953-1968. Without data for 1953-1968, nobody would have suspected a linkage between fluoridation and cancer. Having left out all available and pertinent data in their adjustment, it is not surprising that the National Cancer Institute came up with the wrong answer.

The data for 1953-1968 can and must be included in the adjustment, as can easily be done by standard statistical method. For the control cities, then the experimental cities, a line of best fit can be drawn through 1953-1968, then extended to obtain CDRo values for 1950 and 1970. These CDRo values for 1950 and 1970, it is true, will be artificial because based on assumptions inherent

in linear regression, but the whole of the indirect method, including even the choice of a standard population, is based on like assumptions. And here these CDRo values for 1950 and 1970 represent a proper, conventional, and rational expression of *all available and pertinent data.*

Moreover, the change occurring after 1950 when fluoridation was started in the experimental cities is both a change *in trends after 1950* and a change *from trends before 1950.* Hence linear regression should also be used in reference to data for 1940 through 1950 to obtain CDRo values for 1940 and 1950, both for control cities and for experimental cities.

The resulting CDRo values can then be compared with CDRe values which can be established for 1940, 1950, and 1970. In this way, all available and pertinent data can be used for a comprehensive adjustment of the basic data for age, race, and sex. When this procedure is followed -- using weighted averages for CDRo values and the United States in 1950 as the standard population, exactly like the National Cancer Institute --, striking results are obtained:

	1940	1950	1950	1970
CDRo (+F)	154.2	181.8	186.3	222.6
CDRe (+F)	128.1	146.9	146.9	174.7
CDRo/CDRe (+F)	1.204	1.238	1.268	1.274
CDRo-CDRe (+F)	26.1	34.9	39.4	47.9
CDRo (- F)	153.5	181.3	183.6	188.8
CDRe (- F)	140.3	155.5	155.5	166.0
CDRo/CDRe (-F)	1.094	1.166	1.181	1.137

CDRo-CDRe (-F)   13.2   25.8   28.1   22.8

These figures can be transformed into coefficients which reflect an association between fluoridation and cancer death rates adjusted for demographic variables, as such association developed from 1940 to 1970:

The cumulative change in terms of CDRo/CDRe = [(1.274 – 1.137) – (1.268 – 1.181)] + [(1.204 – 1.094) – (1.238 – 1.166)] = +.088, which means that, relative to what might have been anticipated in light of demographic structure of the populations compared, adjusted cancer mortality grew by *8.8% faster in the fluoridated cities*, not 1.0% less than the unfluoridated cities as the Upton Statement claimed.

The cumulative change in terms of CDRo-CDRe = [(47.9 – 22.8) – (39.4 – 28.1)] + [(26.1 –13.2) – (34.9 – 25.8) = 17.6 excess cancer deaths per 100,000 persons exposed after 15-20 years, an *increase of 9.3%* (17.6/188.8) relative to the highest cancer death rate reached in the unfluoridated cities. This adjusted excess of 17.6 per 100,000, multiplied by 130 million Americans or more drinking fluoridated water 15-20 years, works out to something on the order of 23,000 or more excess cancer deaths in the United States every year.

Consideration could be given to certain variations of technique in using the indirect method to deal with this particular case, but the analysis has gone far enough to show that, whether adjusted or observed cancer death rates are preferred,

the human casualty caused by artificial fluoridation of public water supplies is huge and tragic. It is almost indecent to quibble over the numbers.

Why did the National Cancer Institute leave out all available and pertinent data in adjusting the basic data for age, race, and sex? It is obvious that, if observed cancer death rates for 1940-1950 and 1953-1968 were to be adjusted for age, race, and sex, all data for those years should be used, otherwise the adjustment would not be of the basic data, but of something else. And linear regression is a procedure taught in elementary courses on statistics in our colleges and universities, nor is there anything which might make it inappropriate in dealing with this problem.

