A STUDY OF EXPRESSED OPINIONS AND KNOWLEDGE OF RESIDENTS OF TWO COMMUNITIES CONCERNING FLUORIDATION

by

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CHAPTER I

INTRODUCTION

Introduction to the Problem

Dental disease is one of the major health problems in the United States today. Fluoridation is one of the most noteworthy preventive measures in recent years. Numerous studies have been made of caries among children in communities with natural fluoride or receiving artificially supplied water. These indicate as much as 60 to 65 percent reduction in caries. (2, 8, 31, 51, 52, 69) Fluoridation is approved by all major official and voluntary health and medical groups in the United States (16, 18, 29) as a sound health practice; yet the amount of opposition in many communities is staggering. It is difficult to understand why such a relatively simple and well-founded health measure should gain acceptance so slowly and cause so much controversy.

"Fluoridation is one of the great advances in public health in this generation, despite the threadbare nonsense, pseudo-science, and illogical conclusions put forth by its opponents." (63) Any time that the incidence of a disease can be reduced as much as 65 percent by a process that is safe for everyone and at a low cost, it is an outstanding medical contribution.

When a new health measure is first suggested people should have questions about it and should learn whether the proposal will do what it is supposed to do. With fluoridation there has been more argument than exchange of useful information. Many have formed firm opinions without learning facts. Many who are not qualified to judge the scientific or health merits of the problem are opposing rather than listening to the facts presented by those who have done scientific research. There is much misinformation being published and circulated. Many of the opposers have been misinformed or are so confused about the controversy that they are uncertain and feel safer not to back it. Many people who would ordinarily accept the advice of recognized authorities are doubtful and fearful about fluoridation.

"Those who continue to charge that the use of fluoridated water is harmful have yet to produce supporting evidence that will withstand scientific scrutiny." (53) Dr. Robert Kehoe, Director of the Kettering Laboratories and the Institute of Industrial Health at the University of Cincinnati and his staff have collected and appraised over 8,500 scientific reports on this subject. He says "the question of public safety of fluoridation is nonexistent from the viewpoint of medical science." (19, 37) Arguments concerned with mass medication, deprivation of individual rights, invasion of privacy, infringement of religious freedom, and the trend toward socialized medicine have been weighed repeatedly in the courts and invariably have been rejected.

After 30 years of studies, carried out by many individuals in this and other countries, and acceptance by every health organization of any scientific status, why is there still such widespread opposition to fluoridation?

Statement of the Problem

Many people are not well enough informed about fluoridation to make a scientific decision regarding it. Others are misinformed and thus will make a decision against it. Those that are well informed are not working to bring about adoption of fluoridation in their home communities. In 1960 of the 50 communities voting on fluoridation only five with a total population of 40, 000 voted in favor of it. Forty-five of the fifty communities with a total population of more than a million opposed fluoridation. (48)

Some opposers may be convinced that fluoridation of water is a bad thing while others simply feel that there is too much doubt. Among the proponents of fluoridation there is apt to be those who are in favor without a clear concept of what fluoridation is.

Purpose of the Study

The major purpose of this study is to obtain the opinions of two groups of people regarding fluoridation and to test their knowledge of factual information. Comparisons between the two groups will be made, one group from an area with fluoridation and the other without

fluoridation.

The specific aims of the study are to seek answers to the following questions:

1. Is opinion of fluoridation influenced by knowledge of facts?
2. How do knowledge and opinions vary in a locality with fluoridation as compared to a community without fluoridation?
3. What social characteristics are representative of those with different attitudes?
4. What social characteristics are representative of those who are better informed?
5. What factors would need to be stressed to be most effective in educating residents of non-fluoridated communities on fluoridation?
6. What groups in the areas are opposing fluoridation and to what extent?
7. What groups in the areas are favoring fluoridation and to what extent of activity?

Justification for the Study

Although two-thirds of the major cities have controlled fluoridation, only 17 percent of the communities with populations of 2,500 to 10,000 have it. (41) The average high school graduate has had ten teeth with decay and family dental bills total 1.7 billion annually although only 40 percent of the population seek dental treatment. Tooth decay is the most prevalent of all diseases, being costly, painful and disfiguring. Ninety-seven percent of the American people have had dental decay and there are 700 million untreated cavities or

an average of nearly four per person. (6) Dental defects were the largest single cause of rejections among the first two million men examined for the military service during World War II. It was only required that six upper and six lower teeth make contact but ten percent of those between the ages of 18 and 35 did not qualify. (19)

Many of the larger as well as the smaller cities of Oregon have voted against fluoridation within recent years. Others have had less opposition and have succeeded in adopting it through referenda. Salem, the state capital, is one of the cities that has voted against it several times. One of the suburbs of Salem has had fluoridation for several years.

When opposition to a health measure crops up, inquiry into the sources of opposition is warranted. A study of the sociological factors may be most useful in the design and focusing of health education programs. Knowledge of peoples' opinions regarding fluoridation in this area coupled with the findings from library research should facilitate future efforts to promote fluoridation as a sound health measure.

Hypotheses

For the purpose of this study it is hypothesized that:

1. Those individuals with well authenticated knowledge of fluoridation are more likely to support fluoridation than those who lack knowledge or are misinformed.

2. Residents of an area that has fluoridation are more likely to be well-informed regarding the benefits of fluoridation and favor it more than residents of an area that does not have fluoridation.

3. Social characteristics representative of those favoring fluoridation will be the younger age group, those with young children in the family, and the higher educational, occupational, and income level groups. Sex and length of residence in the area will not be significant characteristics.

4. Those with young children, those in the younger age groups, and those in the higher income, occupational and educational levels are more likely to be well informed. Sex and length of residence in the area will make no significant difference in knowledge.

5. Those favoring fluoridation are doing little publicly to advance the knowledge of its benefits as compared to those who are openly opposed.

Definitions

For the purpose of this study the following definitions are given:

Knowledge. The acquaintance with facts.

Factual information. Information which is known to be true because it has been experienced or actually observed. The factual questions in the questionnaire to be scored will be based on scientifically proven information.

Well informed. The data from the interviews will be tabulated in a frequency distribution. Those whose scores are 1/2 of one standard deviation above the mean will be considered to be well informed.

Poorly informed. Do not know the facts.

Misinformed. Have accepted false or misleading information as factual. Those whose scores are 1/2 of one standard deviation below the mean will be considered to be poorly informed or misinformed.

Opinion. One's conclusion which falls short of absolute conviction.

Assumptions

For the purpose of this study it is assumed that:

1. The respondents will give accurate answers to the questionnaire according to their knowledge.
2. The random sample chosen will be representative samples of the two groups studied.
3. The interview-questionnaire will be adequate for this study, and will be a reliable form for obtaining the needed information.

Limitations

This study is limited to self-report data obtained by the use of a form combining usual opinions and known facts. The conclusions drawn will be dependent on the reliability and validity of the measuring instrument.

Further limitations result from the selection of residents of only two areas and therefore conclusions can be made only for these areas. No broad generalization to other parts of the state or country can be made, but the findings might become significant if similar research elsewhere corroborates them and leads to some theory as to how knowledge and opinions vary with social influences, how they affect action, and what that action is likely to be. The size of the sample may not permit the study of some of the social characteristics and thus it may

not be possible to form valid conclusions. It is recognized that many variables will be beyond the control of the study and that expressed opinions could very well be influenced by numerous subjective factors.

No attempt will be made to discover why individuals have certain opinions other than as related to knowledge and the source of their information. Social characteristics will be reported and related to opinions and knowledge but no attempt will be made to determine if these characteristics have caused a certain opinion.

Design for Research

Sources of Data

The areas selected for the study are Keizer and Salem Heights, both suburbs of Salem, Oregon, and have 1, 600 and 2, 200 families respectively. The people are of about the same socio-economic level in each of the two areas. Each area has its own separate water supply and Salem Heights has had fluoridation for several years without protest or objection. There have been significantly beneficial results to the teeth of the children of this area according to Salem dentists.

Fluoridation has been discussed to some small extent in Keizer but there has been no appeal from the public to fluoridate. According to the chairman of the Keizer water board, fluoridation would be no problem.

Collection of Data

To obtain valid scores of individuals' knowledge a questionnaire was formulated using library references with critical analysis. The pamphlet, Fluoridation Facts--Answers to Criticisms of Fluoridation, (1) published by the American Dental Association in January, 1962, and Classification and Appraisal of Objections to Fluoridation, (20) by the University of Michigan's School of Public Health were used primarily. Respondents were instructed not to guess if the answers were not known.

Procedure

The design for this study may be described in the following steps.

1. An investigation was made of available literature to determine what should be studied.

2. A questionnaire based on fluoridation facts and common controversial issues was constructed.

3. Comments and suggestions concerning the questionnaire were obtained from a dentist, two public health doctors, two public health nurses, and a registered nurse from the University of Oregon Dental School; the questionnaire was then re-formulated.

4. A pre-test was made from a sample of 15 residents of Salem to determine if the questionnaire was easily interpreted.

5. Revisions were made as need was indicated.

6. Permission was secured from the chairmen of the two water boards to select a random sample of 60 from each area.

7. A covering letter was prepared and endorsement from the thesis adviser was obtained.

8. Letters were sent to the families chosen in the sample; self-addressed postcards for reply were enclosed.

9. A schedule for visiting the families was arranged.

10. A guide was made for use in obtaining information at each visit.

11. Visits were made according to schedule and information was obtained.

12. Those who did not return postcards were contacted by telephone and appointments were made for visits. Whenever rejected, the reason for not wishing to participate was sought.

13. Respondents moving in the interim between the choosing of the sample and the actual visit were eliminated.

14. The data obtained were transferred to keysort cards from which separate tables could be constructed.

15. The data were categorized to provide quantitative data which then were analyzed according to statistical formulae to determine significant differences between groups and the findings were presented.

16. Conclusions were drawn and recommendations were made.

Overview of the Study

The remainder of the thesis is organized and presented as follows: Chapter II contains a review of the literature with a background of the fluoridation controversy and a summary of related studies.

Chapter III gives a description of the conduct of the study with an interpretation of the findings.

Chapter IV presents a summary, conclusions with justification therefor, and recommendations for further studies.

CHAPTER II

SURVEY OF LITERATURE AND RELATED STUDIES

The amount of controversy over the problem has turned the question of fluoridation into an exasperating issue for public health workers. Public debate over the addition of fluoride to community water supplies is now commonplace. The main objective of this discussion is to examine the explanations that have been offered to account for the reactions to fluoridation. For a better understanding of this study a brief review of the history of fluoridation from its origin to the present time is given.

Origins of Fluoridation

Fluorine, an element found in the soil, air, and water was of little recognized importance until by chance it was discovered to be effective in reducing the incidence of tooth decay. The early history of the relationship of fluorine to dental decay goes back to the last quarter of the nineteenth century. This history is reviewed at length by McNeil (47) and is summarized by several authors and groups. (11, 18, 24, 41, 49, 51, 52) After searching for 29 years Frederick S. McKay discovered in 1931 the cause of mottled enamel to be due to the guilty agent, fluorine. (49) Then a series of epidemiological studies was carried out by the Public Health Service and it was found that a

strikingly low prevalence of dental decay was associated with one part per million (1 ppm) fluoride in the drinking water. (18, 47, 49) At levels above 1.5 ppm mottling of teeth begins to appear and below 0.7 ppm dental decay rates are higher. Thus an excess or deficiency of fluorine is undesirable.

After a series of toxicity studies conducted by the Public Health Service, the Grand Rapids-Muskegon and the Newburgh-Kingston fluoridation experiments were assumed to have made certain that there would be no harmful side effects accompanying the dental benefits. (48, 49, 52) This was the beginning of a period of experimentation to evaluate the anti-cariogenic power of fluorine. These studies were begun by the Public Health Service with the hope that in ten or fifteen years definitive results would warrant wide-scale application; however, in five years the results were so impressive that many began to demand a statement of approval. (8, 52) Late in 1950 the Public Health Service strongly encouraged communities to fluoridate their communal water supplies if they so desired. By the end of 1949, 50 communities in Wisconsin had approved fluoridation, and many other communities were also encouraged to think about fluoridation.

These studies and many others have demonstrated that 1 ppm of fluoride produces identical dental and general effects whether the fluoride occurs naturally or is added by mechanical means; it prevents tooth decay up to 65 percent safely, economically, and effectively and

it does not produce observable mottling of the teeth. (18, 47) As a public health measure, fluoridation of the water is by far the best known method of reducing dental decay. Alternative techniques and vehicles have been tested but cannot compare and are recommended only in the absence of water fluoridation or where water fluoridation cannot be practiced. Thus fluoridation of public water supplies makes it possible for man to curtail sharply his most common disease by an effective, inexpensive and safe procedure. (15) McNeil states that dental decay is mankind's most widespread affliction. (48)

Endorsements

As with any new health measure people began asking questions and there were many slow to accept it as a sound health practice. The first endorsement of fluoridation was by the Public Health Service in 1950 after all scientific evidence relating to its safety, effectiveness, and practicability were thoroughly examined. The statement by Dr. Luther L. Terry, Surgeon General of the Public Health Service, "I cannot emphasize too strongly the importance of fluoridation as a means of improving the dental health of children... Every community without a fluoridated water supply should adopt this safe and effective public health measure..." is a typical endorsement given to fluoridation by every major health agency in the United States. (51)

The American Dental Association also fully approved fluoridation

in 1950 and the American Medical Association in 1951. At this time 225 communities initiated fluoridation and an additional 347 followed the next year. (49) Careful study of the experience of these communities plus continuing scientific research has given additional evidence supporting fluoridation. There are well over 8,500 references in the literature about the relation of fluorides to health. (18)

Now in the United States fluoridation is approved by every major scientific and professional organization having competence in the field. (18, 28, 31) It has been approved by numerous professional and scientific associations in many foreign countries and also by the World Health Organization. A study was made by the World Health Organization in 17 countries and the findings revealed uniformity in dental health improvements with the incidence of decay reduced about 60 percent in permanent teeth with no ill effects detected. (69)

The results of a study by the Health League of Canada in 1954 show that the majority of heads of departments of Preventive Medicine in North American Universities favored fluoridation. (30) Of 76 departments not one opposed the principle of fluoridation. Six were reluctant to give opinions because of unfamiliarity with the subject and one expressed a desire for caution and further study. The rest were emphatically in favor of fluoridation as a safe health measure.

Present Status

Statistics

According to fluoridation population totals reported by the United States Public Health Service as of June 7, 1963, 2,455 communities have controlled fluoridation, representing 1,382 water systems serving a population of 44,988,503. (2) This represents an increase of more than 953,000 people who started drinking fluoridated water from January 1 to June 7, 1963.

