minority communities. The report of the Secretary's Task Force on Black and Minority Health, on which I served, was published 2 years ago (*3*). At that time, infectious diseases were not even ranked among the six most important causes of excess death in minorities. Those other problems have not disappeared. AIDS is a seventh Horseman of the Apocalypse. Someone who dies of lung cancer caused by cigarette smoking is just as dead, and that death is just as preventable, as someone who succumbs to pneumocystis pneumonia. Indeed, if we could only persuade all cigarette smokers to quit and donate the money they formerly spent on cigarettes to organizations working against AIDS, we could really turn this terrible epidemic to improving the public's health.

Finally, we must keep our eye on the ball—which is to prevent infection with this virus. To do so, we must distinguish the beef, as in "Where's the beef?" from the baloney, as in the recent story, which originated in Atlanta, again exhorting people to the supposed dangers of mosquito-borne transmission of AIDS. There are many other such distractions. Every hour spent focusing on nonsense is an hour not spent dealing with parenteral, sexual, and perinatal transmission, which is what we need to be concerned about.

If we who are concerned about the health status of minorities do what we need to do about AIDS, we shall not only rid our communities of AIDS, we shall also greatly reduce IV drug abuse, other sexually transmitted diseases, and teenage pregnancy. Then, we will indeed rejoice at being free at last.

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Establishment of an Exposure Level to Tetrachloroethylene in Ambient Air in Vermont

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Synopsis

Where environmental contaminants pose potential health hazards, health departments are involved in complex and often controversial situations. Often the rapid formation of a threshold exposure level is required to protect public health. A decision making process was implemented in Vermont when it became necessary to have an interim ambient air exposure level to test for tetrachloroethylene contamination in the water, air, and soil of a community. Contamination of public and private drinking water and ambient air in schools and homes was discovered as a result of uncontrolled waste disposal from an industrial uniform laundry and drycleaning plant.

A telephone survey was conducted to determine action taken by the other 49 States regarding emission standards for tetrachloroethylene into ambient air. There were no guidelines in 25 States, and there were guidelines in the remaining 25.

Vermont's Commissioner of Health convened a multidisciplinary group of public health professionals to review various approaches to the establishment of an ambient air standard. A decision making action using modified Delphi and nominal group consensus methods set the interim standard at 67 micrograms per cubic meter in ambient air. The drycleaning plant had been closed voluntarily before the standard was established, and the interim standard was used to prevent reopening of the plant through a health order issued by the Vermont Health Department. The standard was also useful for guidance during environmental remediation.

DEPARTMENTS OF PUBLIC HEALTH are involved in complex and often controversial situations where environmental contaminants pose potential health hazards. Determining a proper course of action is hampered by a paucity of information on health effects and the lack of standards for the majority of the 60,000–70,000 chemicals in commercial use in the United States (*1*). Yet without a standard or quantitative action level, a public health agency has only limited guidance for intervention, further study, or inaction.

In many situations, the rapid development of a threshold exposure level is required to protect public health. This threshold level may then be used as an advisory, incorporated into guidelines, or formally promulgated through the State's regulatory process. Developing this level for a pollutant involves a series of steps in which existing information on toxicity and carcinogenesis, the experience of other public health agencies, and other related standards are considered, and a decision making process is used. These steps were taken in the summer of 1983, when an interim standard was needed to address the potential health hazard of tetrachloroethylene contamination in the water, air, and soil of Williamstown, VT.

In 1982, the Vermont Department of Health began a statewide surveillance project to determine the levels of volatile organic chemicals in the sources of 50 community water supplies. The project was undertaken under an agreement between Vermont and the Environmental Protection Agency (EPA) to determine the incidence of volatile organic chemicals in the most vulnerable public water supply systems. Vulnerability was based on hydrogeologic conditions and known proximity of the water supply to a source of contamination. As a result of this monitoring, tetrachloroethylene as the primary contaminant, trichloroethylene and its breakdown products, and 1,2-dichloroethylene were found in the community water supply well in Williamstown, a village of approximately 750 persons in central Vermont.

All of the detected levels of these compounds in the public water supply were below the lifetime guidelines of the Health Advisories developed by the EPA (*2*). Health Advisories are technical guidelines that are not legally enforceable but are developed to assist public health officials in the determination of concentrations of contaminants in drinking water at which adverse effects would not be anticipated. Health Advisories were previously called Suggested No Adverse Response Levels (SNARLs) (*3*).