The reasons for this omission was brought out during proceedings before Judge Flaherty on the cross-examination of Dr. *David* Newell, principal author of the paper published by the Royal Statistical Society in support of the Upton Statement, which had been prepared at the National Cancer Institute under the supervision of Dr. *Guy* Newell:

Q. You adjusted essentially for the years 1950 and 1970 did you not?

A. 1950 and 1970, yes.

Q. There are a good many years between 1950 and 1970 on the graph. Why didn't you adjust for the other years as well?

A. The main and simple reason is that we were sent data for 1950 and 1970.

Q. By whom?

A. This by the Royal College of Physicians, certainly the death figures we got from there.

Q. From where?

A. The Royal College of Physicians sent them.

BY THE COURT:

Q. Did the doctor say the main reason was they sent the data?

A. That's right.

Q. For those things?

A. Yes.

THE COURT: Thank you.

A. These are the two years we had the data for.

Cross-examination by counsel continued:

Q. In other words, you weren't sent any other data?

A. No, it was I recall for the individual years. I mean we were sent this graph, but not the data upon which it was based.

Q. Why didn't you request the rest of it?

A. Well, what we were asked to investigate were the figures which were being sent by the Royal College of Physicians, they asked us to investigate those figures and we looked a little further. There is a second reason, of course. The figures between census years are not as accurate.

Q. Not what?

A. Not as accurate, because you have a census only every ten years, so you have to figure, say, from 1960 to 1970.

BY THE COURT:

Q. Excuse me. The doctor says that the intermediate figures are not as accurate?

A. That's right.

Q. As accurate as what?

A. As the 1950 and 1970 figures, because the intermediate figures are based on the national census which takes place every ten years.

Cross-examination by counsel continued:

Q. In other words, we didn't have the actual census figures for the years between '50 and '60 and between '60 and '70?

A. You had no census.

Q. So the figures between census years had to be estimated?

A. They had to be estimated.

Q. How were they estimated?

A. I think Burk and Yiamouyiannis just plotted these points on a graph and read off on a straight line. -- Transcript, May 8, 1978, pages 72-72A and 73-74.

The witness objected to linear interpolation to estimate population figures between census years in working up observed cancer death rates between census years.

The procedure can be illustrated: in all ten experimental cities there were 21,485 reported cancer deaths in 1950, and 22,678 reported cancer deaths in 1955. The aggregate population (in thousands) of the ten experimental cites was 11,886,000 in 1950, as reported by the United States census. The aggregate population (in thousands) of the ten experimental cities was 11,500,000 in 1960, as reported by the United States census. Because there was no census in 1955, the aggregate population of those cities must be estimated for that year = 11,886,000 – [(11,886,000 – 11,500,000/10) x 5] = 11,693,000. The observed cancer death rate in 1950 for those cities as a weighted average is 21,485/11,886,000 = 180.8 cancer deaths per 100,000 population. And for 1955, 22,678/11,693,000 = 193.9 cancer deaths per 100,000 population. The difference between the two CDRo values is that for 1950 the common denominator is reduced from the reported census figure, while in 1955 the common denominator is reduced from an interpolated estimate.

Dr. Newell of the Royal Statistical Society insisted that this procedure is improper, and that all intercensal cancer death rates are too unreliable and should be disregarded. This urging effectively meant that we should close our eyes to the basic data as if they did not exist, and hope for the best.[19]

But Ockham's razor obliges us to take as established, unless the contrary should appear, that, if a population grows or declines by a certain number between census years, the change occurs in approximately equal increments in each

intervening year. A short-term boom and bust in a local economy may cause

irregular growth or decline in a local population. And internal migrations within

even a large country like the United States may under some circumstances cause

irregular growth and decline in the population of a particular city. And such

irregular growth and decline can sometimes weaken the accuracy of an interpolated

estimate. But the basic data, as expressed in weighted averages, pool ten major

central cities situate in different regions of a great continent in each of two large

groups. It is irrational to suppose such an aggregate population will grow or

decline so irregularly that interpolated estimates will be materially in error.

Dr. Newell admitted that he received the data he used from the Royal College

of Physicians. The more ultimate source of his data is even more interesting, as

was revealed in further cross-examination before Judge Flaherty:

> Q. Doctor, you've mentioned that you used the data that were given to you by the Royal College of Physicians. Do you know where they got it?
>
> A. It came, it must have come from the National Cancer Institute of the United States.
>
> Q. So you concede that the data did come from the National Cancer Institute. Then there is no question about it?
>
> A. No question. -- Transcript, May 8, 1978, pp. 75-76.