In addition, more than 7,260,000 Americans living in 1,934 communities have at least one water source with a natural fluoride content of .7 ppm or greater. (3) Between 1950 and 1959 the total population in the United States who were provided with fluoridated water had increased by about 33 million, and 19 foreign countries also had fluoridation programs in operation. (18)

A statistical report by the United States Public Health Service in 1962 stated that a greater proportion of the population benefiting from this public health measure live in large cities rather than in small communities. Sixty-six percent of the cities with a population of over one half million have fluoridated water supplies; 17 percent of those between 2,500 to 10,000 have it, and only five percent of those under 2,500 have it. (18, 34)

Although there are currently over 44 million people in the United

States using fluoridated water supplies, there have been many instances of plans being discontinued and of referenda resulting in adverse decisions. For approximately the last ten years fluoridation has been steadily losing ground to the strident objections of a small but highly persuasive group of opponents. Only about one in every four persons who is provided water by a community water supply is drinking water containing the minimum or higher level of fluoride recommended. (18) Yet there is no public health measure or prophylactic procedure that has been so exhaustively examined and tested. (13, 52) It offers benefits that promise an impressive saving in suffering and money with a wider safety margin than is offered by any other prophylactic procedure. (13) It is interesting to note that fluorides not only reduce dental decay but, as revealed in the Newburgh and Kingston study, crooked teeth occurred two and a half times more frequently in children drinking water without fluorides. (17)

Safety

The scientific world has been in agreement that adding fluorine one part to one million gallons of water positively reduces tooth decay by as much as two-thirds, at a low cost, and that it is absolutely safe. Many studies have been conducted to evaluate the effects of fluoridation. " A review of the tremendous amount of literature in the field of fluoride effects indicates that our estimates of the factors

of safety inherent in water fluoridation are still sound." (62) A discussion of these effects would be irrelevant here, but an excellent report reviewing studies and objections to fluoridation, prepared by students at the School of Public Health of the University of Michigan under the direction of Kenneth Elwell and Kenneth Easlick, is a suggested reference. (20)

No harmful side effects have been found in people living out their lives in fluorine-rich areas of the United States, despite many exhaustive medical examinations and careful comparisons of morbidity and mortality rates. (52) As stated by Donald McNeil:

> "If there were a shadow of a doubt as to the safety of fluoridation these councils (American Dental Association, United States Public Health Service, and American Medical Association) would be the first to call a halt. There is not a single shred of scientific evidence indicating that fluorides at the proper levels do anything else than what the proponents say they do." (49)

Doctor Nicholas Leon, Chief of Medical Investigation for the National Institute of Dental Research, said "we know without question or doubt that one part per million fluoride in a water supply is absolutely safe, is beneficial and is not productive of any undesirable systemic effect in man." (19)

There have been no cases in which fluoride ingestion at the level recommended for controlled fluoridation have demonstrated any cause of individual or community-wide health problems. Consumption of 250 mg. may cause temporary nausea and possibly vomiting but lethal

doses are in the neighborhood of from five to ten grams. (59)

Technical Aspects

Addition of fluorides to water supply systems is very similar to chlorination and other procedures widely employed in water works practice. This presents no technical problem to water superintendents or sanitary engineers. (18, 52, 67) A study by William Ingram led to the conclusion that all engineering problems that occur in the handling of fluoride can be adequately solved and that the average city can well afford the costs of adding fluorides to their water. (33)

Cost

The cost of fluoridation varies according to the amount and kind of compound used and the type of equipment. The average cost is ten cents a year per person. (7, 18, 41, 51) Other sources give varying costs. It ranges from 18 cents per person in Grand Rapids to less than five cents in San Francisco. (19) Paul gives the cost as 10 to 20 cents per person per year, (52), and a study by Ingram of 18 cities found the range to be 1.8 cents in Denver to 11.2 cents in Charlotte, North Carolina. (33) The cost at most would be no more than approximately the fee for filling one cavity during one's lifetime.

The national dental bill, even though one third of the population never goes to a dentist, totals around 2.4 billion dollars annually, or an average of $44 per family. According to the children's dental

officer of the United States Public Health Service this represents an amount over 15 percent of expenditures for all types of medical care, insurance, drugs, and hospitalization. (52) Over 97 million people have decayed teeth requiring treatment and another 21 million have lost all of their teeth. (41, 52) Comparing these statistics with the cost to add fluoridation one would have to say that the cost of fluoridation is very minimal. The United States Public Health Service estimated that community lag in adapting fluoridation is depriving 40 million children of protection from tooth decay and is costing the United States $452 million a year in needless dental bills. (16)

Legality

While the scientists have debated the relative merits of fluoridation, the courts have taken judicial action in resolving the legal problems involved. Every court of last resort in this country, which has had occasion to review the question after a full hearing on the merits, has ruled that the addition of the fluoride ion to public water supplies is legal and a proper exercise of governmental power and that it does not constitute an infringement of individual constitutional rights. (7, 10, 63) Fluoridation has been upheld by the highest court of California, Iowa, Louisiana, Ohio, Oklahoma, Oregon, Washington and Wisconsin. It was also upheld by lower courts in Maryland, Massachusetts, North Dakota, Pennsylvania, and South Carolina. (42)

Every argument which the opponents of fluoridation have made have been heard and answered by the courts. "It is now a settled principle of law that a community has the inherent right to fluoridate the public water supplies. In so doing it is not practicing medicine, engaging in socialized medicine, giving mass medication or violating the pharmaceutical laws." (10) "The ethical issue is not whether it is right to introduce water fluoridation when some citizens object, but rather whether the objectors have a moral right to deny the benefits to others when they are told on the best authority that neither they themselves nor anyone else will come to any harm." (27)

Problems in Community Acceptance

Lag in Acceptance

With the seriousness of the dental health problem and with a proven, safe preventive measure available, it is hard to understand why some communities continue to reject adoption of fluoridation. Of special concern is the steady decline in the rate of community acceptance in the past ten years. From a total of 95 communities with about 1.5 million people at the end of 1950, by 1956 this increased to about 1500 communities with some 31 million people. (52) The peak year was 1952 with 378 communities adopting fluoridation. Since then the number of communities starting fluoridation programs has dropped each year. (18) The number of communities discontinuing their

fluoridation programs after started is also increasing. Luther Terry in addressing the American Dental Association in April, 1961 said it was "nothing short of a tragedy" that only a third of the country's urban population receives community protection against dental caries. He also asserted that "fluoridation is beyond question the most effective, the most economical means available for the prevention of dental caries." (66)

One might well ask the question why did this slow rate of acceptance occur and what needs to be done to accelerate the utilization of this health measure? Much research has been and is continuing to be done to answer this question. There are two contributing factors which help explain the recent lag. The communities which readily accept new health measures have probably done so during the early years of the study and more difficulty was encountered in securing acceptance by the rest of the communities. The other factor is that by 1952 the opponents had joined forces and two national organizations were formed in the United States. (18, 41) Another reason (6) offered by Arra is that some do not understand the measure or are easily swayed by false statements. Arthur S. Flemming, while Secretary of the Department of Health, Education, and Welfare, stated:

> "...all of the blame for the lag in fluoridation must not be placed on the shoulders of the uninformed who for various reasons are opposed to it. Some of the blame must be shared by those of us who are informed, who have seen the evidence, who know the benefits and who

> yet have not worked hard enough to bring about the adoption of this wholesome public health measure by our home communities." (6)

From the beginning vocal antagonists arose and some devoted much time to fight the dangers they saw in fluoridation. Although this was disconcerting to the official proponents, it was not unexpected. Many of the health measures now considered essential were opposed when they were first instituted. It was expected, however, that the cries of opposition would abate and that acceptance would take the place of the doubt in the minds of the hesitant. This has not proved to be the trend. There still exists in most communities a militant few dentists as well as other professional leaders who rigorously oppose the use of fluoride. (28) This adds to the confusion and misunderstanding on the part of the public.

Political Issue

Donald McNeil in an address to the American Dental Association said:

> "Fluoridation has been wrested from the hands of the scientist and deposited squarely in the middle of the political arena. Fluoridation is now a political problem. We need now to reach the minds of men so that they will take political action." (49)

The politics of fluoridation has also received extensive and detailed attention in Donald H. McNeil's recent book, The Fight For Fluoridation. (47) He used available material which devoted most of its

space to the leaders in the struggle and very little to the less demonstrative publics. Yet the public at large is often summoned to issue its sovereign "yes" or "no" on the subject. Therefore, more time should be devoted to research in the social science aspects of fluoridation. We need to be more concerned with fully understanding the motivating forces to ascertain why a segment of the public will sign a petition or cast a ballot in opposition to public health.

Several sociological studies have been undertaken to determine just who votes in opposition and from what ecological group he is drawn. For the most part these studies have identified the opposing group to be those with lower incomes and with jobs of lower occupational status; they tend to be of the older age group and have no children under 12. These social characteristics however, are not as clear-cut as some of these studies seem to imply. (46) Low education level is also added as a characteristic of opponents by Attwood. (7)

Methods of Approval

Communities have reached decisions on fluoridation in several different ways, but chiefly by executive action or by referendum. During the first seven years, decisions to initiate a fluoridation program were made by a governing body of the city. Later after national organizations were formed to oppose fluoridation the issue has been

frequently decided by referendum. Dr. Buckman, biochemist of Memphis, Tennessee, told the National Dental Health Conference in Chicago, "the emotional atmosphere surrounding referendums on the subject leads to unintentional as well as deliberate distortion of the facts." (16) Until recently fluoridation was defeated in about two-thirds of the local referenda but more lately the percent has increased. (52) Opponents often claim that at least 90 percent of all referenda on fluoridation have been lost. The United States Public Health Service reports that past experience shows 60 percent of fluoridation referenda held voted no. (4)

The rash of referenda on fluoridation has been brought about by public officials who were unwilling to be responsible for so controversial a subject and handed the issue over to a confused and inexpert public.

> "Referenda change educational situations into political situations. Doubt is created, indicating that members of public authority or officials lack belief in the measure. When doubt is created, then most people will vote against change." (13)

Recent legislation in Oregon has made it legal for the matter to be decided by the governing bodies. The public must be educated to its task if it is expected to be given a part in deciding about the adoption of the measure. (14) Otherwise, with a public ignorant about general scientific method, the results of democratic referrals can be only a repetition of the sad results experienced in the past. However, all

scientific measures are in a sense influenced by public sentiment. As stated by McNeil,

> "In the final analysis, every scientific measure rests on public approval, whether it be voting tax monies for research, private donations for scientific experiments, or public policies pertaining to the welfare of the people. The professions should acknowledge this and prepare themselves for the political struggle." (49)

Arguments of the Opposition

Who the Opponents Are

The case of fluoridation is no longer questioned except by a militant few diehard physicians and dentists and by a loud group of laymen who are confirmed "aginners" and have succeeded in causing much controversy over fluoridation. Dr. Flemming calls the opposition "a small, willful and militant group" which is "depriving millions of our children of healthy teeth." They are often led, he added, by "professional hate-mongers or persons looking for notoriety." (5) The real nature of the opposition according to Attwood is that people are generally against fluoridation because it is a made-to-order cause for millions of Americans who, for a variety of reasons, dislike change and always suspect the worst. (7) Public opinion and opposition of fluoridation has run a similar course in England as summarized by Dalzell-Ward in the Health Education Journal. (12)

The opponents generally fall into one of four categories:

a) those who feel that it is an invasion of the rights of the individual, b) those who take advantage of the controversy to achieve personal gain or status, c) those who oppose any new health measure, and d) those who are uninformed or misinformed. (41) The active opponents are few in number and include people with no scientific training or background but also with a few trained scientists. (26) Many of these opponents spend vast amounts of money, time and energy in the war against fluoridation. Included among the opponents are Christian Scientists, who feel that fluoridation opposes their religious beliefs and that it is unconstitutional, and natural scientists, who have for years fought other health measures such as compulsory vaccination, pasteurization of milk, and the chlorination of water. (48) Others also frequently include naturopaths, chiropractors, and health-food enthusiasts. (43, 68)

Antifluoridationists, in addition to forming two national organizations, The National Pure Water Association, and the National Committee Against Fluoridation, publish a monthly newspaper, submit articles in medical journals, popular magazines and in newspapers. Their textbook, The American Fluoridation Experiment, is widely distributed. They write letters to state, local and even federal officials.

Techniques of Opponents

Wherever the issue comes up these days, there seems to be bitterness, name calling, smears, hate compaigns, wild charges, distortions, and outright lies. The irrational element in the opposing attitude has roots which penetrate deep into human psychology. Opponents have found that appeal to the emotions of the public is a much more effective means of gaining support than a precise, scientific presentation of information. (41) The opponents do all they can to create doubt and to generate fear, the more primitive the better. (26) As one after another claim is refuted, opponents change their attack. It is noteworthy that much opposition in a community comes from elsewhere. (18)

Nature of Opposition

The many and varied attacks by active opponents to fluoridation has been analyzed in a written report by Morris Davis. (14) He concludes that their beliefs are representative of an expression of "naturalism" or a plea for a return to a simpler life uncomplicated by effects of big government and big business.

The arguments against fluoridation fall mainly into three categories: its benefits are uncertain; it may have injurious consequences; and it violates individual rights. (13, 34, 52) The first of these is probably the least effective and the least used objection. As favorable

results from fluoridation are reported, the force of this argument has diminished in force. The general public is apathetic about dental disease and the prospect of reducing it does not make much impression. (13, 52) To those who are concerned some contend that dental disease should be prevented by attention to diet and oral hygiene.

The second argument, claiming injurious consequences, is perhaps much more persuasive because it appeals to the emotions and evokes anxieties. Attempts have been made to associate fluorides with every conceivable form of disease. To refute these claims negative rather than positive evidence is required. It takes very little doubt on the part of some before they will help tip the scales against taking chances where there is any uncertainty.

Probably the most potent line of argument is the third dealing with human rights. Many contend that they are not free under this form of compulsory medication to make their own choice. This argument rests on a value assumption and thus falls beyond the realm of proof or disproof. (52) Yet arguments concerned with mass medication, deprivation of individual liberty, invasion of privacy, and infringement of religious freedom have been weighed repeatedly in the courts and invariably have been rejected. (53)

> "The crucial point is that the various positions taken in opposition to fluoridation are not just so many chance rationalizations dragged in on the moment but part and parcel of a complex of attitudes an integral part of an opinion syndrome. Thus to treat the arguments of the opponents

> as 'reason' and to try logically to disprove them, will gain little. The point is to change people's attitudes." (14)

Review of Related Studies

As it became clear that fluoridation of the water supplies was to be a political rather than a medical decision, the complexity of the problem was intensified. Scientific inquiry can isolate fluorine as an element related to dental decay and conduct studies of the reactions to the rest of the body but it cannot determine what public policy should be or certify or discredit value judgments. The behavioral scientist was then approached to help identify the determinants of attitudes and responses of individuals and communities. Accounts of controversies, usually in particular communities with defeated referenda, began to appear about 1953. One of the first of these was the account by Hutchinson of the battle in Williamstown, Massachusetts. (32) Many of these types of accounts were published but it was not until 1955 that the first systematic study as distinguished from a case history was published. Since this time many studies have been conducted; however, only a portion of them have as yet been published. The studies of social science in the area of fluoridation have been conducted primarily not to solve the conflict but rather for better insight into community conflict and individual voting behavior.

Attitude Studies - Individuals

Several studies carried out during or following fluoridation campaigns, have gathered opinions about scientific matters. The first of these conducted by the Mausners, (45) a social psychologist and his wife, was made in Northampton, Massachusetts, just a few days before the town voted negatively on fluoridation. Interviews were made of 397 potential voters. Anti- and pro- fluoridation was correlated with such demographic factors as age, income, class, childlessness and education. Conclusions drawn were that young, highly educated, middle-class persons favor fluoridation, and those opposing fluoridation tended to be older, poorly educated, without children under the age of 12, in the lower-income brackets, and in the middle or lower class occupations. More crucial, however, in their findings were the psychological factors. The anti-fluoridation attitude was labeled "anti-scientific." "We were struck by the pervasive attitude of suspicion among those who opposed fluoridation. They were suspicious not only of scientific organizations but of the scientists themselves..." (45) The Mausners viewed opposition to fluoridation as a result of anti-intellectualism, yet they admitted that there were a large number of college graduates, even some with postgraduate education who accepted the anti-fluoridation arguments. Of the proponents 95 percent accepted scientific organization as reliable sources of information, while the

antis were marked by a pervasive attitude of suspicion coupled with a fear of conspiracy. However, in the anti group two-thirds of those with better than high school education professed to accept the authority of the scientific organizations. This study did not explore attitudes toward science in any detail nor was the attempt made to differentiate aspects of science related to the fluoridation issue.

A similar study by Taylor, Munro, and Fuqua based its results on interviews conducted with individuals favoring and opposing fluoridation. (65) A five percent sample was interviewed of all registered voters in each voting precinct of Fairfield, California. Education and income were factors found to be most clearly related to opinion. The better educated and more wealthy individuals tended to support fluoridation. Those with children, women, and people between the ages of 21 and 30 also were inclined to favor fluoridation. Catholics, Democrats, and those rejecting racial integration tended to reject fluoridation and Republican and Independents tended to support it. White collar respondents were most favorable of all occupational groupings; however, the greatest proportion of those with anti attitudes do not necessarily come from unskilled labor groups.

A pair of psychologists, John Kirscht and Andie Knutson in a study made in Berkeley, California, (39, 40) in 1961 point to basic attitudes toward science, particularly the indirect threat as an important variable. Two hundred seventeen voters in two groups were

interviewed, one three months prior and the other three weeks after voting on fluoridation. The purpose of the study was to test the hypothesis of some that rejection of fluoridation is a result of a generalized hostility to science and its effects on society. The respondents were grouped as pro, anti, undecided, or unfamiliar with the issue. Again certain demographic factors were found to be associated with opinion on fluoridation. Those opposing fluoridation were typically less well educated, older, and of lower socio-economic status. People with children were more likely to favor fluoridation than those without children. In testing for a relationship between these items and the "threat score" there was correlation except in the less educated group.

