

Woburn's Burden of Proof: Corporate Social Responsibility and Public Health

MELISSA E. FUCHS

A cluster of childhood leukemia cases identified in Woburn, Massachusetts was linked to consumption of water from contaminated municipal wells. In an effort to prove that corporate pollution was responsible for the illnesses, the affected families utilized two new applications of science: popular epidemiology and clinical ecology. The Woburn trial became the archetype for the "toxic tort" case and defined a new role for the environmental sciences in the law. The scientific research exploring the causal chain between environmental hazards and disease led to debate on the appropriate standards of proof for the laboratory and the courtroom.

Woburn, Massachusetts, is a small, quiet working-class community of 37,000 people located just twelve miles north of Boston.¹ Between 1965 and 1980, nineteen Woburn children contracted leukemia, a rate three times the national average. Eleven of those children died.²

Over the past decade, Woburn has become a focal point for debate on some of the hottest topics in law, the environment, and public policy. The struggle of several Woburn families to identify a leukemia cluster, link it to their contaminated water supply, and win compensation from the industries responsible for this pollution has gained national attention. The events and the personalities of this tragedy have been covered in major newspapers, television shows, a best-selling book, and will soon be featured in a star-studded Hollywood production. Yet a key aspect of this drama is overlooked by most; that is, the science behind the courtroom battle. Science, especially two new applications of science—popular epidemiology and clinical ecology—made this case legitimate and spawned a new breed of "toxic torts." Jan R. Schlichtmann, lead counsel for the plaintiffs, recognized the broad significance of the Woburn case in resolving environmental health disputes:

*it's the bringing of the case, and the fact that truth was uncovered...scientifically, medically, politically, legally, socially—that served as an emetic to help us, our society, deal with this issue. It didn't solve it, but it helps, just like any other step toward the truth.*³

The year 1979 marked the beginning of official investigation, community activism, and government intervention regarding cancer and environmental hazards in Woburn. Toxic wastes—lagoons containing lead, chromium, and arsenic—were found on the Industriplex site, a new industrial development in northeastern Woburn.⁴ Though concerns about the purity of Woburn's natural resources were not new, officials could no longer ignore such complaints when two of the city's wells were also found to be polluted and subsequently closed. Residents had previously expressed in the

Woburn Daily Times that the water from wells G and H was "very unpotable, very hard, and has a strong chemical taste," and they had formed a committee which presented the mayor with a petition demanding that the wells be shut down in the spring of 1969.⁵ Not until May of 1979, as part of routine drinking water quality tests, did the Department of Environmental Quality Engineering (DEQE) find that wells G and H contained unacceptable levels of volatile organic substances,⁶ which are considered "probable carcinogens" by EPA.⁷

This year brought an additional piece of bad news to Woburn: residents learned that the rate of death from cancer was significantly above the average for a city of its size and population characteristics, with clustering in the eastern part. Anne Anderson, mother of a leukemia victim, noticed an unusually high number of leukemia cases in her small Pine Street neighborhood. After futile attempts to obtain information about leukemia incidence from various state and local agencies, Anderson and her community pastor, Reverend Bruce Young, organized a meeting at the Trinity Episcopal Church in October, 1979 for the relatives of children with leukemia and of those who had died from it in the preceding fifteen years.⁸ They plotted the twelve cases identified on a map of Woburn and found that six of them were closely grouped within blocks of the Anderson home.⁹ Later they learned that the odds against six cases within a half-mile radius, according to CDC, are 100 to 1.¹⁰

A month later, Anderson, Young, and twenty others formed the group For a Cleaner Environment (FACE) to solidify and expand their activist efforts. Efforts by FACE led to unprecedented appropriations from the state environmental agency and EPA to trace groundwater movement and determine how and when wells G and H became contaminated.¹¹ In addition, DPH requested assistance from CDC to conduct a study to search for a common denominator in the cancer cases. The study was released on January 23, 1981 and concluded that:

*The hypothesis suggesting that the increase in leukemia incidence was associated with environmental hazards in Woburn, and specifically with the contamination of drinking water supplies, is neither supported nor refuted by the study findings.*¹²

Childhood leukemia in Woburn occurred about twice as often as would be expected overall—and 7.5 times as often within the half-mile radius of the Anderson residence.¹³ The study was limited, however, by lack of information existing on the childhood leukemia mortality and incidence prior to 1969 and the state of the water in the wells during their actual time of operation. Immediately following this report's release, DPH began to examine cancer mortality rates for the decades preceding 1969-1978. Using information about when the wells were brought on-line and the periods in which they were active, Telles wrote in *Cancer Mortality in Woburn: A Three Decade Study (1949-1978)* that:

One of the purposes of this study was to test further whether there was an association between the use of water from wells G and H and the occurrence of leukemia. These additional data seem to weaken this association. The number of childhood leukemia deaths began to rise in the 1959-1963 period, before the wells were drilled and continued to rise in the period in which the wells were drilled.¹⁴

Young and other activists did not agree with the DPH conclusion that leukemia mortality had begun to rise in 1959, five years before well G and eight years before well H began pumping. He felt the observed 20 percent elevation should not have been judged significant because the actual numbers were too small, 3 cases as opposed to the expected number of 2.5. Young posited that the beginning of the mortality rise should have been listed as 1964-68, during which time both wells came on-line.¹⁵ On November 17, 1981, the same day that *Cancer Mortality in Woburn* was released, the Harvard School of Public Health announced that they planned to team up with FACE members to conduct an extensive study of public health in Woburn.¹⁶ This collaboration between citizens and scientists was

a landmark in the annals of environmental health research. It is believed to be the first time that sophisticated methods of statistical analysis have been combined with an ambitious data-gathering effort by the community directly involved.¹⁷

The researchers trained over 300 community volunteers on how to conduct the telephone survey, which reached 3,257 households—54 percent of the target population.¹⁸

During this period, the state DEQE continued hydrogeological investigations. In March of 1982, DEQE published a report that determined that the contamination source was not the Industriplex site, as had been previously believed, but rather Cyrovac, Inc. and the John J. Riley Tannery, facilities of W.R. Grace and Beatrice Foods, respectively.¹⁹ In May, eight families of leukemia victims, including the Andersons, filed a suit in U.S. District Court in Boston against Grace and Beatrice for waste disposal practices that led to water contamination and disease.²⁰ Grace and Beatrice vehemently contested the suit, stating that there was no direct evidence linking the chemicals they used to deaths or illnesses in Woburn. This case would set a precedent for pollution trials across the country, since it was “the first time a jury has had the opportunity to hold a corporation accountable for polluting a public water supply resulting in people contracting serious diseases.”²¹

Results of the two-year study by FACE and the Harvard School of Public Health were made public on February 8, 1984, and the *Boston Globe* ran a cover story headlined “Woburn leukemia linked to tainted water.”²² Childhood leukemia, fetal and newborn deaths, and several birth defects such as cleft palate and Down’s syndrome were found to be significantly associated with consumption of water from wells G and H. Children with leukemia received, on average, 21.2 percent of their yearly water supply from the wells, whereas children without received just 9.5 percent of their water from those wells.²³ Simply put, “the more bad water residents drank, the higher the likelihood that pregnant women and children would suffer serious health consequences.”²⁴ For these findings to be explained by a factor

other than exposure to wells G and H, “it would have had to vary in both space and time the same way the water did.”²⁵

Though the plaintiff families and their attorney, Jan Schlichtmann, hoped that the Harvard study would represent a significant piece of evidence in their favor, they did not rely on its statistical findings alone to prove the elusive cause-and-effect relationship between waste disposal practices and the cases of childhood leukemia. They enlisted expert witnesses in fields including geology, hydrology, immunology, hematology, oncology, psychiatry, and microbiology. Since “court deadlines press harder than Superfund target dates,”²⁶ Schlichtmann’s firm usually obtained the results of scientific tests much quicker than state, local, and federal authorities—which later benefited from this research. Anthony Roisman, founder of Trial Lawyers for Public Justice, agreed that:

Woburn is doing for medical toxicology what World War Two did for aviation because the need in the courtroom has created the financial support for toxic research that wasn’t available before.²⁷

Schlichtmann invested \$2.6 million²⁸ on the case, banking on the predictions of many—including the judge assigned to the case, Walter J. Skinner, who said the potential jury award was “astronomical.”²⁹

The court jury found on July 28, 1986 that W.R. Grace had negligently dumped chemicals and had “substantially contributed to the contamination” of the two wells, but Beatrice Foods was absolved.³⁰ In addition, the jurors, in answer to one of four questions posed by Judge Skinner, listed September, 1973 as the earliest date for which Grace’s negligence resulted in contamination of the water wells. Since several of the plaintiffs contracted leukemia before that date, Schlichtmann feared that this answer would become an obstacle in proving that Grace was responsible.³¹ On the eve of the second trial, an \$8 million, out-of-court settlement between the victims’ families and W.R. Grace was reached.³² Part of the settlement involved Judge Skinner granting Grace’s motion for a new trial and rendering the verdict null. Furthermore, Grace’s lawyers demanded that, for public-relations purposes, it had to appear as if the settlement had come about only after the judge declared a new trial. Schlichtmann reluctantly agreed to this fictitious chronology because he suspected that the judge was planning to order a new trial anyway.³³ The *New York Times* reported that:

Judge Walter Jay Skinner ruled in favor of an appeal by Grace and ordered that the first stage be held over again because of trial errors. He said the jury had confused crucial dates about when the pollution occurred.³⁴

The settlement left many of the key issues in the case unresolved, and there was no clear winner or loser. Anderson, who frequently assumed the role as spokeswoman for the families, treated the \$8 million settlement as a victory, “I think we sent a message to corporate America, and I think it was heard well.”³⁵ An official statement from Grace, however, continued to maintain that the company was not responsible for the chemical contamination of the two wells in Woburn or the leukemia deaths. According to the statement, Grace had decided to make the settlement only

because of the enormous costs of the trial and the “additional strain on the families.”³⁶ The data from the Harvard health study and the extensive medical examinations were not used in the trial, which never got to the second stage of assessing the causal chain of pollution and illness. Even if the case did not succeed in “ring[ing] alarm bells in corporate boardrooms across America,”³⁷ as Schlichtmann had hoped, it created the precedent for a new role for the environmental sciences in the courtroom. Woburn was the first case in which a jury had the opportunity to hold polluters responsible for the medical consequences of their actions³⁸ since similar cases had been thrown out or settled without a verdict.³⁹ The Woburn families and Schlichtmann tackled the scientific complexity in their search, first, for answers, and later, for evidence. Schlichtmann felt that Woburn created a national precedent:

*The most important thing that it [the trial] did was show, like the little choo-choo, that you can. It's the trying that's the important thing, not in the end, whether you're successful.... That's what the corporations are afraid of, it's just the bringing of them, not whether they win them in the end, but whether they're brought, because sooner or later, one or two or three will win, in the end, they will win.*⁴⁰

In the process, the Woburn community and their attorney ushered in two new “disciplines” of science: popular epidemiology and clinical ecology.