Williamstown was informed of the findings, and an investigation was undertaken to determine the sources of contamination. The only significant user of volatile organic chemicals in the community was an industrial uniform laundry and drycleaning plant located between the elementary school and the high school; it was within 130 feet of the high school building. Concern was heightened by the finding that this drycleaning plant used distilled fluids in the cleaning process and disposed of the tetrachloroethylene-containing sludge in holes measuring 3 x 5 feet (.9 x 1.5 meters) on the hill overlooking both schools.

Three single-home water supply wells near the plant were found to be highly contaminated with a variety of volatile organic chemicals—with tetrachloroethylene levels up to 9 milligrams (mg) per liter (L). In addition, reports and observations of tetrachloroethylene-like odors were noted in the high school next to the plant. The known odor threshold for tetrachloroethylene is 33.5–335 mg per cubic meter (m^3) (*4*). Instantaneous grab samples of the air taken on the property of the high school and elementary school showed concentrations up to 1 mg per m^3. Subsequently, the air in the schools and private homes near the plant was more accurately monitored, using time-integrated samples. Extremely high levels found in two private homes (table 1) led to a recommendation to vacate the homes.

As a result of the findings of tetrachloroethylene contamination of the community water system, private wells, surface water, and soil and in the ambient air near the plant (table 1), questions arose concerning possible health hazards, especially for the students in the schools. There were demands from some parents for the State health department to close both schools because of this potential risk.

Properties, Uses, and Health Effects

Tetrachloroethylene is a widely used chlorinated organic solvent with important applications in the drycleaning of fabrics and degreasing of parts in industry (*5,6*). Approximately 90 percent of the amount of tetrachloroethylene produced in the United States is released to the ambient air as a result of evaporative losses during production, storage, and use (*7–9*).

Tetrachloroethylene has been termed a ubiquitous pollutant because it is so widely detected in the ambient air (*10*). Although it is generally recognized as an atmospheric pollutant,

tetrachloroethylene is also a contaminant of water and of solid wastes. As is common with environmental pollutants, little information is available about the health effects of this substance at the concentrations encountered in Williamstown. Although a Health Advisory was available for tetrachloroethylene in drinking water, there was no readily applicable ambient air standard. Because low levels of tetrachloroethylene are widely detected in ambient air as byproducts of many industrial and commercial activities, inhalation is the principal route by which tetrachloroethylene enters the body (*10*). A secondary source of entry is the ingestion of contaminated drinking water. (*10,11*). Following entry into the body, tetrachloroethylene is absorbed by the blood and distributed throughout the body (*12,13*).

There is extensive documentation of the acute and chronic toxic effects of tetrachloroethylene at substantially higher concentrations from industrial experience and from experimental human and animal studies (*10,12,14,15*). The first gross signs of central nervous system (CNS) depression (decrements in task performance and coordination) and behavioral alterations have been observed in controlled studies in which humans were exposed to tetrachloroethylene at 670 mg per m^3 (100 ppm) for up to 7 hours (*13*).

Tetrachloroethylene is a potential carcinogen; biotransformation of the chemical in the liver is believed to be responsible for its hepatocarcinogenic potential (*16,17*). There have been several retrospective studies of drycleaning and laundry workers exposed to tetrachloroethylene (*18-21*). Although the number of deaths due to cancer was small, the increased risk of cancer noted in one investigation (*18*) underscored the need for additional epidemiologic studies of this occupational group.

Existing Standards

Because of the toxic and potential carcinogenic properties of tetrachloroethylene, there are regulations, although limited, for its control, but at higher concentrations and in noncommunity settings. In the workplace, the current standard of the Occupational Safety and Health Administration (OSHA) is 670 mg per m^3 over an 8-hour workday and a 40-hour workweek. This standard allows a ceiling concentration of 1,340 mg per m^3 and a peak concentration of up to 2,010 mg per m^3 for 5 minutes in any 3-hour period (*22*). These limits were based on toxicity. The Threshold Limit Value (TLV) for tetrachloroethylene is 335 mg per m^3. The American Conference of Governmental Industrial Hygienists established TLVs for specific chemicals to provide exposure limits in the workplace (*23*).