Highly positive general attitudes toward science regardless of position on fluoridation were found. "Even though attitudes toward science were related to position on fluoridation, a categorical anti-scientific attitude did not appear in our study." (40) However, opponents put less value on science as compared with other values, but scored higher on the index of indirect threat of science. This study then, as did the Mausners', suggests that there is a relationship between the anti position on fluoridation and concern over the threat of science, although the relationship is far from perfect. Indications are, though, that rejection of fluoridation tends to correlate with greater ambivalence toward science.

Mr. Simmel, research sociologist in the Bureau of Dental Health, New York State Department of Health, in a study in 1961 proposed that opposition to fluoridation is concentrated in people who are suffering relative social deprivation. (60) This deprivation was interpreted as deprivations of prestige or insults to the self-esteem. The study considered four types of deprivations: economic, prestige, political and rank disequilibrium. Simmel reasoned that people who feel deprived tend to register their resentment against society by voting against fluoridation. The results of this study were based on interviews of over 400 people in Brushtown and Welltown, New York. Income, used as a determinant of economic deprivation, supported the claim that richer people tend to favor fluoridation and poorer people are more likely to oppose fluoridation. Not only present income but change in income over the past ten years was used. Those with decreased or the same income were considerably less favorable to fluoridation than those who claimed increased income.

In evaluating prestige deprivation, the interviewer's estimate of the home value and occupational rank were determinants. The estimate of the dwellings and upkeep was found to be highly correlated with a favorable opinion on fluoridation. Occupational rank was categorized into four groups: higher and lower white collar and higher and lower blue collar. The explanation that occupation is related to fluoridation opinion primarily through education was definitely

contradicted by the data. Respondents in the highest ranked occupation categories were far more favorable to fluoridation than the lowest, irrespective of whether they had graduated from high school. The percentage of those expressing anti attitudes was virtually the same for those with less than high school education as for high school graduates or those having more education.

Simmel asked whether the average person can do anything about floods, air pollution, fallout and fluoridation. The antis were much more likely than the pros to say no except on the question of fallout. However, the undecided group was more likely to say no than the anti group on questions about fluoridation, air pollution and fallout.

Simmel also found that those with lower feelings of political efficacy were more opposed to fluoridation. Highly educated people with a relatively poor consumption status were also relatively hostile to fluoridation. Thus Simmel presents evidence to support his thesis that persons who are anti-fluoridationists feel deprived as they compare themselves with other persons in their communities. This deprivation leads to hostility which is indirectly expressed by opposition.

Another study seeking to explain individual attitudes and behaviors in terms of the sociological conditions activating these attitudes and behaviors is that of Arnold Green, an anthropologist. (25) Unlike the other studies, the major concern was with the attitudes of townspeople who lead the fight against fluoridation. Twenty-eight

anti-fluoridation leaders in six Massachusetts communities were interviewed. Evidence was produced to support the contention that a major cause of protest among anti-fluoridationists, actively partisan, is the feeling of loss of personal control in a world of large and complex social organizations. This study indicates that the charge that fluorides are poison is merely rationalization and cover for this deeper anxiety caused by distrust of authority and a sense of low political efficacy.

An additional test of Green's argument for the symbolic nature of the poison argument is found in the study of O'Shea and Kegeles. (50) This study did not use interviews but rather was an analysis of content of 376 letters sent to federal officials over ten years arguing against fluoridation. During the past decade, the United States Public Health Service has received more protests about fluoridation than about any other health measure. The content of the letters was divided into four categories. Fluoridation of water: causes physical harm, has not been scientifically proven, is a threat to individual rights and is uneconomical. In the analysis three-fourths believed fluoridation to be physically harmful and also held it contrary to rights; half gave some kind of scientific argument; and one-fifth considered it uneconomical. Of the 226 letters with an identifiable main argument 43 percent contended it was against rights, 37 percent claimed it to be physically harmful, 16 percent said it was not scientific and three percent

felt it uneconomical. Green (25) theorized that physical harm is a cover for the basic fear of social manipulation. However, this study indicates that the chief issue is individual rights. Since the two issues are most prevalent it would seem that pro-fluoridationists would need to focus their attention here and spend less time in worry about the cost argument.

Still another approach was used by Menczer in an attempt to identify logic or reason for the anti-fluoridationists' actions. (46) Data were collected by interviewing a random sample of those who had signed a petition presented to the town council in Hartford, Connecticut, requesting that fluoridation be discontinued one year after it was started. Of those signing the petition against fluoridation 34 percent were actually in favor of it. Nineteen percent were doubtful and only 44 percent were opposed. Those actually favoring it gave these reasons for signing the petition: thought petition was for fluoridation, the petitioner insisted, husband signed for wife, or disinterest. Among the doubtful group the most frequent answer was that the petitioner carried a bottle marked poison and this was frightening. This study emphasizes the importance of investigating and challenging the work of the professional antifluoridationists.

A master's thesis on fluoridation by Boyd (9) was done in 1961 at Bowling Green State University in Ohio. A questionnaire was administered to 490 students in 14 Health Education classes at the

University to ascertain their knowledge and opinion of fluoridation. Major conclusions from the study were that only 30 percent were entirely correct in their concept of fluoridation, and 50 percent were entirely incorrect. Although 75 percent of the students were in favor of fluoridation only 35 percent of the total positive votes were cast by individuals who gave evidence that they understood fluoridation. These results then are in contradiction of those studies claiming that high educational level is related to favorable opinion on fluoridation. Knowledge was found not to be the deciding factor in the opinion formed.

Another study by Simmel and Ast (61) used data from interview surveys made in Welltown and Brushtown, New York. Of the analysis of social characteristics it was found that older people particularly over 65 tend to oppose fluoridation. Children seemed to be an artifact due to the correlation of age and children. In any particular age group children seemed to make no difference. Sex had no effect except that men are more likely to go to the polls especially in the lower social group and this group is associated with negative opinion. Income and occupation were directly related to opinion; the higher the rank, the more likely to favor fluoridation. Education did not affect opinion. It is often explained as the cause of the lower-socio-economic levels being less favorable but this is not a sufficient explanation. Other mechanisms affecting opinion were related to newspaper articles and doctors' opinions. Ninety percent read newspaper accounts

recommending fluoridation and signed by doctors and dentists in the county, yet over half voted against this advice. Those not knowing how their own doctor or dentist felt were much less favorable to fluoridation. Negative attitudes toward one's doctor correlated with negative attitudes to fluoridation. The better informed were more likely to favor fluoridation and it was concluded that perhaps there is a joint affect where there is initially a sufficiently high level of education.

In the spring of 1962 a survey of registered voters was conducted in Salem, Oregon, by a Willamette University seminar team in Sociology Theory under the direction of Dr. John Rademaker as reported in the Oregon Statesman. (55) The survey showed that 59 percent of Salem's voters appeared to favor fluoridation of water. Only 25 percent were opposed with the remainder being undecided. Of the 34 percent who listed disadvantages of fluoridation 17 $\frac{1}{2}$ percent considered it harmful, five and one-half percent said it was against individual rights and 11 percent thought it was too expensive. In general, persons with larger families were more likely to favor fluoridation as were those persons from ages 30 to 39. Those over 60 were strongly opposed. Persons with little education were somewhat more likely to be opposed than better educated persons. Activity in the controversy was found to be present in higher proportions in the anti-group. Those who had previously lived in a fluoridated area tended to support fluoridation.

A study of five communities of South Jersey was made in 1963 by George Masterson. (44) Opinion on fluoridation was related to age, education, number of children, and occupation of respondents and to whether they had had polio immunization. More than 50 percent of each community were favorable to fluoridation as compared to 18 percent who were unfavorable. The data suggested a statistically significant relationship between age, education, and family size to fluoridation opinion in four of the five communities; however, discrepancies in relationships between these data suggest some doubt as to the importance of this relationship. Favorable response was related to younger age, more education, larger families and polio vaccination of the respondents. The most commonly mentioned categories of reasons for responding no were: it is dangerous, it has not been proven effective or safe in all respects, it infringes upon individual rights, and nature has made water pure and it should not be tampered with.

Attitude Studies - Community

One important aspect of any campaign in a community is the role played by the issue leaders. Raulet's paper (56) concerns the role conflict of the health professional in a fluoridation referendum. In one sense this study complements Green's (25) which was concerned with the opponents. The study was made in two Massachusetts towns in 1959 two months before referendum. Conclusions were that two

approaches to community action could be pursued by the health professionals. They might stay out of the discussion entirely giving it only their blessing and endorsement or they might be justified in participating in the political aspects of the fluoridation fight directly and wholeheartedly. An attempt to play both roles simultaneously is likely to make their actions vulnerable to opposition attack and public misunderstanding.

Another similar study was made by Sanders in ten Massachusetts towns, which recently had had fluoridation controversies. (58) Both of these studies involve areas having the town meeting form of government and not the city council as do many, and thus generalizations from them cannot be made to other parts of the country. The study showed how different health professionals have been involved and how their behavior, knowledge, and opinions are related to status. Factors associated with high activity were participation in professional organizations, holding public office, and participation in other controversies. It was particularly significant that demographic variables had little to do with activity. Those most active in the controversy were also more informed but it was not determined which grew out of the other.

Sanders did another study in ten Massachusetts towns of the characteristics of the community controversy. (57) The characteristics of each of six stages leading up to a decision were identified.

This facilitates cross-community and cross-issue comparisons and helps the research worker to put in order the multitude of forces at play during a campaign. (52)

In Cambridge, Massachusetts, in 1953, a fluoridation proposal was badly defeated by referendum in 48 of 55 precincts. As a result of this overwhelming rejection, Thomas Plaut conducted a public opinion study to determine ecological differences in voting behavior. (54) Those precincts with the greatest vote for fluoridation were characterized by a low rate of social problems, very few substandard living conditions, and a very small proportion of the population without a high school diploma. Support of fluoridation is also correlated with a "liberal" position in politics.

Another study conducted in Massachusetts is the one by Gamson (22). One hundred forty-one registered voters in Cambridge were interviewed on election day. They were grouped into six groups according to their responses: convinced, moderate, and weak, for both pro and anti groups. In an attempt to measure the issue of individual rights it was found that overt differences in ideology had little to do with the average voter's position on fluoridation. The study discourages the hypothesis that a pro-fluoridation position is correlated with liberal political views as indicated by Plaut (54) and Taylor, Munro, and Fuqua. (65)

Gamson's study also contradicts findings of Green (25) and

Simmel (60). Opponents of fluoridation are much more likely to feel that public officials do not really care about them. Green and Simmel both hypothesized that opponents feel that they are being victimized or manipulated in some way and that their opposition is an expression of hostility derived from a sense of deprivation. Conclusions from Gamson's study are that opponents have greater feelings of helplessness and a lower sense of political efficacy than proponents. Many opponents (55 percent) believed that scientists should decide the question rather than voters but if they are asked their answer is no. Gamson rejects the overt ideology of individual rights opposing government intervention and posits feelings of helplessness as the root of the anti attitudes.

Gamson also found complicated relationships between age and education, and attitude toward fluoridation. Those strongly favoring fluoridation had college education or less than an eighth grade education. Those with medium education were less likely to be for fluoridation. These relationships persisted when the effects of age were controlled.

Until recently fluoridation studies have been heavily concentrated in only three or four geographical areas, and hardly allow generalization to the entire country. However, a study by Gamson and Irons (23) is a national analysis comparing demographic factors of communities to success or failure of fluoridation referenda. As in

the study of a disease, epidemiology often precedes and gives some clues to etiology. Thus an attempt to establish the existence of gross differences among communities with different attitudes seems reasonable. Four sets of data were analyzed having been collected by A. Simmel in New York, by J. Coleman and M. Pinard for John Hopkins, by A. Green and J. Briggs in Massachusetts, and by W. Gamson and P. Irons in New England. There was no clear relationship shown between size of community and the likelihood of fluoridation winning or losing. National statistics show that the larger the community the greater is the likelihood that fluoridation is in effect.

Gamson and Irons also examined the relationships of age, education, income, and rate of population growth to the outcome. There seemed to be a fairly consistent inverse relationship between age and fluoridation success. However, the towns with the highest percent of children under 15 were more likely to pass fluoridation. A very slight relationship was shown between income and action on fluoridation. Communities experiencing rapid growth appeared to be slightly more likely to take favorable action on fluoridation than more stable communities. Education showed an interesting relationship: towns of either high or low median education seemed slightly more likely to take favorable action on fluoridation than those that were in between. This agrees with data mentioned previously that suggest that those with high school education may be more likely to oppose fluoridation

than are those with college or only grade school education.

Research in Progress

Studies now in progress may begin to fill in some of the gaps in present knowledge and aid in understanding of the fluoridation conflict. A study being conducted now is one by Elihu Katz and Robert Crain of the University of Chicago. Various aspects of how communities affect each other's actions are being studied. An attempt is being made to study over 1,100 communities to determine differences between votes on fluoridation and votes on other issues, the types of pro- and anti-fluoridation leaders and the kinds of literature which have been used in these communities. This work is part of the research program of the Public Health Service. (35, 36)

An attempt is being made by Simulmatic, Incorporated, under Public Health Service sponsorship, to construct a model for the simulation of a fluoridation referendum by means of electronic computers. The attempt is to project, eventually whether a community will have a successful or unsuccessful referendum. (35, 36)

William A. Gamson and Benjamin D. Paul are currently pursuing a study comparing previously unstudied New England communities. In an effort to understand community decision-making, better information is being collected on the operation of power and on various aspects of the social structure. (35)

No doubt there are other studies under way and in the future it is expected that the social science data collected will lead to more rational community programs than have been undertaken in the past. There are still many aspects of the controversy which need further examination.

CHAPTER III

PROCEDURE AND FINDINGS

Introduction

The public issue of fluoridation of community water supplies has generated considerable research. Beliefs about the use and effects of fluoride in drinking water concern much broader issues than the technical one and many investigators have given explanations in an attempt to account for the public response. It is very clear from the numerous studies that the issue is a very complex one influenced by many facets of human behavior. There are still many unanswered questions.

Public health workers need to give accurate information in simple terms to the public in an effort to promote fluoridation. This paper represents an attempt to obtain and compare knowledge and opinions of residents of two communities: one with and the other without fluoridation. The specific aims of the study are to seek answers to the following questions:

1. Is opinion of fluoridation influenced by knowledge of facts?
2. How do knowledge and opinions vary in a locality with fluoridation as compared to a community without it?
3. What social characteristics are representative of those with different attitudes of fluoridation?
4. What social characteristics are representative of those who are better informed?

5. What factors would need to be stressed to be most effective in educating residents of the non-fluoridated community?

6. What groups in the areas are opposing fluoridation and to what extent of activity?

7. What groups in the areas are favoring fluoridation and to what extent of activity?

Procedure

Description of Selected Areas

Data for this study were obtained by the use of an interview-questionnaire with 85 residents of two suburban areas of Salem, Oregon, during July of 1963. Salem Heights is south of Salem and has approximately 2, 200 families. Keizer is located north of Salem and has approximately 1, 600 families. Each community has an organized water district supplying its own water. Salem Heights has had fluoridation for eight years without protest or objection, and with significantly beneficial results to the teeth of the children. The Salem Heights district was fluoridated by action of the water board without referendum. Keizer has never had a fluoridation referendum, although fluoridation has been discussed by interested residents with the members of the water board. The city of Salem, however, has voted against fluoridation several times. The residents of both communities are of about the same socio-economic level. The schools are under the city of Salem system. Publicity of city actions and

sentiment through newspapers and radio would be the same for each suburb.

Preliminary Steps in the Procedure

In preparation of the questionnaire, the literature was searched to obtain content ideas and to determine if the use of the questionnaire would be a valid method of obtaining knowledge of residents. Items to be scored as test items were each validated by critical analysis of library references. The two chief sources of reference for this purpose were the bulletin, Classification and Appraisal of Objections of Fluoridation, published by the University of Michigan's School of Public Health, (20) and the American Dental Association's pamphlet Fluoridation Facts, Answers to Criticisms of Fluoridation. (1) The questionnaire also included items related to opinion as well as factual information.

The questionnaire was constructed so the hypotheses which were formulated could be tested from the data. The major hypothesis was that those individuals with well authenticated knowledge of fluoridation are more likely to support fluoridation than those who lack knowledge or are misinformed. Contributory hypotheses were:

1. Residents of an area with fluoridation are more likely to be well informed regarding the benefits of fluoridation and favor it more than residents of an area that does not have fluoridation.

2. Social characteristics representative of those favoring fluoridation will be the younger age group, those with young children in the family, and the higher educational, occupational, and income levels. Sex and length of residence in the community will not be significant characteristics.