This ultimate source is important, because, in proceedings before Judge Farris,

none other than Dr. *Guy* Newell, who had supervised preparation of the Upton

Statement for the National Cancer Institute, testified against the plaintiffs, this time appearing as a Professor of Epidemiology in the Medical School at the University of Texas. On cross-examination, this Dr. Newell was questioned about the use of linear regression and linear interpolation as they applied to the basic data which the other Dr. Newell had claimed were so improper upon data gathered by Dr. Burk. And on these fine points, the whole case turned. Due to the importance of this part of the trial, the courtroom was tense and silent as questions were asked and answers were given:

Q. If you wanted to demonstrate the true trend of the field of points, as pictured on this graph, would you draw a line from one end point to the other, or would you use a line of best fit, going through the entire field of points?

A. You would do both. If you had only two points, you would draw a line from one to the other and then extrapolate. If you had a field of points, you would do a best fit regression. -- Transcript, page 1649 (January 26, 1982)

Questioning continued:

Q. For the field of points, would you use the best fit line?

A. If the data are accurate.

Q. If the data are accurate. Let me ask you another question, Doctor. Isn't it quite regular in cancer epidemiology to ascertain cancer death rates for years between census years by a procedure called linear interpolation?

A. Yes. -- Transcript, page 1651 (January 26, 1982).

So the question was clearly raised whether the interpolated estimates in the basic data used by Dr. Burk were reliable enough for epidemiological use, or rendered the data inaccurate and meaningless. Then came the crucial moment of the trial:

Q. In Vital Statistics we have the number of cancer deaths in every city and county of the United States for every year. Isn't the problem that, in order to get cancer death rates for those year between the census years, we have to work up a data base by linear interpolation?

A. For the denominator.

Q. For the denominator, isn't that correct?

A. But there is nothing bad with that, you understand.

Q. I understand.

A. It is accepted procedure.

Q. It is accepted procedure.

A. Yes. -- Transcript, pages 1653-1654 (January 26, 1982).

Without going into all the technical motions, pleas, demurrers, and arguments, it will be well here to consider the express findings of fact entered Judge Flaherty and Judge Farris, each formally on the record and never overturned:

Judge Flaherty began his discussion of the evidence,

Over the course of five months, the court held periodic hearings, which consisted of extensive expert testimony from as far as England. At issue was the most recent time-trend study of Dr. Burk and Dr. Yiamouyiannis which compared cancer mortality in ten cities which fluoridated their water systems with ten which did not fluoridate over a

period of twenty-eight years from 1940 to 1968. The study concluded that there was a significant increase in cancer mortality in the fluoridated cities. -- Opinion, November 16, 1978, page 6.

Judge Flaherty then defined the question before him:

The sole question before him is whether fluoride may be a carcinogen. -- Opinion, November 16, 1978, page 6.

He then found:

Point by point, every criticism made of the Burk-Yiamouyiannis study was met and explained by the plaintiffs. Often the point was turned around against the defendants. In short, this court was compellingly convinced of the evidence in favor of the plaintiffs. -- Opinion, November 16, 1978, page 9.

Judge Farris found upon a fair preponderance of the evidence:

That artificial fluoridation of public water supplies, such as is contemplated by Houston City Ordinance No. 80-2530, may cause or may contribute to the cause of cancer, genetic damage, intolerant reactions, and chronic toxicity, including dental mottling, in man; that said artificial fluoridation may aggravate malnutrition and existing illnesses in man; and that the value of said artificial fluoridation is in some doubt as the reduction of tooth decay in man. -- Findings of Fact and Conclusions of Law, May 24, 1982, pages 1-2.

 Now for the legal aftermath, political fallout, and historical significance:

Appellate courts in Pennsylvania and Texas did not react well to these

powerful judicial findings, which is regrettable, but only a temporary setback in the

unrelenting march of scientific and legal history. Sir John Elliot died in prison

following his arrest for a speech he delivered in Parliament. But thirty-seven years

after his death, the wrong against him was acknowledged by the House of Lords in

England, and today legislators enjoy an important immunity from arrest for what they say in the course of legislative business. We all owe a debt to Sir John Elliot. Sometimes the law is tardy, but the law cannot forever deny justice, and in those cases in which the law has spoken after much delay, the law often speaks so memorably that a monument to legal tradition is established. In due course others will be able to build upon the foundations laid in the courtrooms of Judge Flaherty and Judge Farris.