Woburn gained national attention as a result of its citizens' initiatives in discovering the leukemia cluster and pursuing the subsequent investigations. Woburn is considered the first example of popular epidemiology strong enough to formulate a detailed concept:

*popular epidemiology is the process by which lay persons gather scientific data and other information and direct and marshal the knowledge and resources of experts to understand the epidemiology of disease.*⁴¹

Social movements are an integral part of popular epidemiology which seeks political and judicial remedies—and “unite[s] lay and scientific perspectives in an effort to link science and politics.”⁴² The Woburn cluster was originally detected, not by public health or other government officials, but rather, by members of the affected community itself:

*In the waiting room [of Dr. Truman], Mrs. Anderson sat among other mothers with leukemic children. Afterward, she recognized some of them shopping in Woburn. She learned about an infant who had died of leukemia, then discovered that the child had lived somewhere in East Woburn. She noticed a woman putting trash out in front of a house down the street, and later saw the same woman at the hospital—waiting for a leukemic child.*⁴³

Fears among Woburn residents about the silent health risks of environmental contamination were channeled into the collaboration between FACE and the Harvard School of Public Health—together creating the study which became a “model for low-cost epidemiology.”⁴⁴ Professor Marvin Zelen, one of the biostatisticians leading the project, commented on the utility of popular epidemiology:

*Government can't afford to mount a study of this magnitude. But this effort demonstrates that there may be another approach—to harness the energy of the town.*⁴⁵

This study, however, met with much criticism from professional and governmental groups—including DPH, CDC, EPA, and the American Cancer Society—who charged that it was biased due to the degree of lay involvement.⁴⁶

Schlichtmann realized that the defense would protest using the Harvard health study as a key piece of evidence and that a statistical link between the incidence of leukemia and exposure to wells G and H was not enough to prove his case:

*Even if you were able to determine, as the Harvard study did, that there was a statistical relationship between the incidence of disease and exposure to the water, how do you prove that Jimmy Anderson's leukemia...was because of the water?...The way we approached the solution to that problem was that we basically looked at it as a clinician would look at it.*⁴⁷

Schlichtmann retained the services of dozens of scientists and physicians, including Dr. Allan Levin, a self-designated “clinical ecologist,”⁴⁸ who testified in court that exposure to common industrial chemicals damages the immune system. He tied TCE to cell damage, in particular to altered lymphocytes—which are, in effect, precancerous cells, and are easily connected to leukemia. According to Roisman, his approach—which links many illnesses to immune system injury and ties immune injury to pollution—led both sides to, “refer to Levin as Galileo, because he's regarded by the ‘establishment’ as a heretic, and by the plaintiffs as a genius.”⁴⁹ Schlichtmann used the living family members as examples of chronic industrial solvent poisoning and illustrations of this theory.

The scientific controversies raised by the Woburn case illustrate how such differences in the testimonies are reconciled:

*In a court of law, the jury is the ultimate determiner of which is more reasonable, and the standard that the jury is instructed to follow...it's what's more probably true than not.*⁵⁰

The role of science in the courtroom is inextricably linked with this standard of proof—and the question of whether this standard differs from that of the scientific community at large lies at the heart of cases such as Woburn. Kevin Conway, one of Schlichtmann's law partners who also worked on the Woburn case, sees

*a big difference between science in the courtroom and science in the laboratory...the law requires that something be proved probably, rather than certainly.*⁵¹

Schlichtmann, to the contrary, believes that this perceived difference is superficial. He feels that the standard of a “very high level of confidence” propounded by the scientific community is, for all practical purposes, identical to the “reasonable scientific certainty” required in a court of law:

[So when] scientists like to say there's a difference, I tell you, as a lawyer who has studied this issue, it is my opinion that there is no difference because the...same psychodynamics a scientist or doctor goes through deciding whether what he sees is true or not is exactly the same as what occurs in the courtroom.⁵²

Lawyers for Grace, however, filed papers in court stating that “there is no scientific basis for concluding that the alleged exposure of the plaintiffs [to the chemicals] caused any harm,” because they interpreted “scientific basis” to mean 100 percent certainty.⁵³ According to the author of the report of a Congressionally authorized study group created by Superfund, toxic tort cases “present challenges to the legal system for which it is wholly unprepared”⁵⁴—applying customary rules of evidence to slippery scientific concepts.