3. Those with small children, those in the younger age groups, and those in the higher income, occupational and educational levels are more likely to be well informed. Sex and length of residence in the community will make no significant difference in knowledge of fluoridation.

4. Those favoring fluoridation are doing little publicly to advance the knowledge of its benefits as compared to those who are openly opposed.

Each item of the questionnaire was intended to amplify one or more of the contributory objectives of the study. The questionnaire was divided into four parts. (See example in Appendix B) Part I consisted of two questions pertaining to how well the respondent felt he understood the fluoridation issue and what the main issues were to him. Part II, items 1 through 11, included questions about the recommended alternate forms of fluoridation and activity relative to participation in the fluoridation issue. Items 12 through 33 were to be graded as test items to be used for testing the major hypothesis, and the total possible score was 30. Part III was designed to indicate degrees of opinion on some of the main controversial issues. Part IV consisted of eight categories to obtain the demographic characteristics of the respondents.

A preliminary draft of the questionnaire was formulated and presented to experienced professional persons for constructive

criticism. These included a dentist, two public health doctors, two public health nurses, and a registered nurse from the University of Oregon Dental School. The questionnaire was then reformulated. A pilot study was then made from a group of 15 residents of Salem to determine if the questionnaire was easily interpreted. The purpose of the study and the questionnaire were explained. Upon completion of the questionnaire, the participant was asked if he had difficulty in answering any of the questions. Further revisions were then made as indicated. The findings of the pilot study were such that they could be categorized and lead to the formulation of conclusions. No data obtained in the pilot study were included in this final study.

Letters were then written to the chairmen of the Salem Heights and the Keizer water boards (example in Appendix A) requesting permission to use their files to obtain a random sample of the families in each water district. The procedure for conducting the study was discussed. Since some people in each area are using private wells it was felt that the sample should be drawn from the water users rather than from the registered voters in each area. The findings thus will reveal family opinion rather than give a true indication of how a vote would result.

After obtaining permission from the water boards a random sample of 60 families from each community was chosen. In the Keizer area a number between 1 and 26 was chosen from a table of

random digits. This number was six; thus the sixth name and every 26th thereafter was chosen, giving a list of 60 names. In the Salem Heights area the number chosen from the table of random digits was 14 and every 36th user was chosen to give a sample of 60. When a place of business or a new home not occupied was drawn the closest name counting back was substituted.

Obtaining the Data

Preplanning for conducting the visits included sending a letter endorsed by the thesis adviser and a self-addressed and stamped postcard. (examples in Appendix A) The letter included an explanation of the study and asked for participation. The postcard was to be returned to advise the researcher of their decision to participate and to facilitate making a schedule of visits. It was planned to avoid interference with family routines and facilitate an atmosphere more conducive for administering the questionnaire. The cards returned numbered 14 (23 percent) in Salem Heights and 16 (26 percent) in Keizer. Of those returned 78 percent in Salem Heights were willing to participate and only 37 percent in Keizer. This meant that there would be 11 participants from Salem Heights and six from Keizer. Two additional cards were returned unsigned and marked unwilling to participate.

It was then decided to contact each participant by telephone if possible and if not by a home visit. This revealed that many had

intended to mail the card and were willing to participate. A schedule for visiting the families was arranged and visits were made during a four week period during July 1963. Table 1 gives the number of letters mailed and the number of final participants for each community as well as the totals for the entire study. Those answering were over 70 percent of the total sample. This sampling was deemed large enough to provide the necessary data to reflect accurately the communities' opinions and knowledge regarding the hypotheses.

Table 1. Number and Percentage Distribution of Letters Mailed and Questionnaires Completed by Two Communities

Community	Number of Letters Mailed	Number of Questionnaires Completed	Percent
Keizer	60	40	66.7
Salem Heights	60	45	75.0
Totals	120	85	70.8

An attempt was made to ascertain the reason from those who refused to participate. The reasons given were responses to be expected in a public survey such as vacations, moved, illness, or too busy. There were only three who refused because of strong opinions--one in Salem Heights and two in Keizer. It is strongly possible that those who would give no reason might also be in the undecided or opposed group. Table 2 shows the numerical distribution of reasons for not

participating.

Table 2. Numerical Distribution of Reasons for Non-Participation by 35 Residents of Two Communities

Reason for Non-Participation	Community		Total
	Keizer	Salem Heights	
Illness	1	1	2
Vacation	3	3	6
Too busy	1	3	4
Moved	2	2	4
Strong opinions	2	1	3
Undecided	1	0	1
No reason given	9	4	13
Unable to locate	1	1	2
Total	20	15	35

Prior to administering the tool used to obtain the data, a planned guide was used to make explanations concerning the study. The approach after the personal introduction was as follows:

> "Your willingness to participate in the study of fluoridation is greatly appreciated. As noted before you were selected in a random sample of all residents in this community. The questionnaire will be entirely anonymous and you need not put your name on it. The interest is in perceptions held by the residents and not in names. The questionnaire is self-explanatory but if you do not understand any part of it, you may ask about it. No other questions can be answered about fluoridation until you are finished. Answer each question in order and do not make changes. When in doubt about the answer it would be better to check the "don't know" answer than to guess."

Plan for Analysis

The data obtained were transferred to keysort cards from which separate tables could be constructed. Section II, Items 12 through 30 of the questionnaire were graded as test items and a score was given to each participant. The respondents were also classified as pro, anti or undecided by their response to Item 1 in Section II. Score and opinion for each respondent were then used in testing hypotheses.

For statistical analysis of the data, various techniques were used. The Chi-Square technique was used to compare respondent's opinion of fluoridation with the community, with knowledge groupings, and with demographic data to indicate the probability of getting a difference equal to or greater than that which was observed. For all four cell tables with small expected frequencies the Chi-Square was corrected with Yates Correction and referred to as Yates corrected Chi-Square (X^2_c). The analysis of variance was used to test the homogeneity of respondents' scores with respect to the social data. The t-test was used to test for significant differences between means when the analysis of variance test was significant. Pearson Product-Moment Coefficient of Correlation was used to establish the degree of similarity between scores and how well the respondents felt they understood the fluoridation issue. See Appendix C for statistical formulae. For this study a probability of .05 will be considered significant

and .01 very significant.

Analysis of Data

Opinions of Fluoridation and Knowledge of Respondents

Since this study is primarily interested in the responses to the fluoridation question, and knowledge of factual information, Tables 3 through 8 present tabulations of such responses by themselves and in relationship to the other criteria for which information was obtained. It can be seen from Table 3 and Figure 1 that both communities were favorable to fluoridation. Of those who had an opinion on fluoridation 92 percent in Salem Heights and 77 percent in Keizer favored it. In Keizer 35 percent were either undecided or had insufficient information to venture an opinion.

Table 3. Numerical and Percent Distribution of Opinions of Fluoridation by 85 Residents of Two Communities

	Opinions of Fluoridation							
	Pro		Anti		Undecided		Total	
Community	N	Percent	N	Percent	N	Percent	N	Percent
Keizer	20	50.0	6	15.0	14	35.0	40	100
Salem Hts.	36	80.0	3	6.6	6	13.4	45	100
Totals	56	65.9	9	10.6	20	23.5	85	100

$X^2 = 9.71$ p less than .01 (df 2)

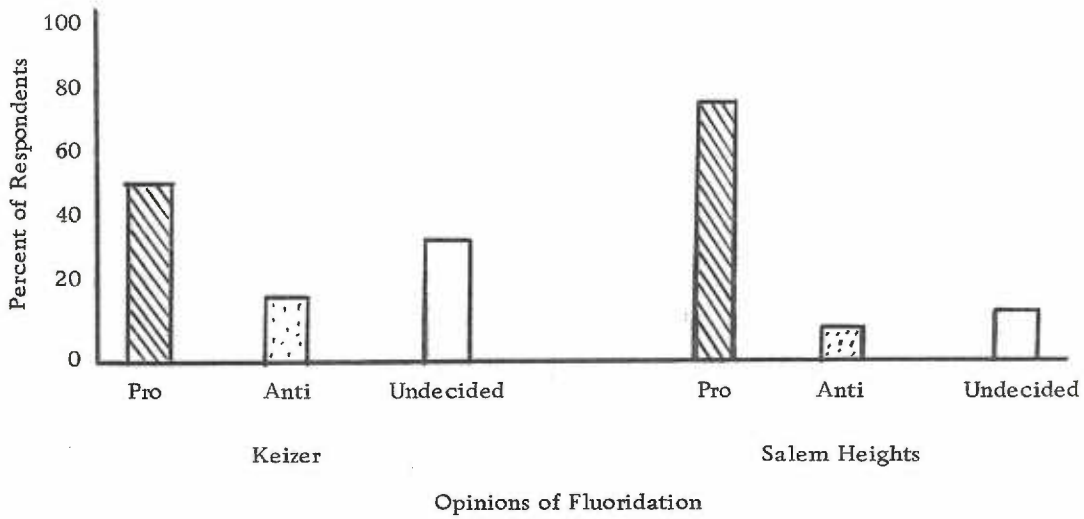

Figure 1. Percentage Distribution of Opinions of Fluoridation by 85 Residents of Two Communities.

To test the null hypothesis that residents of an area with fluoridation will not differ in opinion from those in an area without fluoridation a Chi-Square test was calculated. The difference of opinion in the two areas was significantly different, the Chi-Square being 9.71, significant at the .01 level. The null hypothesis was thus rejected with the conclusion drawn that opinion was significantly different in the two communities. The fluoridated community is more favorable to fluorides than the non-fluoridated community. Whether this difference is a result of experience with fluoridation in Salem Heights or due to other variables is not easily discerned.

The scores of the respondents, derived from the factual fluoridation information of items 12 through 33, Section II of the questionnaire, ranged from zero to 25 with a possible score of 30. Salem

Heights' scores were higher; however, there was a wide range in both areas as revealed by Table 4 and Figure 2.

Table 4. Numerical Distribution of Raw Scores on Fluoridation Test for 85 Residents of Two Communities

Salem Heights N = 45				Keizer N = 40			
Score	N.	Score	N.	Score	N.	Score	N.
25	2	12	2	22	3	11	2
23	2	10	1	21	1	9	1
22	1	9	2	20	2	8	1
21	1	8	1	19	2	7	2
20	2	7	1	18	1	5	1
19	2	6	1	17	1	4	3
18	4	5	2	16	2	3	1
17	4	2	1	14	1	2	1
16	7	1	1	13	1	1	5
15	3	0	1	12	3	0	6
13	4						

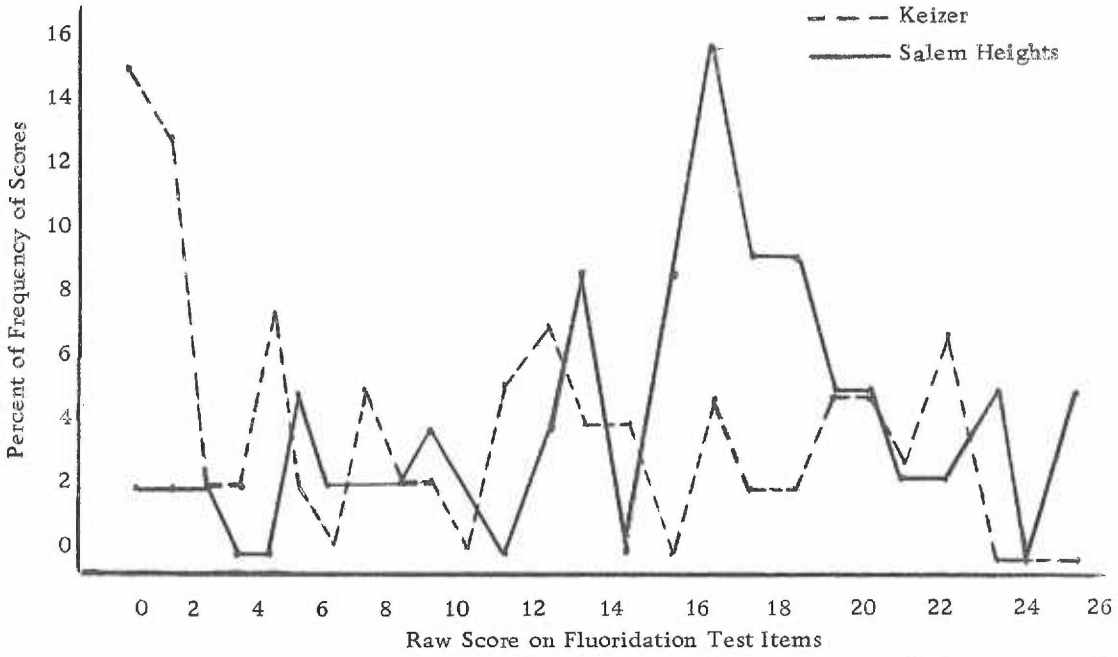

Figure 2. Raw Scores on Fluoridation Questionnaire and Percent of Frequency of Each for 85 Residents of Two Communities

The highest percentage of low scores was in Keizer and Salem Heights had the highest percentage of the higher scores. Neither area presents a normal distribution of scores. The median score for Salem Heights was 16 and for Keizer was 8. 5. The mode for Salem Heights was also 16 and for Keizer was zero.

The means and standard deviations were calculated for the three opinions groups (pro, anti, undecided) for the total in both communities and for the combined sample. As shown in Table 5, the overall mean was 12. 08; the mean for Salem Heights was 14. 49, and the mean for Keizer was 9. 38. The t-test was used to test the null hypothesis that the knowledge would not differ in the two communities. The means were found to be significantly different with a t of 3. 36 (df 83) and significant at the . 01 level. Residents of the community with fluoridation are better informed regarding the benefits of fluoridation than residents of the area without fluoridation.

Table 5. Numerical Distribution and Comparison of Mean Scores of 85 Residents of Two Communities for Three Fluoridation Opinion Groups

Opinion Groups	Communities Combined N	Mean Score	Standard Deviation	Keizer N	Mean Score	Standard Deviation	Salem Heights N	Mean Score	Standard Deviation	t
Pro	56	15.3	5.64	20	13.8	6.76	36	16.1	4.81	1.52
Anti	9	8.1	7.42	6	6.3	6.62	3	11.7	9.07	1.03
Undecided	20	4.9	5.94	14	4.4	5.61	6	6.1	5.43	.63
Totals	85	12.08	7.10	40	9.38	7.74	45	14.49	6.09	3.36*

*Significant at .01 level.

The mean scores of the three opinion groups in Salem Heights were higher than the corresponding ones in Keizer. However, t-tests revealed no significant differences. The pros in each community have a higher average than do the anti or undecided groups. However, in each community the anti group has a higher mean score than do the undecided.

Table 6. Comparison of Fluoridation Means of Three Opinion Groups Within Two Communities

	t of Fluoridation Opinion Groups		
Community	Pro to Anti	Pro to Undecided	Anti to Undecided
Keizer	1.98*	3.55**	.64
Salem Heights	1.43	4.63**	1.18
Communities Combined	3.4 **	6.97**	1.25

*Significant at slightly > .05
**Significant at < .01

To test the null hypothesis that the knowledge of fluoridation is not related to one's opinion concerning fluoridation, t-tests were calculated of the means for the three opinion groups given in Table 5. As shown by Table 6, the proponents mean score was significantly higher than the undecided in both communities and for the combined sample. The t-test for Keizer was 3.55 (df 22, p = <.01), for Salem Heights was 4.63 (df 40, p = <.01) and for the entire group was 6.97 (df 74, p = <.01). In Salem Heights the pros' mean score was not

significantly different from the antis' but in Keizer the t-test was 1.98 (df 24) and with a probability slightly >.05. There were no significant differences found between the means of the anti and undecided groups for either community. The null hypothesis is thus not completely disproved. There is a definite tendency for the pros to be more familiar with fluoridation facts and those who have no opinion of the fluoridation issue are more unfamiliar with facts. This agrees with the findings of Simmel and Ast (61) that the better informed are more likely to favor fluoridation. It seems that the anti attitudes presuppose some level of knowledge and awareness of the issue. Of the three antis in Salem Heights one had a high score of 20. While evidence indicates that knowledge is important there seems to be other factors involved in formulating opinions for or against fluoridation.

The respondents were categorized into two groups: well-informed and the poorly or misinformed. The combined standard deviation of 7.1 was used and those with scores falling within one-half standard deviation above and below the mean were excluded. This eliminated scores 3.55 above and below the over-all mean of 12.08 or scores 9 through 15. This eliminated eight in Keizer and 12 in Salem Heights. The well-informed in Salem Heights numbered 25 and in Keizer 12. There were 8 and 20 in the poorly or misinformed groups in Salem Heights and Keizer respectively. Individuals in each group were then classified according to their opinion of fluoridation. The

results are shown in Table 7 and in Figure 3.