Jurisdiction to enter the findings entered on November 16, 1978, was expressly sustained on appeal in *Aitkenhead v. West View*, 397 Atl. 2d 878 (Pa. Cmwlth. 1979). Then on a rather contrived technicality of administrative law, defying traditional principles of equity jurisdiction, it was held in *Aitkenhead v. West View*, 442 Atl. 2d 364 (Pa. Cmwlth. 1982), that the court of first instance could proceed no further. By then, in any event, Judge Flaherty was sitting on the Pennsylvania Supreme Court. The findings of Judge Flaherty were left undisturbed on appeal.

As appears in *Safe Water Foundation v. Houston*, 661 S. W. 2d 190 at 192 (Tex. App. 1983), the findings of Judge Farris were expressly sustained on appeal as having been supported by sufficient testimony and exhibits to prove harm by fair preponderance of the evidence, yet for reasons impossible to reconcile with

good sense and sound law it was held that such evidence was still not enough to justify an injunction enjoining legislative power.

The Safe Water Foundation of Texas relied on an old case from a golden age. In *Houston & T. C. Ry. v. Dallas*, 84 S. W. 648 at 653-654 (Tex. 1905), it was held that, where an exercise of general legislative power rests on assumed facts, those facts may be judicially examined, and if, upon inquiry it fairly appears that the means chosen are disproportionate to the end desired, the statute or ordinance should be declared unconstitutional. Obviously, given this rule, the City of Houston could not cause cancer and other ailments in a dubious attempt at reducing tooth decay. But this old case was disregarded. Nothing but the passing of time can remedy such an irrational error.

Even so, there have been good developments which have helped redeem confidence in human nature.

Among other things, the findings of Judge Flaherty have inspired spirited debates in the British House of Lords in which the Earl of Yarborough, Lord Douglas of Barloch, and the Earl Baldwin of Bewdley have delivered grand speeches against artificial fluoridation of public water supplies.[20]

And not long after Judge Flaherty entered his findings, a suit arose of public record as Sandra Green et al. v. Rockland County Department of Health, No. 57/79 on the docket of the Supreme Court of New York in Rockland County. The

complaint pleaded that a county board of health should be enjoined from imposing artificial fluoridation of public water supplies, because fluoride so delivered to the general public is "tumorogenic, mutagenic, teratogenic, and carcinogenic, causing or contributing to widespread cancer in humans," etc. A motion to dismiss was filed and argued. On April 30, 1980, Justice Robert Stolarick noted the judicial findings in Pittsburgh, and held that, if the same facts could be proved again in his court by fair preponderance of the evidence, the proposed imposition of fluoridation would be unconstitutional under the established standard of *Paduano v. New York.* The motion to dismiss was, therefore, denied. Thereupon county health authorities reflected upon their determination to impose fluoridation, and repealed their regulation, whereupon the cause became moot.

The decision of Justice Stolarick is important because it shows that, given scientific evidence already in existence in a form which has been presented before and can be presented again, it should be possible under established law in the United States, and probably also in Canada, to win injunctions enjoining artificial fluoridation of public water supplies.

In November 1979, an interdisciplinary committee led by Dr. Benoît Bundock returned a comprehensive report on artificial fluoridation of public water supplies, in which they advised the Environment Minister for the Province of Quebec in Canada that the findings of Judge Flaherty were scientifically correct.[21]

Again, in April 1980, Dr. Brian Dementi returned an official report on artificial fluoridation of public water supplies to the Virginia Department of Health, in which he advised the Commonwealth that the findings of Judge Flaherty were scientifically correct.[22]

Finally, on June 29, 2000, the professional union at the national headquarters of the United States Environmental Protection Agency appeared through its senior vice president before a subcommittee of the United States Senate, and advised the government of the United States that the judicial findings Judge Flaherty and Judge Farris were scientifically correct. A copy of this remarkable statement is attached as an appendix to this chapter.   It speaks to the future.