As the Woburn case brought into focus conflicting views on standards of proof, it became “a forum for national debate”⁵⁵ not only on the role of science in the courtroom, but on issues of corporate social responsibility as well. Business watched this case closely, for, in the words of one government attorney, a victory for the plaintiffs had “major, major implications for companies.”⁵⁶ Corporations could no longer complacently pollute their surroundings with hazardous wastes without the threat of retribution. As lawyers in Woburn “wrote the casebooks for the new age of toxic tort,”⁵⁷ they set a precedent for other lawsuits brought by individuals trying to show that toxic chemicals were responsible for serious health problems.⁵⁸ Schlichtmann feels that these various debates can be integrated in one key issue:

*Corporate social responsibility, science, and accountability are all part of the same process of truth-finding.... It is the blessing and the curse of our system that, in the courtroom, these things come together...Society is made better when it allows truth to be heard, and, through the legal system, we can combat corporate abuse, or more generally, the abuse of power.*⁵⁹

Woburn gained national attention because it reflected the social conflicts inherent in the expanding field of environmental health. It brought to light the scientific controversies surrounding, specifically, the causes of cancer, and, more generally, the standard of proof appropriate for the courtroom. It was a landmark in the development of the toxic tort case—as it highlighted the tension between corporate social responsibility and public health. As clusters continue to be identified across America, suffering families can look to the struggle of women like Anne Anderson for hope and inspiration. Woburn became a symbol: not only of environmental contamination, but also a positive “symbol of how we can move forward.”⁶⁰

References

- (1) Phil Brown and Edwin J. Mikkelsen, *No Safe Place: Toxic Waste, Leukemia, and Community Action*, Berkeley: University of California Press, 1990, 7.
- (2) William F. Doherty, “Jury: Firm Fouled Wells in Woburn,” *Boston Globe*, July 28, 1986, 1.
- (3) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (4) Wendy O'Donnell, Case Program C16-86-659.0, Kennedy School of Government, Harvard University, Cambridge, MA, 1986.
- (5) Jonathan Harr, *A Civil Action*, New York: Random House, 1995, 23.
- (6) Norman Telles, *Cancer Mortality in Woburn: A Three Decade Study (1949-1978)*, Department of Public Health, Commonwealth of Massachusetts, November 17, 1981. Appendix, portions of EPA report F1-8010-04B.
- (7) Eliot Marshall, “Woburn Case May Spark Explosion of Lawsuits,” *Science*, Vol. 234, No. 4775, 418.
- (8) Wendy O'Donnell, KSG C16-86-659.0, 4.
- (9) Brown and Mikkelsen, 12.
- (10) Evan T. Barr, “The New Age of Toxic Tort: Poisoned Well,” *New Republic*, Vol. 194, No. 11, March 17, 1986, 18.
- (11) Paul Diperna, “Leukemia Strikes a Small Town,” *New York Times*, December 2, 1984, 103.
- (12) Gerald Parker and Sharon Rosen, *Woburn: Cancer Incidence and Environmental Hazards*, Department of Public Health, Commonwealth of Massachusetts, January 23, 1981, 2.
- (13) Diperna, 1984, 104.
- (14) Norman Telles, 7.
- (15) Wendy O'Donnell, Case Program C16-86-660.1, Kennedy School of Government, Harvard University, Cambridge, MA, 1986, 1.
- (16) “Harvard to aid Woburn toxic study,” *Boston Globe*, November 18, 1981, 25.
- (17) Richard A. Knox, “Woburn health-risk study to be released,” *Boston Globe*, February 8, 1984, 18.
- (18) J. Raloff, “Woburn survey may become a model for low-cost epidemiology,” *Science News*, Vol. 125, No. 7, February 18, 1984, 104.
- (19) Brown, *Environment*, 25.
- (20) Harr, 81.
- (21) Matthew L. Wald, “Jury in Cancer Death Suit Says Factory Polluted Wells,” *New York Times*, July 29, 1986, I, 8.
- (22) Richard A. Knox, “Woburn leukemia linked to tainted water,” *Boston Globe*, February 9, 1984, 1.
- (23) “Boston Suburb Ponders Report That Links Its Water to Leukemia,” *New York Times*, February 12, 1984, I, 29.
- (24) Richard A. Knox, February 9, 1984, 1.
- (25) J. Raloff, 104.
- (26) Barr, 20.
- (27) Barr, 20.
- (28) Harr, 453.
- (29) Gene I. Maeroff, “Trial Set in Suit Over 7 Cancer Cases,” *New York Times*, March 9, 1986, I, 36.
- (30) Matthew L. Wald, 8.
- (31) Doherty, 1.
- (32) Jerry Ackerman, “12 Families, Grace Settle Woburn Toxic Case,” *Boston Globe*, September 23, 1986, 1.
- (33) Harr, 451-2.