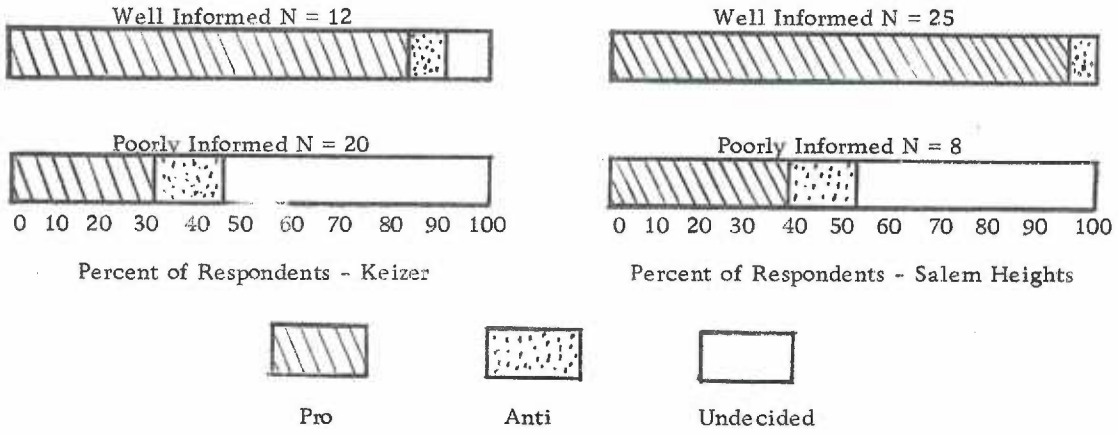

Figure 3. Percent Distribution of Respondents by Opinion and Two Knowledge of Fluoridation Groups for Two Communities

Of the 56 favoring fluoridation only 34 (or 60. 7 percent) were well-informed. Of the nine opposing fluoridation two (or 22. 2 percent were well-informed. Of those individuals in Salem Heights responding positively to fluoridation, 66. 7 percent were well informed, and 8. 3 percent were poorly or misinformed. Although 80 percent (or 36 individuals) would vote yes only 24 (or 53 percent) of these were well-informed individuals. Of those individuals in Keizer responding positively to fluoridation, 50 percent were well-informed and 30 percent were poorly or misinformed. Fifty percent (or 20 individuals) would vote yes, but only ten (or 25 percent) were well-informed individuals. Of the six individuals opposed to fluoridation in Keizer one was in the well-informed group and three were in the less informed group. In Salem Heights there was one opposed in each of the groups. Thus the

antis and the pros may come from either the well or poorly informed groups. This finding agrees with that of Boyd who found that of 75 percent favoring fluoridation only 35 percent understood it. (9)

Of the well informed group, 96 percent in Salem Heights and 83.4 percent in Keizer favored fluoridation, with only 4 percent and 8.3 percent respectively opposed to it. Yet in the poorly or misinformed group, 50 percent in Salem Heights and 55 percent in Keizer were undecided, 12.5 percent and 15 percent opposed it, and 37.5 percent and 30 percent respectively favored it. It seems probably that the higher percentage favoring fluoridation in both knowledge groups in Salem Heights may be influenced by the experience of having had fluoridation in that area.

Table 7. Numerical Distribution of 65 Residents of Two Communities by Knowledge and Opinion of Fluoridation

	Keizer			Salem Heights			Both Communities			
Knowledge	Pro	Anti	Undec'd	Pro	Anti	Undec'd	Pro	Anti	Undec'd	Totals
Well Informed	10	1	1	24	1	0	34	2	1	37
Misinformed or Uninformed	6	3	11	3	1	4	9	4	15	28
Totals	16	4	12	27	2	4	43	6	16	65

Communities Combined:

$X^2 = 21.38$ $p = <.01$ (df 2)

$X^2 = 3.51$ $p =$ slightly $>.05$ (df 1) (only pro and anti)

$X^2 = 23.28$ $p = <.01$ (df 1) Pro and Not Pro (Anti and Undec'd Comb)

Keizer:

$X^2 = 6.53$ $p = <.01$ (df 1) Pro and Not Pro (Anti and Undec'd Comb)

The null hypothesis that the amount of knowledge of fluoridation is not related to opinion of it was again tested. This time the two knowlege groups (well-informed and poorly or misinformed) were used in a Chi-Square. A Chi-Square (combining the two communities) over the three opinion and two knowledge groups was 21. 38 (df 2) and significant at the . 01 level. When the anti and undecided group is combined X^2 was 23. 28 (df 1) and also significant with $p = <. 01$. Eliminating the undecided group and doing a Chi-Square between those that favor and oppose in the two knowledge groups gives a result of 3. 51 with a probability of slightly more than . 05. This agrees with the previous findings that anti and pros do not differ significantly.

Another Chi-Square test was calculated with Keizer results alone to eliminate the possible influence of the respondents of the fluoridated community. Again the anti and undecided were added and the test was done for two opinion groups and two knowledge groups. The result was 6. 53 (df 1) and significant with a probability of less than . 01. Thus the null hypothesis was rejected with the conclusion drawn that the knowledge of fluoridation facts was related to whether respondents favored fluoridation.

Question 1 in Section I was designed to obtain information regarding how well the respondents felt they understood fluoridation. Since there were only two rating themselves in each of the very well acquainted and the not acquainted groups, these were combined with

the well acquainted and the barely acquainted groups. The three knowledge groups: well-informed, average, and poorly and misinformed were then used and a Chi-Square test was calculated to test the null hypothesis that actual knowledge was not an influence on the self-rating. At four degrees of freedom and with a result of 27.98 the Chi-Square was significant at less than .01 probability. Thus the null hypothesis was rejected and it was accepted that the respondents' self-rating was related significantly to his acquaintance with facts on fluoridation. These findings are shown in Table 8.

Table 8. Numerical Distribution of 85 Residents of Two Communities by Knowledge of Fluoridation and Self-Rating of Knowledge

	Fluoridation Knowledge Groups									
	Poorly Informed 0-8			Av. Informed 9-15			Well Informed 16-30			
Self-Rating Groups	K.	SH.	Total	K.	SH.	Total	K.	SH.	Total	Totals
Well or Very Well Acquainted	1	0	1	0	1	1	5	10	15	17
Just Acquainted	5	5	10	5	6	11	5	14	19	40
Barely or Not Acquainted	14	3	17	3	5	8	2	1	3	28
Totals	20	8	28	8	12	20	12	35	37	85

X^2 (Totals of 3 Knowledge and 3 Self-rating Groups) = 27.98 $p = < .01$ (df 4)

As an additional test for relationships between self-rating and score the Pearson Product-Moment Coefficient of Correlation was calculated in each area. The self-rating was ranked from one being no

knowledge to five as very well acquainted. In Salem Heights r was .54 and in Keizer it was .53. In both communities the correlation is great enough for one to make a fairly accurate prediction of acquaintance with facts by the individuals concept of what he knows about fluoridation.

Comparisons by Sex

To identify and characterize the opponents and supporters of fluoridation the social data collected in Section IV of the questionnaire was used. Opinion of fluoridation will be related to these demographic characteristics as given by the respondents in the two communities. Opinion will also be related to the test scores for each category. Marital status was not used for comparison since 79 of the respondents or 93 percent of the sample were married.

The hypothesis was made that sex would have no relationship to the formed opinion of fluoridation or to the knowledge of fluoridation held by the respondents. The analysis of data related to sex, as shown by Table 9, indicates that there is no significant relationship between sex and opinion of fluoridation. The Chi-Square test of the combined sample for sex and opinion was 4.58 (df 2) and not significant. The hypothesis thus is not disproved and must be accepted. The males tended to be slightly more favorable and the females to be more undecided, but not significantly so. The numbers in the anti and

undecided groups are so small that the results of this test cannot be relied upon very heavily. Simmel and Ast (61) also found that sex made no difference, but Taylor et. al. (65) found that females were more favorable.

Table 9. Numerical Distribution of 85 Residents of Two Communities by Sex and Opinion of Fluoridation.

	Fluoridation Opinion											
	Keizer				Salem Heights				Communities Combined*			
Sex	Pro	Anti	Undec'd	Total	Pro	Anti	Undec'd	Total	Pro	Anti	Undec'd	Total
M	8	4	2	14	10	1	2	13	18	5	4	27
F	12	2	12	26	26	2	4	32	38	4	16	58
Totals	20	6	14	40	36	3	6	45	56	9	20	85

*X^2 = 4.58 (df 2) p = n.s.

The respondents' sex and whether they were well-informed or poorly or misinformed is shown in Table 10. Here there is slight relationship with a Yates corrected Chi-Square (see formula in Appendix C) at 4.15 (df 1) for the combined sample. This is significant at the .05 level and the null hypothesis must be rejected. Males were better informed than females. Of the 19 males in the two knowledge groups 79 percent were well informed. Only 48 percent of the 46 females were well informed.

As a further test it was decided to use the mean scores to test for significant differences in the two communities in relationships to sex. Table 11 gives the mean score for the opinion groups in the two communities as well as for the two sexes. The t-test between the

Table 10. Numerical Distribution of 65 Residents of Two Communities by Sex and Knowledge Groups of Fluoridation

	Fluoridation Knowledge Groups								
	Keizer			Salem Heights			Communities Combined		
Sex	Well Informed	Poorly or Misinformed	Total	Well Informed	Poorly or Misinformed	Total	Well Informed	Poorly or Misinformed	Total
Male	7	4	11	8	0	8	15	4	19
Female	5	16	21	17	8	25	22	24	46
Totals	12	20	32	26	8	33	37	28	65

Communities Combined: $X_c^2 = 4.15$ (df 1) $p = < .05$

total male and female mean scores within each community revealed no significant differences. The 20 scores which were eliminated in the knowledge groupings (well-informed and poorly or misinformed) of Table 10 plus the wide range of scores within the groups has apparantly made these t's not significant while the Chi-Square of Table 10 was significant. The results of the t-tests supports the hypothesis that sex makes no difference in knowledge of fluoridation held by residents of either community. Although a t-test could not be done of the Salem Heights anti, one should note that the one male anti had a high score of 20, while the females' mean score was only 5.5.

Another interesting fact is that the males in Salem Heights had higher means than those in Keizer for each of the opinion groups but when one looks at the female data in each community it is noticed that the anti and the undecided females in Keizer had a higher mean score than those in Salem Heights.

The t-test comparing the means for the males of Keizer to Salem Heights was 2.16 (df 25) and significant at the .05 level and for the females of Keizer to Salem Heights was 2.86 (df 56) and significant at the .01 level. These findings again show Salem Heights residents to be better informed than Keizer residents regardless of sex.

Table 11. Opinion of Fluoridation and Mean Score by Sex for 85 Residents of Two Communities

Fluoridation Opinion by Community	Sex: Males N	Males Mean Score	Males Standard Deviation	Females N	Females Mean Score	Females Standard Deviation	t
Pro							
Keizer	9	14.5	6.44	12	12.4	7.42	n s
Salem Heights	10	17.0	3.65	26	15.8	5.22	n s
Anti							
Keizer	4	6.8	7.23	2	7.5	7.78	n s
Salem Heights	1	20.0	0	2	5.5	7.71	-
Undecided							
Keizer	1	0	0	12	4.8	6.66	-
Salem Heights	2	12.5	.25	4	3.0	2.62	5.83**
Totals							
Keizer	14	11.3!	7.82	26	8.4 !!	7.50	1.2
Salem Heights	13	16.5!	5.10	32	13.7 !!	6.73	1.4

**Significant at .01
!means compared by t-test, t 2.16 p = <.05 (df 25)
!!means compared by t-test, t 2.86 p = <.01 (df 56)

Comparisons by Age

Table 12, which gives the numerical and percent distribution of the residents by communities, indicates that Salem Heights has a higher percentage in the younger age group than Keizer and that

Keizer has a higher percentage in the older age group. Since other studies have shown that the persons favorable to fluoridation tended to be younger (23, 44, 45, 55, 65) it could be possible that this is a contributing factor in Salem Heights' being more favorable. On the basis of others' findings, the hypothesis was made that those in the younger age groups would be more favorable to fluoridation. It was also hypothesized that the younger group would be better informed about fluoridation.

Table 12. Numerical and Percent Distribution of 85 Residents of Two Communities by Three Age Categories

Age Categories	Community			
	Keizer		Salem Heights	
	N	Percent	N	Percent
35 or under	15	37.5	25	55.5
36 - 45	11	27.5	10	22.3
46 or over	14	35.0	10	22.2
Totals	40	100.0	45	100.0

However, when one looks at the data of Table 13, it is apparent that the differences by age are not significant in this study. The anti group is fairly evenly distributed in all three age groups. Two of 40 in the youngest group (35 or under) or five percent were opposed. In the middle (36-45) and older (46 and over) age groups the percentage was 14 and 12.5 respectively. The highest percentage of favorable opinion to fluoridation was in the middle age group of 36 to 45 with

76 percent in the pro group, or 16 of 21. Twenty-six of 40 (or 65 percent) were favorable in the under 35 age group and 14 of 24 (or 58 percent) of the 64 or older group. There were too few in the anti and undecided groups to do a Chi-Square. An analysis of variance of the scores for the three age groups revealed that the differences between groups were not significant with the F ratio being 1.10 (df 2, 82). This indicated that there were no significant differences in the scores for the three age groups. The F ratio for the three age groups in Keizer was .86 (df 2, 33) and 1.81 (df 2, 42) in Salem Heights. Neither was significant. The null hypothesis is not disproved and it must be accepted that age makes no difference in the knowledge of fluoridation facts. Planned t-tests were not computed because of the nonsignificant F ratios.

As shown in Table 14 age is not significantly related to the knowledge groups either. To test the null hypothesis that age makes no difference in whether the respondent was well informed, a Chi-Square test of the total sample for the three age groups was found to be 4.09 (df 2) and not significant. Thus the null hypothesis was not disproved and it must be accepted that age makes no difference in whether a person is well informed or poorly or misinformed about fluoridation facts.

Comparisons by Education

Those with higher education tend to be favorable to fluoridation as revealed by studies of the Mausners (45), Taylor et al (65),

Table 13. Opinion of Fluoridation and Mean Score by Age for 85 Residents of Two Communities

Fluoridation Opinion by Area	Age 35 or Under N	Mean Score	Standard Deviation	Age 36 - 45 N	Mean Score	Standard Deviation	Age 46 or Over N	Mean Score	Standard Deviation
Pro									
Keizer	7	10.1	6.89	6	14.5	5.37	7	16.8	6.69
Salem Heights	19	15.7	5.73	10	16.3	.95	7	17.0	5.50
Anti									
Keizer	1	1.0	0	3	8.7	7.42	2	5.6	7.78
Salem Heights	1	2.0	0	0	-	-	2	16.5	4.95
Undecided									
Keizer	7	5.3	7.80	2	1.0	1.00	5	4.4	5.32
Salem Heights	5	4.6	4.72	0	-	-	1	13.0	0
Totals									
Keizer[1]	15	7.27	7.44	11	10.45	7.42	14	10.79	8.59
Salem Heights[2]	25	12.96	7.35	10	16.30	.95	10	16.50	4.95
Combined Totals[3]	40	10.825	7.80	21	13.238	6.07	24	13.17	7.72

[1] F =(Keizer) = .86 p = n.s (df 2, 37)
[2] (Salem Heights) = 1.81 p = n.s. (df 2, 42)
[3] Combined Totals 1.10 p = n.s. (df 2, 82)

Table 14. Numerical and Percentage Distribution of 85 Respondents by Community, Age, and Knowledge of Fluoridation Groups.

Fluoridation Knowledge Groups by Community	Age Groups: 35 of Under N	%	36 - 45 N	%	Over 45 N	%	Total N	%
Keizer								
Well Informed	3	25	4	50	5	42	12	37
Poorly or Misinformed	9	75	4	50	7	58	20	63
Total	12	100	8	100	12	100	32	100
Salem Heights								
Well Informed	11	58	8	100	6	100	25	76
Poorly or Misinformed	8	42	0	0	0	0	8	24
Total	19	100	8	100	6	100	33	100
Communities Combined*								
Well Informed	14	45	12	75	11	64	37	57
Poorly or Misinformed	17	55	4	25	7	36	28	43
Total	31	100	16	100	18	100	65	100

*X^2 Total = 4.09 (df 2) p = not significant

Masterson (44), and Rademaker (55). Thus it was hypothesized that, likewise in this study, those with higher education would be more favorable to fluoridation and would also be in the well-informed group. As revealed by Table 15, Salem Heights had a higher percentage of respondents in the college group than Keizer (36.4 percent to 17.5 percent) while Keizer had a higher percentage in the grade school group (15 percent to 9.1 percent).