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1 - Two comprehensive law review articles covering reported judicial decisions on artificial fluoridation of public water supplies are by Douglas Balog, *Fluoridation of Public Water Systems: Valid Exercise of State Police Power or Constitutional Violation?*, 14 Pace Envtl L. Rev. 645 (Pace University 1997), and J. R. Graham and Pierre Morin, *Highlights in North American Litigation During the Twentieth Century on Artificial Fluoridation of Public Water Supplies*, 14 Jour. Land Use & Envtl. L. 195 (Florida State University 1999). In the latter article, the trials before and findings of three American judges are discussed in some detail, including ample context in legal history.

2 - *Commentaries on the Laws of England*, Edward Christian, London, 1765, Bk. I, p. 134.

3 - *Bigalow v. RKO Radio Pictures Inc.,* 327 U. S. 252 at 264-265 (1946).

4 - *Julian Petroleum Corp. v. Courtney Petroleum Co*., 22 F. 2d 360 at 362 (9 Cir. 1927).

5 - Ruth Roy Harris, *Dental Science in a New Age: a History of the National Institute of Dental Research*, Montrose Press, Rockville, Md., 1989, pp. 112 and 396.

6 - These many studies have been discussed in Chapter IV. But among some of the most outstanding examples of work confirmatory of Dr. Taylor's results are the contributions of Dr. John Emsley and others at the University of London, reported in their article *An Unexpectedly Strong Hydrogen Bond: Ab Initio Calculations and Spectrospopic Studies of Amide-Fluoride systems*, 103 Jour. Am. Chem. Soc. 24 (1981), and the work of Dr. Takeki Tsitsui and others at Nippon Dental University, reported in their article, *Sodium Fluoride-Induced Morphological and Neoplastic Transformation, Chromosome Aberrations, Sister Chromatid Exchanges, and Unscheduled DNA Synthesis in Cultured Syrian Hamster Embryo Cells*, 44 Cancer Res. 938 (1984). Important papers on the related phenomenon of mutagenesis induced by fluoride are Aly Mohamed and Mary Chandler, *Cytological Effects of Sodium Fluoride on Mice*, 15 Fluoride 110 (1982), and Takeki Tsitsui and others, *Induction of Unscheduled DNA Synthesis in Cultured Oral Keratinocytes by Sodium Fluoride*, 140 Mutation Res. 43 (1984). Much inferior in quality is a study authorized by the government of the United States: John Bucher and others, *Results and Conclusions of the National Toxicology Program's Rodent Carcinogenity Studies with Sodium Fluoride*, 48 Int. Jour. Cancer 733 (199l). It appears almost as if the study was designed to show no carcinogenic potential of fluoride, yet it showed a dose-dependent, statistically significant trend of osteosarcomas of bone in male rats, which was actually confirmed by independent epidemiological studies: Perry D. Cohn, *A Brief Report on the Association of Drinking Water Fluoridation and the Incidence of Osteosarcoma Among Young Males*, New Jersey Department of Health, 1992, and John Yiamouyiannis, *Fluoridation and Cancer: the Biology and Epidemiology of Bone and Oral Cancer Related to Fluoridation*, 26 Fluoride 83 (1993). Dr. Bucher and his colleagues conceded the findings in eleven published studies on the mutagenic potential of fluoride, recommended further work on fluoride and osteosarcomas, and noted the importance of revisiting epidemiological surveys on fluoridation and cancer. The official reaction at the United States Public Health Service was to stop further investigation.

7 - The epidemiological work of Dr. Burk in the form which he considered most satisfactory at the time of his death, and related scientific particulars, was comprehensively explained by John Remington Graham in a deposition given by him on December 8, 2003. The testimony was given under oath in reference to a full battery of exhibits marked and introduced. The deposition, including testimony and exhibits, is a matter of public record in Shirley Macy et al. v. City of Escondido et al., No. GIN 015280 on the docket of the Superior Court of California in San Diego County.

8 - See, e. g., Sir Austin Bradford-Hill, *Short Text on Medical Statistics*, Hodder & Stoughton, London, 1977, especially pp. 161-198 on the measurement of correlation, linear regression, calculation and statistical significance of the correlation coefficient, the direct and indirect methods for standardization of death rates, etc.

9 - Los Angeles, Boston, New Orleans, Seattle, Cincinnati, Atlanta, Kansas City (Missouri), Columbus (Ohio.), Newark, and Portland.