- (34) Fox Butterfield, "Settlement Averts Key Trial In Deaths Tied to Pollution," *New York Times*, September 23, 1986, 1, 16.
- (35) Jerry Ackerman, September 23, 1986, 1.
- (36) Butterfield, 16.
- (37) Harr, 249.
- (38) Butterfield, September 23, 1986, 16.
- (39) Doherty, July 28, 1986, 1.
- (40) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (41) Brown and Mikkelsen, 125-6.
- (42) Brown and Mikkelsen, 127.
- (43) Diperna, 1984, 101.
- (44) J. Raloff, 104.
- (45) Richard A. Knox, "A community coalition is generated from fears," *Boston Globe*, February 9, 1984, 18.
- (46) Brown, Environment, 26-7.
- (47) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (48) Marshall, 418.
- (49) Barr, 19.
- (50) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (51) Interview with Mr. Kevin Conway, January 12, 1996.
- (52) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (53) Barr, 19.
- (54) Diperna, 1984, 105.
- (55) Gene I. Maeroff, "Trial Set in Suit Over 7 Cancer Cases," *New York Times*, March 9, 1986, 1, 36.
- (56) Lois Therrien, Jonathan Tasini, and Richard Hoppe, "Why Business is Watching This Pollution Case," *Business Week*, March 24, 1986, 39.
- (57) Barr, 18.
- (58) Therrien, Tasini, and Hoppe, 39.
- (59) Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- (60) Daniel Greenbaum, commissioner of Massachusetts Department of Environmental Protection, in Dumanoski, 1.
- Brown, Phil and Edwin J. Mikkelsen. *No Safe Place: Toxic Waste, Leukemia, and Community Action*. Berkeley: University of California Press, 1990.
- Butterfield, Fox. "Settlement Averts Key Trial In Deaths Tied to Pollution," *New York Times*. September 23, 1986, 1, 16.
- "Dark days for toxic polluters," *US News and World Report*. Vol. 101, No. 6, August 11, 1986, 8.
- "Deadly Water: Suing Over Poisoned Wells," *Time*. Vol. 127, No. 14, April 7, 1986, 27.
- Diperna, Paula. "Leukemia Strikes a Small Town," *New York Times*. December 2, 1984, 100-106.
- Diperna, Paula. *Cluster Mystery: Epidemic and the Children of Woburn, Mass.*, New York: C.V. Mosby Company, 1985.
- Doherty, William F. "Jury: Firm Fouled Wells in Woburn," *Boston Globe*, July 28, 1986, 1.
- Dumanoski, Dianne, "4 companies to pay \$69m for Woburn cleanup," *Boston Globe*, July 9, 1991, 1.
- Engineering News Record*, "Pollution suit halts; Woburn well case is settled, but a city suit is coming," October 2, 1986, 14.
- Engineering News Record*, "Firms to spend millions in well pollution pact," No. 3, Vol. 227, July 22, 1991, 22.
- Greenberg, Michael R., ed. *Public Health and the Environment*. New York: The Guilford Press, 1987.
- Ground Water Monitor*, "EPA reaches \$69-million settlement with four Woburn, Mass., companies," No. 15, Vol. 7, July 24, 1991.
- Harr, Jonathan. *A Civil Action*. New York: Random House, 1995.
- "Harvard to aid Woburn toxic study," *Boston Globe*, November 18, 1981, 25.
- Interview with Mr. Kevin Conway, January 12, 1996.
- Interview with Mr. Jan R. Schlichtmann, January 12, 1996.
- Knox, Richard A. "Woburn health-risk study to be released," *Boston Globe*. February 8, 1984, 18.
- Knox, Richard A. "Woburn leukemia linked to tainted water," *Boston Globe*. February 9, 1984, 1.
- Knox, Richard A. "A community coalition is generated from fears," *Boston Globe*. February 9, 1984, 18.
- Knox, Richard A. "Authors' colleague raps Woburn study," *Boston Globe*. June 8, 1984, 21.
- Maeroff, Gene I. "Trial Set in Suit Over 7 Cancer Cases," *New York Times*. March 9, 1986, 1, 36.
- Marshall, Eliot. "Woburn Case May Spark Explosion of Lawsuits," *Science*. Vol. 234, No. 4775, October 24, 1986, 418.
- O'Donnell, Wendy. Case Program C16-86-659.0, Kennedy School of Government, Harvard University, Cambridge, MA, 1986.
- O'Donnell, Wendy. Case Program C16-86-660.0, Kennedy School of Government, Harvard University, Cambridge, MA, 1986.
- O'Donnell, Wendy. Case Program C15-86-660.1, Kennedy School of Government, Harvard University, Cambridge, MA, 1986.
- Parker, Gerald and Sharon Rosen. *Woburn: Cancer Incidence and Environmental Hazards*. Department of Public Health, Commonwealth of Massachusetts, January 23, 1981, 1.
- Pave, Marvin. "Woburn residents hope water study will aid case," *Boston Globe*. February 14, 1984, 19.