Table 15. Numerical and Percent Distribution of 84 Residents* of Two Communities by Three Educational Levels.

Educational Level	Keizer N	Keizer Percent	Salem Heights N	Salem Heights Percent
Grade School	6	15.0	4	9.1
High School	27	67.5	24	54.5
College	7	17.5	16	36.4
Totals	40	100.00	44	100.0

*One Salem Heights resident gave no answer to education.

Table 16, which gives the distribution of respondents by education achieved and opinion of fluoridation, indicates that while 20 percent of the grade school group (2 of 10) are opposed to fluoridation only 8.7 percent of the college group are anti (2 of 23). Testing the null hypothesis that education achieved would make no difference in opinion, a Chi-Square test with results of 2.93 (df 4) was found not significant. However, three of the nine expected frequencies were below five so that this is not a reliable test here. However, the null

hypothesis is not disproved.

Table 16. Numerical Distribution of 84* Residents of Two Communities by Educational Level and Opinion of Fluoridation

Opinion of Fluoridation by Community	Educational Level			
	Grade School	High School	College	Total
Keizer				
Pro	2	13	5	20
Anti	2	3	1	6
Undecided	2	11	1	14
Salem Heights				
Pro	2	21	12	35
Anti	0	2	1	3
Undecided	2	1	3	6
Communities Combined**				
Pro	4	34	17	55
Anti	2	5	2	9
Undecided	4	12	4	20

*One Salem Heights Resident gave no answer to education
**X^2 = 2.93 (df 4) p = n. s.

Figure 4 gives a graphic picture of the percentage distribution of the opinion groups within each education group by community. In both Keizer and Salem Heights the high school group is very similar to the college group in the percentage favoring and opposing fluoridation. The data were insufficient to make conclusions. Comparisons to findings of other studies, namely that the college group are more favorable than the high school group, (45, 65, 44) and findings of Simmel (60) and Simmel and Ast (61) that education does not affect opinion either way, could not be made.

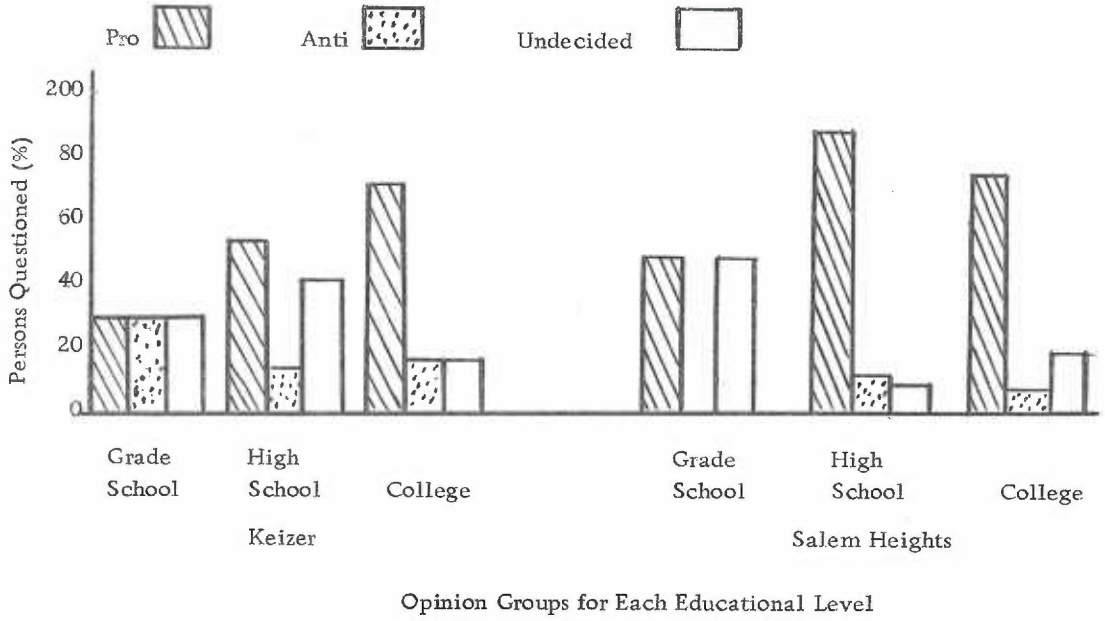

Figure 4. Percent Distribution of Three Opinion Groups of Fluoridation Within Three Educational Levels as Given by 85 Residents of Two Communities

The antis were found to come from all three education groups: two each from the grade school and college category and five from the high school group. This contradicts findings of the Mausners(45) and Kirscht and Knutson (39, 40) that the antis are from the less well educated group and supports Gamson's findings that the antis are more likely to come from the group with medium education.

On the basis of the findings that the higher scores are significantly those in favor of fluoridation an F test of the mean scores in the two communities was calculated and then t-tests computed in an attempt to further test the null hypothesis that education makes no difference in opinion. Table 17 shows the mean score for the

Table 17. Opinion of Fluoridation and Mean Score by Educational Level for 84* Residents of Two Communities

Opinion of Fluoridaion By Community	Grade School N	Grade School Mean Score	Grade School Stand. Dev.	High School N.	High School Mean Score	High School Stand. Dev.	College N	College Mean Score	College Stand. Dev.	F
				Educational Level						
Pro										
Keizer	2	11.5	0.71	13	12.6	7.09	5	17.8	6.26	
Salem Heights	2	16.0	0	21	16.2	4.32	12	16.6	5.74	
Anti										
Keizer	2	5.5	7.78	3	3.7	4.62	1	16.0	0	
Salem Heights	0	-	-	2	11.0	12.73	1	13.0	0	
Undecided										
Keizer	2	0.5	0.71	11	3.6	4.73	1	20.0	0	
Salem Heights	2	2.5	3.67	1	5.0	0	3	8.7	6.66	
Total										
Keizer	6	5.8	5.79	27	8.0	7.38	7	17.8	5.24	6.6**
Salem Heights	4	9.25	8.06	24	15.3	5.54	16	14.9	6.35	1.7
Combined Totals	10	7.2	6.71	51	11.4	7.49	23	15.8	6.08	21.3**

*One respondent gave no educational level

**Significant at the .01 level

t-tests Keizer - college to high school $t = 3.29$ (df 32) $p = < .01$

college to grade school $t = 3.93$ (df 11) $p = < .01$

Keizer high school to Salem Heights high school $t = 3.96$ (df 49) $p = < .01$

Table 18. Numerical and Percent Distribution of 65 Residents of Two Communities by Educational Level and Knowledge of Fluoridation Groups

Fluoridation knowledge groups by Community	Grade School N	Grade School %	High School N	High School %	College N	College %	Total N	Total %
	Educational Level							
Keizer								
well informed	0	0	5	22.7	7	100.0	12	37.5
Poorly or misinformed	3	100	17	77.3	0	0	20	62.5
Total	3	100	22	100.0	7	100.0	32	100.0
Salem Heights								
well informed	2	50.0	15	78.9	8	80.0	25	75.7
poorly or misinformed	2	50.0	4	21.1	2	20.0	8	24.3
Total	4	100.0	19	100.0	10	100.0	33	100.0
Communities Combined*								
well informed	2	28.5	20	48.8	15	88.2	37	56.9
poorly or misinformed	5	71.5	21	51.2	2	11.8	28	43.1
Total	7	100.0	41	100.0	17	100.0	65	100.0

*X^2_c Communities combined (with grade school and high school added) = 7.79 (df 1) $p = < .01$

respondents of the two areas by their educational level and their opinion of fluoridation. The F ratio over the three educational levels (communities combined) was 21.3 (df 2, 81) and significant at the .01 level. This indicates that there are some differences in scores between the educational groups. However, the F ratio of Salem Heights showed no significant difference, being 1.7 (df 2, 41). For Keizer the F ratio was 6.6 (df 2, 37) and significant at the .01 level. Next, t-tests were computed between the three educational groups in Keizer and the college group was found to be significantly different from both the grade school and high school groups. For the college to high school group the t-test was 3.29 (df 32) and for the college to grade school group it was 3.93 (df 11) both significant at the .01 level. The null hypothesis that education makes no difference in opinion (based on higher scores being favorable) and in knowledge is then rejected for Keizer but must be accepted for Salem Heights.

The fluoridation knowledge mean score of the college group in Keizer is higher than the same group in Salem Heights, however a t-test between the means was not significant. The t-test of the means for the grade school respondents of the two communities was not significant either but the t-test of the two high school means was 3.96 (df 49) with a probability of $<.01$. The previous finding that Salem Heights residents are significantly more informed than Keizer residence is shown to be true only in the high school group.

To test the null hypothesis that education makes no difference in whether the respondent is well-informed or poorly informed, a Yates corrected Chi-Square test was calculated of the total sample with the grade school and high school groups combined. The results were 7.79 (df 1) and significant at the .01 level. The null hypothesis was thus again rejected and education was found to be related to opinion. Chi-Square tests could not be calculated for each area separately because of the deficiency in numbers, and therefore the percentage distribution was calculated for each category and is shown in Table 18.

In Keizer 100 percent of the grade school graduates were in the poorly or misinformed group and 100 percent of the college graduates were in the well informed group. More of the high school group were in the lower group. In Salem Heights the difference was not so marked. Of the four grade school graduates only 50 percent were in the poorly or misinformed group and 80 percent of the college graduates were in the well-informed group. The high school group was predominantly well educated with 79 percent being well informed. These facts support the belief that level of education is related to whether respondents are well-informed or would fall into the poorly or misinformed group.

Comparisons by Children

People with children are more likely to favor fluoridation than

those without children. This finding has been repeated in several of the studies. (23, 39, 40, 65) For this study, on this basis, it was hypothesized that those with young children in the family would be more favorable to fluoridation and also be better informed than those with no children. Table 19 presents the numerical distribution of children in the home and responses to opinion on fluoridation by residents of each community. In the total sample and in Salem Heights the total number favoring fluoridation is greater than the number opposing or undecided in each category. In Keizer those with no children and those with only preschoolers had a higher percent in the undecided group.

Table 19. Numerical Distribution of 85 Residents of Two Communities by Opinion of Fluoridation and Children in the Home Groups

Opinion of Fluoridation by Community	Children in The Home Groups				
	No Children	All Pre-schoolers	All school ages	Pre and school age	Totals
Keizer					
Pro	5	3	7	5	20
Anti	3	1	2	0	6
Undecided	7	3	2	2	14
Salem Heights					
Pro	7	3	13	13	36
Anti	1	1	1	0	3
Undecided	2	2	1	1	6
Communities Comb. *					
Pro	12	6	20	18	56
Anti	4	2	3	0	9
Undecided	9	5	3	3	20
Combined Totals	25	13	26	21	85

*X_c^2 = 3.87 (df 1) p = <.05 (combined 2 x 2 table with all with children combined and anti combined with undecided)

To test the null hypothesis that children in the family would make no difference in a decision in favor of fluoridation, a Yates corrected Chi-Square test was calculated. All of those with children were totaled together giving 60 of which 44 favored fluoridation and 16 were opposed or undecided. Of the 25 with no children 12 were pro and 13 anti or undecided. The results of the X_c^2 was 3.87 (df 1) and significant at the .05 level. The null hypothesis was thus rejected and the conclusion made that the presence of children in the family was related to a decision in favor of fluoridation. A graphic picture of the percentage distribution of the opinion groups among those with children as compared to those with no children is shown in Figure 5. While only 33 percent of those with no children in Keizer favor fluoridation in Salem Heights 70 percent are proponents. The study by Mausners found that those with no children are more likely to be anti to fluoridation (45). This finding is supported by the Keizer group but not by Salem Heights. Also interesting is the fact that a higher percentage of those with no children in Salem Heights favor fluoridation than those in Keizer with children.

Table 20 gives the numerical distribution as well as the means for the four categories of number of children in the home. An F test over the total sample was 4.1 (df 3, 81) and significant at the .01 level. This meant that there was a significant difference in mean scores between groups for the entire sample. F tests were then computed for

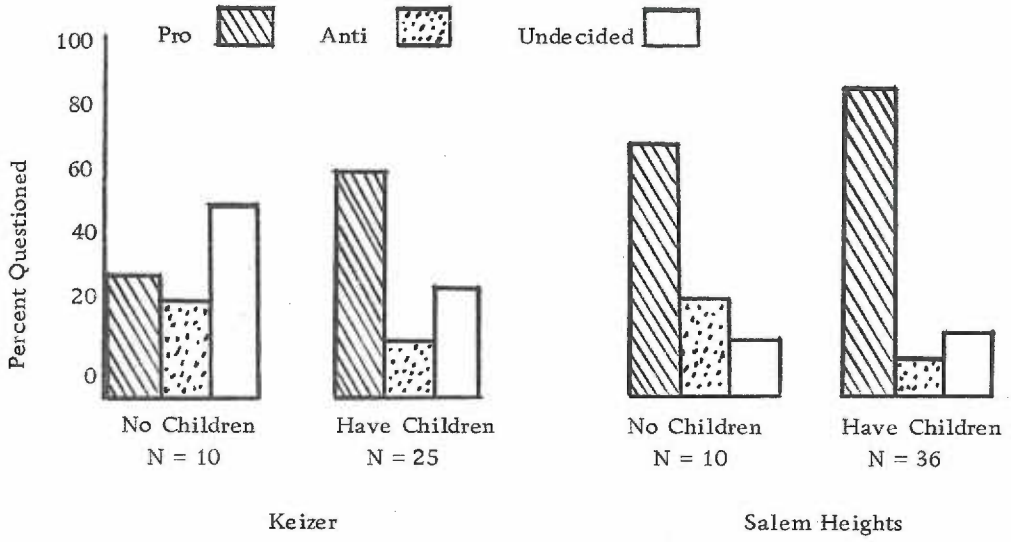

Figure 5. Percentage Distribution of Three Opinion Groups of Fluoridation Within Two Children Groups as Given by 85 Residents in Two Communities

Table 20. Numerical Distribution and Fluoridation Mean Scores of 85 Residents of Two Communities by Four Children in the Home Groups

Children in the Home Groups	Community: Keizer N	Keizer Mean Score	Keizer S. D.	Salem Heights N	Salem Heights Mean Score	Salem Heights S. D.	Totals N	Totals Mean Score	Totals S. D.
1. No Children	15	9.5	7.82	10	14.1	5.08	25	11.3	7.13
2. All Pre-schoolers	7	5.6	6.45	6	6.7	6.62	13	6.1	6.28
3. All School Age	11	11.2	8.42	15	16.7	3.50	26	14.3	6.55
4. Both Pre and School Age Children	7	10.1	8.55	14	15.8	6.62	21	14.2	7.61
Totals	40	9.4	7.74	45	14.5	6.09	85	12.1	7.10

F test

Combined 4.1 (df 3, 81) p = < .01
Keizer .7 (df 3, 36) p = n. s.
Salem Heights 5.3 (df 3, 41) p = < .01

t-test (Salem Heights)

Group 2 & 1 t = 2.52 (df 14) p = < .05
Group 2 & 3 t = 4.59 (df 19) p = < .01
Group 2 & 4 t = 2.82 (df 18) p = < .02

t-test Salem Heights to Keizer

Group 3 t = 2.3, df 24 p = < .05

each community separately and no differences were found in Keizer with an F ratio of . 7 (df 3, 36). The F ratio for Salem Heights, however, was 5. 3 (df 3, 41) and significant at the . 01 level. Individual t-tests were then computed between the means of the four groups in Salem Heights. Group 2, those with all pre-schoolers, was found to be significantly different from each of the other groups. Difference from the no children group was significant with a t-test of 2. 52 (df 14) and p = <. 05. Comparison with the group with all schoolage children resulted in a t-test of 4. 59 (df 19) and p = <. 01 and with the group of pre and school age children 2. 82 (df 18) and p = <. 02. This gives results different than expected for it was hypothesized that those with young children would be more likely to be well informed. There was no difference in the four groups in Keizer and it was the group with all preschoolers in Salem Heights that was significantly different from the rest with a much lower mean score. Thus the null hypothesis that children in the home makes no difference in the knowledge of fluoridation must be accepted for Keizer and rejected for Salem Heights because those with small children were significantly less well informed.