Table 1. Concentrations of tetrachloroethylene found in Williamstown, VT

Media	Number of sample locations	Range of concentrations
Drinking water [1]:		
Public	3	N.D.–0.007 mg per L
Private	57	N.D.–9.0 mg per L
Ambient air:		
Schools	4	N.D.–0.284 mg per m^3
Homes	8	N.D.–67,442 mg per m^3
Soil	20	N.D.–0.050 mg per kg
Surface water	3	N.D.–0.009 mg per L

[1] Health Advisory for tetrachloroethylene in drinking water is 0.020 mg per L. Health Advisories are technical guidelines that assist in determination of concentrations in drinking water at which adverse effects would not be anticipated.

NOTE: N.D. = not detected, mg = milligram, L = liter, m^3 = cubic meter, and kg = kilogram.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be treated in the workplace as if it were a human carcinogen (*14*). This interim recommendation was issued pending full evaluation of the carcinogenic potential of tetrachloroethylene.

Because of the lack of applicable Federal regulations, emissions of tetrachloroethylene into the ambient air must be regulated by individual States. The air pollution control officers of the other 49 States were contacted in a telephone survey conducted in October 1983 to determine what action other States had taken about emission of tetrachloroethylene into ambient air. When the air pollution control responsibility was not located in a State health department, the environmental health section of the State health department was contacted in addition to the air pollution control officer.

According to the agencies contacted, there were no guidelines in 25 States for tetrachloroethylene in ambient air. The guidelines in the other 25 States ranged from 1/2 to 1/420 of the TLV for the chemical.

Development of a Standard

Possible approaches. To develop an interim air standard for Williamstown schools and to ensure the safety of students and school staff, the Commissioner of Health convened a multidisciplinary group of public health professionals. This

'Following a challenge to reopen the plant, the standard was incorporated in a Health Order that required the plant to remain closed unless it could be demonstrated that concentrations of tetrachloroethylene would be less than 67 μg per m^3 at the school property's boundary.'

Table 2. Possible guidelines for standard for tetrachloroethylene exposure of students in Williamstown, VT

Approach	Result
Toxicological approach (range of 25 States):	
Low State (1/420 of TLV)	797 μg per m^3
High State (1/2 of TLV)	167,500 μg per m^3
Carcinogenic risk calculation[1]:	
National Academy of Sciences (*25*)	34.8 μg per m^3
Environmental Protection Agency (*2*)	15.4 μg per m^3
No Observed Effect Level (NOEL) (*2*):	
Elementary school student	7.4 μg per m^3
High school student	10.0 μg per m^3

[1] Carcinogenic risk is defined as 1 excess cancer case per 100,000 people.
NOTE: μg per m^3 = micrograms per cubic meter.

decision making group included the Secretary and Deputy Secretary of the Agency of Human Services (a physician and an attorney with public health educations and backgrounds), an EPA assignee to the Vermont Department of Health, the Director of the Health Department's laboratory, and the Deputy Commissioner of Health (an attorney). A background document was prepared for the group that reviewed the literature on tetrachloroethylene and calculated an ambient air level based on several approaches:

- A fraction of the TLV (1/2 to 1/420),
- An ambient level equivalent to a lifetime cancer risk of one in a million based on potency values of the EPA and the National Academy of Sciences (NAS), and
- Calculation of an ambient level based on a No Observed Effect Level (NOEL) for a hypothetical elementary and a high school student.

These approaches could result in the possible guidelines for tetrachloroethylene exposure in table 2.

Although all the results in table 2 are supportable scientifically, the occupational exposure approach and the NOEL approach were not appropriate. Clearly the levels obtained using a toxicological approach based on an occupational standard were not appropriate for the general public. A TLV is based on protection of healthy workers from exposure in the workplace during an 8-hour workday and a 5-day workweek; the general public is exposed for different durations at different concentrations and includes people who are not healthy. In addition, the TLV for tetrachloroethylene was set in 1968, before the chemical's carcinogenic potential was appreciated.

A NOEL is the concentration of a specific chemical that will not result in any observable noncarcinogenic effect. Excluding considerations of carcinogenicity, this level is the most conservative value used to protect human health in any kind of exposure, be it from air, food, or water. Its adoption was considered to be prohibitively restrictive because of reported ambient measurements elsewhere.