Bibliography

- Ackerman, Jerry. "Law, Science Mix During Trial," *Boston Globe*. July 29, 1986, 8.
- Ackerman, Jerry. "12 Families, Grace Settle Woburn Toxic Case," *Boston Globe*. September 23, 1986, 1.
- Bailey, Anne. Press Release, Department of Public Health, Commonwealth of Massachusetts, December 12, 1979.
- Barr, Evan T. "The New Age of Toxic Tort: Poisoned Well," *New Republic*. Vol. 194, No. 11, March 17, 1986, 18.
- "Boston Suburb Ponders Report That Links Its Water to Leukemia," *New York Times*. February 12, 1984, 1, 29.
- Brown, Phil, "Popular epidemiology challenges the system; citizen action in stopping toxic waste pollution of water supply," *Environment*, Vol. 35, No. 8, October, 1993, 16-28.

Raloff, J. "Woburn survey may become a model for low-cost epidemiology," *Science News*. Vol. 125, No. 7, February 18, 1984, 104.

Simon, James. "Woburn Leukemia Death Trial Opens in Court Today: Families Square Off Against two Companies," *Boston Globe*. March 10, 1986, 22.

Tangley, Laura. "Contaminated Groundwater Linked with Disease," *BioScience*. Vol. 34, No. 5, May 1984, 292.

Telles, Norman. *Cancer Mortality in Woburn: A Three Decade Study (1949-1978)*. Department of Public Health, Commonwealth of Massachusetts, November 17, 1981.

Therrien, Lois, Jonathan Tasini and Richard Hoppe. "Why Business is Watching This Pollution Case," *Business Week*. March 24, 1986, 39.

Toxic Materials News, No. 46, Vol. 19, November 18, 1992.

Wald, Matthew L. "Jury in Cancer Death Suit Says Factory Polluted Wells," *New York Times*. July 29, 1986, I, 8.