Comparisons of the mean scores between each child group for communities were made by t-tests. Only Group 3, those with all school age children, was found to be significantly different in the two communities. The t-test was 2. 3 (df 24) and significant at the . 05 level. The previous finding of this study that Salem Heights had

significantly higher scores than Keizer is now found to be true only in the parents of children who are all of school age. It is possible that the dental survey made of Salem Heights school children could have increased the knowledge of fluoridation held by the parents.

To test the null hypothesis that the well informed would not be influenced by children in the home, a Yates corrected Chi-Square test was calculated of the total sample as shown in Table 21. The results did not disprove the null hypothesis with a Chi-Square of .023 (df 1) which was not significant. In both areas there is a higher percent of well informed individuals with no children than there are well informed individuals with children. The percentage of well informed was greater than the poorly or misinformed for both children groups in Salem Heights but less in Keizer.

Table 21. Numerical and Percent Distribution of 65 Residents of Two Communities by Two Children and Two Fluoridation Knowledge Groups

Fluoridation Knowledge Groups by Community	Children Groups: No Children N	%	Have Children N	%	Total N	%
Keizer						
Well Informed	5	41.7	7	35.0	12	37.5
Poorly or Misinformed	7	58.3	13	65.0	20	62.5
Total	12	100.0	20	100.0	32	100.0
Salem Heights						
Well Informed	5	83.3	20	74.1	25	75.7
Poorly or Misinformed	1	16.7	7	25.9	8	24.3
Total	6	100.0	27	100.0	33	100.0
Communities Combined*						
Well Informed	10	55.5	27	57.4	37	56.9
Poorly or Misinformed	8	44.5	20	42.6	28	43.1
Total	18	100.0	47	100.0	65	100.0

*X_c^2 = .023 (df 1) p = n.s.

Comparisons by Income

Studies by Taylor et al (65), Simmel (60) Simmel and Ast (61), and the Berkeley study (39) all found that the higher the income, the greater the proportion of people in favor of fluoridation. It was also found that those opposed to fluoridation had the lowest income level. (45, 60) Thus it was hypothesized, for this study, that higher income levels would be characteristic of those favoring fluoridation and that these same individuals would be more likely to be well informed. The numerical and percent distribution of the total sample by income in the two communities is shown in Table 22. While Salem Heights, which has fluoridation, has 44. 2 percent of the total sample in the $9, 000 and over group, Keizer, which does not have fluoridation, has only 23 percent.

The numerical distribution of the sample by opinion of fluoridation and income groups for the two communities is given in Table 23. Testing the null hypothesis that income would not be related to opinion, a Chi-Square test (combining the two communities) over the three income levels and the three opinion groups was 9. 37 (df 4) and with a probability of slightly more than . 05. There is then a slight relationship between income and opinion.

Figure 6 gives a graphic picture of the percent distribution of three opinion groups within each income group by community. In both

Table 22. Numerical and Percent Distribution of 82 Residents of Two Communities by Three Income Groups

Income Groups	Community			
	Keizer		Salem Heights	
	N	Percent	N	Percent
$0-5,999	13	33.4	14	32.55
$6,000-8,999	17	43.6	10	23.25
$9,000 and over	9	23.0	19	44.20
Totals	39	100.0	43	100.00

Table 23. Numerical Distribution of 82* Residents of Two Communities by Opinion of Fluoridation and Three Income Groups.

Opinion of Fluoridaion by Community	Income Groups			
	$0-5,999	$6,000-8,999	$9,000 & Over	Totals
Keizer				
Pro	3	13	4	20
Anti	3	1	2	6
Undecided	7	3	3	13
Salem Heights				
Pro	9	9	16	36
Anti	1	1	1	3
Undecided	4	0	2	6
Both Communities**				
Pro	12	22	20	54
Anti	4	2	3	9
Undecided	11	3	5	19
Combined Totals	27	27	28	82

*Three Respondents gave no income

**$X^2 = 9.37$ (df 4) p = slightly >.05.

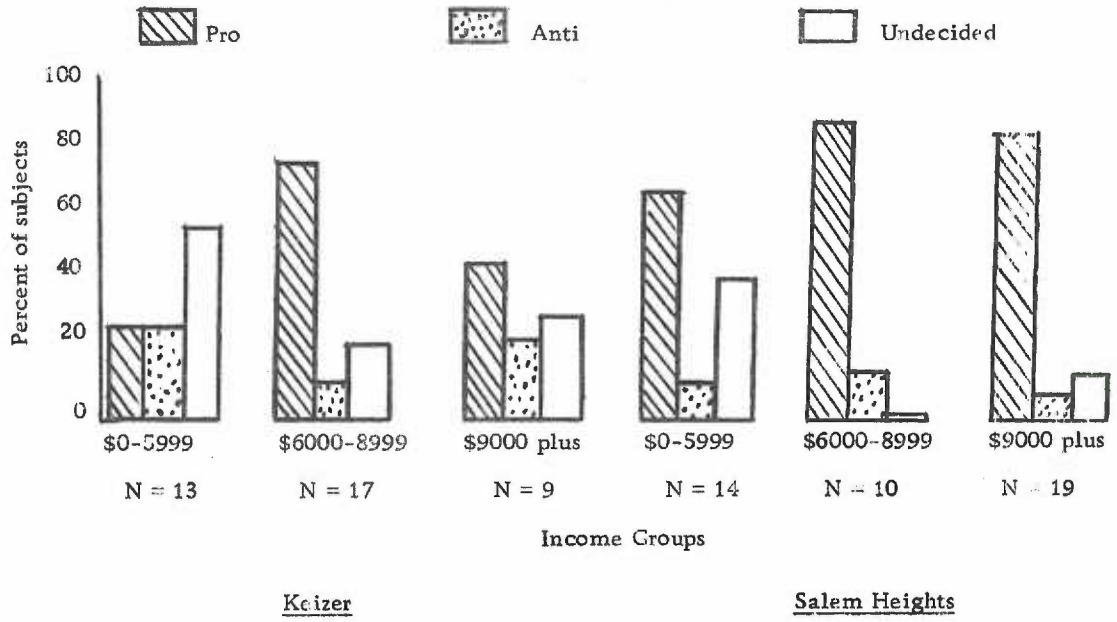

Figure 6. Percent Distribution of Three Opinion Groups of Fluoridation Within Three Income Groups in Two Communities as given by 82 Residents of Two Communities.

communities the percent favoring in the highest income group was not as great as those favoring in the $6,000 to $8,999 income group. In each community the lowest income group had a lower percent favoring than in each of the other two income groups. In comparing the two areas however, the lowest income group in Salem Heights had a higher percent favoring than the highest income group in Keizer.

Testing the null hypothesis that income would make no difference in knowledge of fluoridation, F tests (Table 24) and t-tests (Table 25) were computed. The F ratio (combining the two communities) over the three income groups was 5.3 (df 2, 79) and significant at the .05 level. F tests were then calculated for each community and significant

Table 24. Opinion of Fluoridation and Mean Score by Income for 82 Residents of Two Communities

Opinion of Fluoridation by Community	Income Groups: $0 - 5,999 N	Mean Score	S. D.	$6,000-8,999 N	Mean Score	S. D.	$9,000 or Over N	Mean Score	S. D.	F
Pro										
Keizer	3	8.0	7.81	13	12.6	6.64	4	19.0	2.51	
Salem Heights	9	13.3	4.69	9	17.8	2.89	16	17.7	4.13	
Anti										
Keizer	3	4.0	6.08	1	16.0	0	2	5.0	5.66	
Salem Heights	1	2.0	0	1	13.0	0	1	20.0	0	
Undecided										
Keizer	7	2.6	4.39	3	7.3	11.01	3	4.3	7.24	
Salem Heights	4	2.8	2.63	0	0	0	2	12.5	.71	
Total Sample										
Keizer	13	4.2	5.58	17	12.6	7.36	9	11.0	8.56	5.40**
Salem Heights	14	9.5	6.61	10	17.3	3.13	19	17.3	4.41	11.50**
Combined	27	5.4	7.94	27	14.3	6.44	28	15.3	6.65	5.30*

* p = <.05
** p = <.01

Table 25. Comparison of Fluoridation Means of Income Groups and Opinion Groups for Two Communities

Opinion Groups by Community	Low to Middle Income: Differences Between Means	t	Low to High Income: Differences Between Means	t	Middle to High Income: Differences Between Means	t
Pro						
Keizer	4.6	.76	11.0	2.70*	6.4	1.86
Salem Heights	4.5	2.46*	4.4	2.44*	.1	.04
Anti						
Keizer	12.0	1.71	1.0	.18	11.0	1.59
Salem Heights	11.0	-	18.0	-	7.0	-
Total Community						
Keizer	8.4	3.43**	6.8	2.27*	1.6	.50
Salem Heights	7.8	3.45**	7.8	3.79**	0	0

* p = < .05
** p = < .01

differences were found to exist between the three income groups in each community. For Salem Heights the F ratio was 11.5 (df 2, 40, p = <.01) and for Keizer it was 5.4 (df 2, 36, p = <.01). This indicates that there are significant differences in knowledge of fluoridation scores between the three income groups in both communities.

When the mean scores for the three income groups in both communities were compared, statistically significant differences (determined by t-test) were found as shown by Table 25. In both Keizer and Salem Heights the low income group was significantly different from both of the other income groups. Comparison of the low to middle income group for both communities was significant at .01 with t's of 3.43 (df 28) for Keizer and 3.45 (df 22) for Salem Heights. The t-test comparing the low to high income means in Keizer was 2.27 (df 20) and significant at the .05 level and in Salem Heights comparing the same two income groups was 3.79 (df 21) and significant at the .01 level. Testing to see if this difference still existed in the opinion groups, t-tests were calculated of the means for the opinion groups for each income level when it was possible to do so. Comparing the pro group of the low to the pro group of the middle income group there was no significant difference found in Keizer but in Salem Heights the t-test was 2.46 (df 16) and significant at the .05 level. Comparing the pro group of the low income group to the pro of the high income group both were significantly different at the .05 level with a t-test

in Salem Heights of 2. 44 (df 23) and in Keizer 2. 70 (df 10). There were no significant differences found in the anti groups for the three income levels. The null hypothesis is therefore rejected and it is shown that high income is significantly related to a higher level of knowledge of fluoridation. Since amount of information has been shown to be related to opinion, this supports the hypothesis that the higher income groups will be more favorable to fluoridation although it does not prove it.

In comparing the total information means of each income group by community it was found that the lowest income group in the two communities did not differ significantly in amount of information on fluoridation. The mean scores of the middle and higher income groups did differ significantly. Salem Heights middle income group mean was significantly higher than Keizers middle income group with a t-test of 2. 24 (df 25) and $p = <.05$. The higher income mean in Salem Heights was also significantly higher than Keizers with a t-test of 2. 59 (df 26) and $p = <.02$. This again adds to the findings that Salem Heights, the fluoridated community, is better informed than Keizer, the nonfluoridated community but only in the middle and higher income groups.

A Chi-Square (combining the two communities) was calculated to test the null hypothesis that the well informed are not significantly related to any one income level. The result was 18. 89 (df 2) and very

Table 26. Numerical and Percent Distribution of 63 Residents of Two Communities by Three Income Groups and Two Knowledge of Fluoridation Groups

Fluoridation Knowledge Groups by Community	Income Groups: $0-5,999 N	%	$6,000-8,999 N	%	$9,000 & Over N	%	Total N	%
Keizer								
Well Informed	1	9.1	7	53.8	4	57.1	12	38.7
Poorly or Misinformed	10	90.9	6	46.2	3	42.9	19	61.3
Total	11	100.0	13	100.0	7	100.0	31	100.0
Salem Heights								
Well Informed	3	33.0	8	100.0	14	93.3	25	78.1
Poorly or Misinformed	6	67.0	0	0	1	6.7	7	21.9
Total	9	100.0	8	100.0	15	100.0	32	100.0
Communities Combined*								
Well Informed	4	20.0	15	71.4	18	81.8	37	58.7
Poorly or Misinformed	16	80.0	6	28.6	4	18.2	26	41.3
Total	20	100.0	21	100.0	22	100.0	63	100.0

* $X^2 = 18.99$ (df 2) $p =< .01$

significant at the .01 level. (See Table 26) Thus the null hypothesis was rejected and the conclusion made that the income level was significantly related to the knowledge classifications. The high income group tends to be well informed and the low income group to be poorly or misinformed.

Comparisons by Occupation

As a result of the findings of Taylor, et al (65) Simmel, (60) and Simmel and Ast (61) the hypothesis was made, for this study, that those in the higher or white collar jobs would favor fluoridation. The occupational classifications used were the same as those used by

Simmel. The division of white and blue collar were each divided into upper and lower. The upper white collar group included professional and technical workers as well as managers, officials, and proprietors. The lower white collar group included clerical and sales workers. The blue collar group was divided into craftsman and foreman and service workers and laborers. A fifth group was added to include those who are retired. The distribution for each community is shown in Table 27. Salem Heights, the fluoridated community, had a higher percentage in the Professional and Technical group and Keizer had a higher percentage in each of the other categories.

Table 27. Numerical and Percent Distribution of 85 Residents of Two Communities by Five Occupational Classifications

Occupational Classification	Community			
	Keizer		Salem Heights	
	N	Percent	N	Percent
Professional & Technical	7	17.5	18	40.0
Clerical & Sales	13	32.5	13	28.9
Craftsman & Foreman	6	15.0	5	11.1
Service & Laborer	11	27.5	7	15.6
Retired	3	7.5	2	4.4
Totals	40	100.0	45	100.0

Table 28, which gives the distribution of respondents by occupation and opinion of fluoridation, shows that 88 percent of Group A (professional and technical) were proponents of fluoridation, yet there were no proponents in Group E (retired). The other three groups

Table 28. Numerical and Percent Distribution of 85 Residents of Two Communities by Opinion of Fluoridation and Five Occupational Groups

Opinion of Fluoridation by Community	A Prof. & Tech. N	A %	B Clerical & Sales N	B %	C Craftsman & Foreman N	C %	D Service & Labor N	D %	E Retired N	E %	Totals N	Totals %
Keizer												
Pro	5	71.4	7	53.8	3	50.0	5	45.45	0	0	20	50.0
Anti	0	0	2	15.4	2	33.3	1	9.1	1	33.3	6	15.0
Undecided	2	28.6	4	30.8	1	16.7	5	45.45	2	66.7	14	35.0
Total	7	100.0	13	100.0	6	100.0	11	100.0	3	100.0	40	100.0
Salem Heights												
Pro	17	94.4	10	76.9	4	80.0	5	71.4	0	0	36	80.0
Anti	0	0	0	0	0	0	1	14.3	2	100.0	3	6.7
Undecided	1	5.6	3	23.1	1	20.0	1	14.3	0	0	6	13.3
Total	18	100.0	13	100.0	5	100.0	7	100.0	2	100.0	45	100.0
Communities Combined*												
Pro	22	88.0	17	65.4	7	63.6	10	55.6	0	0	56	65.9
Anti	0	0	2	7.7	2	18.2	2	11.1	3	60.0	9	1.1
Undecided	3	12.0	7	26.9	2	18.2	6	33.3	2	40.0	20	33.0
Total	25	100.0	26	100.0	11	100.0	18	100.0	5	100.0	85	100.0

*X_c^2 Comparing A & D (with anti and undecided combined) = 4.22 (df 1) $p = < .05$

did not vary greatly with 65.4 percent, 63.6 percent and 55.6 percent favoring fluoridation in Group B (clerical and sales), Group C (craftsman and foreman), and Group D (service and laborers) respectively. Simmel, (60) found that craftsmen and foremen were slightly more likely to favor fluoridation than the clerical and sales group. This was true in Salem Heights but not in Keizer.

In looking at the distribution in Keizer the percent favoring in each of the groups is smaller than the percent favoring in Salem Heights with the exception of the retired group in which there were no

pros for either community. The antis are fairly equally distributed in the last four groups with none in the professional and technical group. This agrees with findings of Taylor, et al (65) that antis do not necessarily come from the unskilled labor groups. It also agrees with the Mausner's (45) that antis come from the middle and lower occupations. Chi-Square tests were computed (totals of communities combined) comparing groups A, B, C, and D with each other, and Group A was found to be significantly different from Group D. (See Table 28) The Yates corrected Chi-Square was 4. 22 (df 1) and significant at the . 05 level. Comparisons could not be made with Group E (retired) because of the small number in this group. The null hypothesis that occupation made no difference in opinion is rejected since there were significantly more pros in Group A (professional and technical) than in Group D (service and laborer).