Evaluation of carcinogenic risk of tetrachloroethylene concentrations proved to be helpful, and a modified approach was ultimately used. The evaluation is based on 1 excess cancer case per 100,000 people.

Uptake calculations. To determine an allowable level of tetrachloroethylene in the ambient air of a Williamstown school student, it was necessary to calculate its uptake by the body from all sources of exposure. Several assumptions were made:

- An elementary school student hypothetically drinks 1 liter of water per day and has a total daily respirable volume of 15 m^3 per day, 6.2 m^3 of which is respired during the active school day (*5*).
- A high school student hypothetically drinks 2 liters of water per day and has a total daily respirable volume of 20 m^3, 9 m^3 of which is respired during the active school day (*5*).
- Humans have a 100 percent uptake of ingested tetrachloroethylene and a 30 percent uptake of it in respired air (*3,4*).
- The contaminated public water system contained up to 7 micrograms (μg) per liter (or parts per billion [ppb]) of tetrachloroethylene, and any air exposure must be added to this existing body burden.

Decision making process. Modified Delphi and nominal group consensus methods were used (*24*). The persons in the previously described group, who participated in the Delphi process, were polled individually and anonymously over several rounds of questionnaires. After the Delphi process provided a preliminary consensus, the nominal group consensus process began with a discussion, as each participant gave his or her ideas about an interim standard. These methods provided a structured environment for this group of decision makers.

After formal and informal consideration of all available information and extensive discussions, the decision makers established an interim ambient air exposure level of 67 μg per m^3 (10 ppb) for tetrachloroethylene for evaluating the short-term air quality in and around Williamstown schools. Establishment of this level considered the estimated daily intake from all sources of tetrachloroethylene by school students and staff.

Conclusion

The Commissioner of Health succeeded in persuading management to close the drycleaning plant before the full extent of the contamination had been determined and before the interim standard was set. Following a challenge to reopen the plant, the standard was incorporated in a Health Order that required the plant to remain closed unless it could be demonstrated that concentrations of tetrachloroethylene would be less than 67 μg per m^3 at the school property's boundary. The drycleaning company at first challenged the level as being too low and threatened court action to allow the plant to reopen, but it has remained closed.

The standard was also used to advise the community and parents regarding health risks. Community and school drinking water and ambient indoor air in the schools were measured at monthly intervals for more than 2 years while investigation and remediation of the environmental contamination were undertaken. Results over this period provided long-term evidence of health and safety protection: the standard was exceeded only once, and that was actually a laboratory error. The community remained divided on whether a health risk was present.

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Financing Medical Care for the Underserved in an Era of Federal Retrenchment: the Health Service District

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Synopsis

Federal funding programs have, since the 1960s, been available in a variety of forms to deal with problems of access to medical care for the medically underserved. Certain programs, such as the National Health Service Corps, have recently pulled back from their points of maximal impact in terms of numbers of obligated physicians in the field. This change leaves a need for greater contributions by State and local entities in the face of Federal retrenchment.

The health service district (HSD) is one such mechanism for filling the gap. It has been available under this name in Arizona law since 1977, but the first such district in the State is only now under development in a small copper mining community. Similar to school districts in concept, the HSDs allow residents in their catchment areas to tax themselves for the purpose of delivering primary health care.

Two successful HSDs—or similar entities—in other States are described. One program is in Stickney, IL, and other in Condon, OR. The political success and financial viability of the Condon program are documented.

THE PROBLEM OF ACCESS TO PRIMARY HEALTH care services in remote and rural areas has been well-documented. While some say the diffusion principle—the premise that an increased supply of physicians will result in the diffusion of physicians into rural and other areas which previously had a difficult time recruiting medical manpower—will solve part of the access problem, this process has not occurred. A recent study in Arizona (*1*) indicated that between 1973 and 1983, population growth rates exceeded the percentage increase in primary care physicians in 5 of 13 primarily rural counties. This finding supports the conclusion of Fruen and coworkers (*2*) that counties with the smallest populations and numbers of physicians have shown the least improvement in physician densities.

Federal Role

The Federal Government has in recent years addressed the issue of medically underserved areas, urban and rural, through the definition of underserved populations and designation of Health Manpower Shortage Areas (HMSAs) and Medically Underserved Areas (MUAs). The designation of these areas of underservice has been the basis for awarding Federal grant dollars to support community health centers and for the placement of National Health Service Corps (NHSC) providers