10 - Chicago, Philadelphia, Baltimore, Cleveland, Washington D. C., Milwaukee, St. Louis, San Francisco, Pittsburgh, and Buffalo.

11 - Starting with Atlanta and Seattle in 1969 and other control cities thereafter.

12 - With the exception of Boston for the years 1953-1954 and 1956-1958. In those years, cancer deaths for were estimated by linear interpolation. The estimates are certainly very close to accurate, and it was believed better to include Boston with estimates for these years, than to exclude the city altogether, lest the association between fluoridation and cancer be exaggerated. The objective of Dr. Burk and his co-workers was not to overstate the case, but to supply the facts as accurately and fairly as possible.

13 - The principles here discussed are drawn from the aphorisms in the first book of the *Novum Organum* by Sir Francis Bacon, and the rules of reason set forth at the beginning of the third book of the *Philosophiae Naturalis Principia Mathematica* by Sir Isaac Newton.

14 - As appears in *Hearings before a Subcommittee of a Committee on Appropriations, House of Representatives, 94th Congress, 2nd Session, Labor and HEW Appropriations, Part 7*, U. S. Government Printing Office, Washington D. C., 1976, pp. 1064-1065.

15 - In proceedings before Judge Farris, Dr. Burk gave extended testimony on adjustments for age, race, and sex, including reference to both direct and indirect methods. His testimony on demographic adjustments appears in the trial transcript on pages 48-105 (January 13-14, 1982). His active attention to the question of demographic adjustments is reflected in a series of articles published in two sets. The first set, representing his earlier views, was published as Dean Burk and John Yiamouyiannis, *Fluoridation of Public Water Supplies and Cancer Death Rates*, 35 Fed. Proc. Am. Soc. Biol. Chem. 1707 (1976), and *Fluoridation and Cancer: Age-Dependence of Cancer Mortality Related to Artificial Fluoridation*, 10 Fluoride 123 (1977). The second set, representing his matured views, was published as Dean Burk and J. R. Graham, *Lord Jauncey and Justice Flaherty: Opposing Views on the Fluoridation-Cancer Link*, 17 Fluoride 63 (1984), and Dean Burk, J. R. Graham, and Pierre Morin, *A Current Restatement and Continuing Reappraisal Concerning Demographic Variables in American Time-Trend Studies on Water Fluoridation and Human Cancer*, 61 Proc. Pa. Acad. Sci. 138 (1988).

16 - Reprinted in *Hearings before a Subcommittee of the Committee of Government Operations, House of Representatives, 95th Congress, lst Session, Government Operations and Human Resources, Part 2, Fluoridation of Public Water Supplies, September 21 and October 12, 1977*, U. S. Government Printing Office, Washington D. C., 1977, pp. 104-120.

17 - Reprinted ibid., pp. 219-230. This paper was by Drs. Peter Oldham and Davis Newell, and published by the Royal Statistical Society as *Fluoridation of Water Supplies and Cancer -- A Possible Association?*, 26 Applied Statistics 125 (1977).

18 -The prepared statements of Dr. Yiamouyiannis, controverting the Upton Statement on September 21 and October 12, 1977, are reprinted op cit. *Hearings, 95th Congress*, pp. 3-17 and 310-318.

19 - Dr. Newell of RSS actually helped convince Lord Jauncey, a British judge, to adopt this fabulous proposition, as appears in the opinion in causa Catherine McColl v. Strathclyde Regional Council, handed down in the High Court of Sessions in Edbinburgh, June 1983, pp. 148-154. But see the commentary of Dr. Burk et al. in op. cit. *Lord Jauncey and Justice Flaherty*, pp. 68-69.

20 - *Hansard's Parliamentary Debates*, House of Lords, November 15, 1979, pp. 1446-1450 (Yarborough), and 1461-1468 (Barloch); December 16, 1998, pp. 1394-1399 and 1427-1429 (Bewdley).

21 - Benoît Bundock, et al., *Les fluorures, la fluoruration, et la qualité de l'environnement,* Ministère de l'Environnement, Gouvernement du Québec, Ste-Foy, Novembre 1979, pp. 1-2, 103-104, 107-108, 116-117, 197-200.

22 - Brian Dimenti, *Fluoride in Drinking Water*, Department of Health, Commonwealth of Virginia, Richmond, April 1980, pp. 29-34.