Again the mean scores of each group were used in a further attempt to determine differences in opinion for each. Simple analysis of variance of the means for the five occupation groups (communities combined) showed that there were significant differences among the groupings with an F ratio of 3. 23 (df 4, 80) and significant at the . 05 level. (See Table 29) Analysis of variance was then computed of the totals for each community and it was found that Salem Heights F ratio was 1. 14 and not significant. Keizer, however, was significant with an F ratio of 11. 5 (df 4, 35) and a probability of <. 01. Then t-tests

Table 29. Opinion of Fluoridation and Mean Score by Occupation for 85 Residents of Two Communities

Opinion by Area	A Prof. & Tech. N	Mean	S.D	B Clerical & Sales N	Mean	S.D.	C Craftsman & Foreman N	Mean	S.D.	D Service & Labor N	Mean	S.D.	E Retired N	Mean	S.D.	F
Pro																
Keizer	5	11.6	6.0	7	18.3	5.3	3	11.7	7.5	5	11.0	4.6	0			
S. H.	17	16.8	5.1	10	16.3	4.0	4	12.5	4.9	5	16.2	4.9	0			
Anti																
Keizer	0			2	8.5	10.6	2	10.0	1.4	1	1.0		1	0		
S. H.	0			0			0			1	2.0		2	16.5	4.9	
Undecided																
Keizer	2	16.0	5.7	4	1.7	1.8	1	0		5	2.6	5.3	2	4.5	4.9	
S.H.	1	5.0	-	3	8.7	6.7	1	5.0		1	0		0			
Total																
Keizer	7	12.9	5.8	13	11.7	9.6	6	9.1	6.6	11	6.3	7.4	3	3.0	4.4	11.5**
S.H.	18	16.2	5.3	13	14.5	5.3	5	11.0	5.4	7	11.7	8.4	2	16.5	4.9	1.14
Combined	25	15.3	5.8	26	13.1	7.6	11	10.0	5.9	18	8.4	8.1	5	8.4	7.1	3.23*

* $p = <.05$
** $p = <.01$

were computed of the difference between the mean scores of the five occupation groups in Keizer and only Group A was found significantly different from Group E with a t-test of 2.69 (df 9) and significant at the .05 level. Group A had no antis and Group E had no pros. Thus occupation is significantly related to opinion and knowledge in Keizer but not in Salem Heights. Those individuals who are retired are significantly different from the professionals and technicals in knowledge of fluoridation facts.

To test the null hypothesis that occupation makes no difference in whether the respondent is well informed or not a Chi-Square test

was calculated of the total sample. The results were 10. 958 (df 4) and significant at the . 05 level. Thus the null hypothesis is rejected and it is assumed that occupation does have a significant relationship to amount of knowledge held (although this is not a reliable test result due to the small n's). Percentage as well as numerical distribution of the respondents in the occupational and knowledge groups is given in Table 30. In Keizer the percentage in the well informed group is highest in Occupation Group A and drops gradually down the scale with the lowest in Occupation Group E. The percentage in the poorly or misinformed group is inversely proportional to the well-informed group with the highest in Occupation Group E and the lowest in Group A. This relationship is not so clear in Salem Heights. The one retired person in Group E was in the well-informed group. Group D had a higher percentage in the well-informed group than did Group C and Group B had more than Group A.

Comparisons by Length of Residence

For this study the hypothesis was made that length of residence in the community would not be a significant factor in the opinion favoring fluoridation. As shown by Table 31 there was little difference in the two communities, for in both, two-thirds or more of the respondents had lived there over five years.

Table 30. Numerical and Percent Distribution of 65 Residents of Two Communities by Five Occupation and Two Knowledge of Knowledge of Fluoridation Groups

Knowledge Groups by Community	Occupational Groups A Prof. & Tech. N	%	B Clerical & Sales N	%	C Craftsman & Foreman N	%	D Service & Labor N	%	E Retired N	%	Totals N	%
Keizer												
Well Informed	3	60.0	7	53.8	1	33.3	1	12.5	0	0	12	37.5
Poorly or Misinformed	2	40.0	6	46.2	2	66.7	7	87.5	3	100.0	20	62.5
Total	5	100.0	13	100.0	3	100.0	8	100.0	3	100.0	32	100.0
Salem Heights												
Well Informed	14	82.4	6	85.7	1	33.3	3	60.0	1	100	25	75.7
Poorly or Misinformed	3	17.6	1	14.3	2	66.7	2	40.0	0	0	8	24.3
Total	17	100.0	7	100.0	3	100.0	5	100.0	1	100.0	33	100.0
Combined												
Well Informed	17	77.3	13	65.0	2	33.3	4	30.8	1	25	37	56.9
Poorly or Misinformed	5	22.7	7	35.0	4	66.7	9	69.2	3	75	28	43.1
Total	22	100.0	20	100.0	6	100.0	13	100.0	4	100.0	65	100.0

X^2 (Communities combined) = 10.958 (df 4) $p = < .05$

Table 31. Numerical and Percent Distribution of 85 Residents of Two Communities by Length of Residence in Each Community

Length of Residence	Community: Keizer N	Keizer Percent	Salem Heights N	Salem Heights Percent
Under 5 years	13	33.3	12	26.7
Over 5 years	26	66.7	33	73.3
Totals	39	100.0	45	100.0

Table 32, which gives the distribution of respondents by length of residence and opinion of fluridation, indicates that the two are not significantly related.

Table 32. Numerical Distribution of 84 Residents of Two Communities by Opinion of Fluoridation and Length of Residence in the Locality

Fluoridation Opinion by Community	Length of Residence: Under 5 years N	%	Over 5 years N	%	Totals N	%
Keizer						
Pro	4	30.8	15	57.7	19	48.7
Anti	2	15.4	4	15.4	6	15.4
Undecided	7	53.8	7	26.9	14	35.9
Total	13	100.0	26	100.0	39	100.0
Salem Heights						
Pro	10	83.7	26	78.8	36	80.0
Anti	0	-	3	9.1	3	6.7
Undecided	2	16.3	4	12.1	6	13.3
Total	12	100.0	33	100.0	45	100.0
Communities Comb. *						
Pro	14	56.0	41	69.5	55	65.5
Anti	2	8.0	7	11.9	9	10.7
Undecided	9	36.0	11	18.6	20	23.8
Total	25	100.0	59	100.0	84	100.0

*X^2 = 2.83 (df 2) p = n. s.

A chi-Square test (communities combined), calculated to test the hypothesis, was found to be 2.83 (df 2) and not significant. When one looks at the two communities alone there are slight differences noted. In Keizer, while 57.7 percent of those with over five years residency

are pro, only 30. 8 percent of those under five years are pro. The antis are equally distributed between the two groups. In Salem Heights those favoring are slightly higher in the group with less than five years residency, with 83. 7 percent as compared to 78. 8 percent in the group with over five years residency. All three of the antis in the fluoridated community came from the over five year residents. This might indicate that new residents in the area consider the fluoridated water as an asset and those opposed to it do not move into the community.

To test the hypothesis that length of residence would make no difference in knowledge of fluoridation held by respondents, t-tests were computed of the means and a Chi-Square was computed of the totals in the well-informed and poorly or misinformed groups. The data for the t-tests are shown in Table 33 and for the Chi-Square in Table 34. In Salem Heights there was no significant difference found in the knowledge of fluoridation between the two groups by length of residence. In Keizer, the t-test was 2. 04 significant at the . 05 level (df 37). However, when t-tests were computed of the means for the three opinion groups of each length of residence group none of them was found to be significant. Thus while in Keizer length of residence and knowledge of fluoridation are significantly related in the total group, there is no apparent significant relationship of length of residence and knowledge of the pro, anti, or undecided opinion groups.

Table 33. Opinion of Fluoridation and Mean Score by Length of Residence in the Locality for 84 Residents of Two Communities

Opinion of Fluoridation by Community	Length of Residence: Less than 5 years N	Mean	S. D.	Over 5 years N	Mean	S. D.	t
Pro							
Keizer	4	10.7	8.18	15	15.3	6.06	1.27
Salem Heights	11	17.1	16.88	25	15.7	4.52	0.81
Anti							
Keizer	2	1.0	0	4	9.0	6.68	1.60
Salem Heights	0	-	-	3	11.6	9.07	-
Undecided							
Keizer	7	5.1	7.79	7	3.6	4.75	0.43
Salem Heights	2	3.0	2.83	4	7.5	6.13	0.947
Total Sample							
Keizer	13	6.2!	7.63	26	11.2	7.25	2.04*
Salem Heights	13	14.9!	7.24	32	14.3	5.75	0.296

*significant at .05 (df 37)
!means compared by t-test $t = 2.97$ $p = < .01$ (df 25)

Table 34. Numerical and Percent Distribution of 84 Residents of Two Communities by Two Length of Residence Groups and Two Knowledge of Fluoridation Groups

Fluoridation Knowledge Groups by Community	Length of Residence: Under 5 years N	%	Over 5 years N	%	Total N	%
Keizer						
Well Informed	2	18.2	10	50.0	12	38.7
Poorly or Misinformed	9	81.8	10	50.0	19	61.3
Total	11	100.0	20	100.0	31	100.0
Salem Heights						
Well Informed	6	60.0	18	78.2	24	72.7
Poorly or Misinformed	4	40.0	5	21.8	9	27.3
Total	10	100.0	23	100.0	33	100.0
Communities Combined*						
Well Informed	8	38.1	28	65.1	36	56.2
Poorly or Misinformed	13	61.9	15	34.9	28	43.8
Total	21	100.0	43	100.0	64	100.0

*$X_c^2 = 3.13$ (df 1) p = n. s.
Keizer $X_c^2 = 1.92$ (df 1) p = n. s.

In comparing the two communities, there was no significant difference in the means for the Keizer and Salem Heights residents of over five years. However, the t-test of the Keizer and Salem Heights residents of less than five years was significant at the .01 level with a score of 2.97 (df 25). This might indicate that those having lived in a fluoridated community less than five years had increased knowledge of fluoridation due to the experience or they might have moved to the community because of the fluoridated water supply.

As shown by Table 34, a corrected Chi-Square test (communities combined) for the two knowledge groups (well and poorly or misinformed) and the two length of residence groups (less than five or over five years) was 3.13 (df 1) and not significant. Since the mean score of the Salem Heights residents of less than five years was significantly higher than Keizer, as shown by Table 33, a separate Chi-Square of only Keizer residents was calculated. This too was not significant with the Chi-Square being 1.92 (df 1), Thus when using the two knowledge groups (which eliminated eight in Keizer and 12 in Salem Heights) the hypothesis is supported that length of residence does not affect knowledge. Yet when using the entire sample and testing with t-tests of the mean scores length of residence and knowledge were not found to be significantly related in Salem Heights but were in Keizer.

Question two of Section II was designed to check for significant relationship between formed opinion of fluoridation and previous experience of living in a fluoridated community. The data, as shown by Table 35, reveal that those who had previously lived in a fluoridated area tended to support fluoridation. The Chi-Square test was calculated giving a result of 12.84, significant at the .01 level (df 2). This corresponds to the findings of the study in Salem by Rademaker (55).

Table 35. Opinion of Fluoridation and Experience of Living in A Fluoridated Community as Given by 76* Residents of Two Communities

Experience with a Fluoridated Community	Opinion of Fluoridation			Total
	Pro	Anti	Undecided	
Have lived in a fluoridated community	37	5	4	46
Have not lived in a fluoridated community	14	3	13	30
Totals	51	8	17	76

*Nine respondents did not know if they had ever lived in a fluoridated community.

$X^2 = 12.84$ (df 2) $p = <.01$

Of the five antis who stated they had previously lived in a fluoridated community, two (Keizer residents) stated they had previously lived in Stayton and Salem neither of which have ever had fluorides in their water. The only areas listed as previously lived in by respondents other then Salem Heights were: New Jersey, for five years;

Minnesota for four years; and Athens Ga., for 13 years. One of the undecided respondents had lived in fluoridated Rochester, New York for six months.

Also of special interest was the fact that three Salem Heights residents said there were no fluorides in their water and one Keizer respondent said that there was fluoride in the water supply. There were four in Salem Heights and 15 in Keizer that did not know if their water was fluoridated or not.

Comparisons by Community Ranks

Another approach was used in an attempt to compare the various criteria of the two communities. The various criteria of social data thought to be related to favorable opinion of fluoridation were used as bases for ranking the two communities. These rankings are presented in Table 36. Salem Heights held the highest rank in every case. This means that Salem Heights had the highest percentage participating in the study, the highest percentage of "Yes" response, the lowest percentage of "No" and "Don't Know" responses, the highest percent of young respondents and of those with higher education, the highest percentage with children, the highest average income, and the highest percentage of higher occupations. This might be one indication of why Salem Heights is more favorable to fluoridation of their water.

Table 36. Comparisons of Community Ranks Derived from Various Criteria

Various Criteria	Keizer Rank	Salem Heights Rank
Percent Participation in study	2	1
Percent Response to Fluoridation Question		
Yes	2	1
No*	2	1
Don't Know*	2	1
Highest percent of young respondents	2	1
Highest percent of higher educated	2	1
Highest percent with young children	2	1
Highest percent with higher income	2	1
Highest percent of white collar workers	2	1

*These criteria were ranked with lowest numbers receiving highest ranks.

Main Issues

Section III was designed to determine how strongly respondents feel about some of the more controversial issues of fluoridation. These data are shown in Table 37. The respondents were given a choice of five responses: strongly opposed; opposed; indifferent; agree; and strongly agree. On the majority of the issues there were very few that checked either the strongly opposed or strongly agree. The issue receiving the greatest number of strongly opposed votes was that fluoridation is being promoted by communistic means. There were only

Table 37. Numerical and Percent Distribution of Opinion Responses to Fluoridation Issues by 85 Residents of Two Communities

Fluoridation Issues: Items of Questionnaire Section III	Area	Opinion Response										Total	
		Strongly Oppose		Oppose		Indifferent		Agree		Strongly Agree			
		N	%	N	%	N	%	N	%	N	%	N	%
1. Proven safe by science	K.			3	7.5	13	32.5	19	47.5	5	12.5	40	100
	S.H.			1	2.2	6	13.3	28	62.2	10	22.2	45	100
2. Invasion of individual rights	K.	5	12.5	12	30.0	13	32.5	9	22.5	1	2.5	40	100
	S.H.	6	13.3	25	55.6	6	13.3	7	15.6	1	2.2	45	100
3. Still in experimental stages	K.	2	5.0	12	30.0	11	27.5	13	32.5	2	5.0	40	100
	S.H.	6	13.3	17	37.8	11	24.4	10	22.2	1	2.2	45	100
4. No more socialized than chlorination	K.			3	7.5	10	25.0	19	47.5	8	20.0	40	100
	S.H.			6	13.6	5	11.4	24	54.6	9	20.4	44*	100
5. Promoted by communistic groups	K.	14	35.0	12	30.0	11	27.5	1	2.5	2	5.0	40	100
	S.H.	25	55.6	16	35.6	4	8.9					45	100
6. Emphasized by political groups	K.	6	15.0	12	30.0	20	50.0	1	2.5	1	2.5	40	100
	S.H.	14	31.1	20	44.4	10	22.2	1	2.2			45	100
7. Salem fluoridation acceptable to me	K.	2	5.0	4	10.0	9	22.5	18	45.0	7	17.5	40	100
	S.H.	2	4.4	1	2.2	5	11.1	18	40.0	19	42.2	45	100
8. No more medication than substances in water	K.	1	2.5	5	12.5	12	30.0	16	40.0	6	15.0	40	100
	S.H.	2	4.4	9	20.0	6	13.3	16	35.6	12	26.7	45	100
9. Religious rights should not interfer with community practice	K.	1	2.5	4	10.0	8	20.0	23	57.5	4	10.0	40	100
	S.H.	1	2.3	2	4.5	7	15.9	21	47.7	13	29.6	44*	100
10. Decision best by vote	K.	2	5.0	1	2.5	3	7.5	27	67.5	7	17.5	40	100
	S.H.	2	4.4	1	2.2	4	8.9	24	53.3	14	31.1	45	100

*One Salem Heights respondent did not answer

three in the entire sample that thought this was true and they interestingly were not from the anti group. The issue of fluoridation being emphasized by political groups was also strongly opposed with only three agreeing that it is.

The strongest anti opinions were found in Number 2 and 3, with rather high percentages believing that fluoridation of water is an invasion of individual rights and still in the experimental stages. In Keizer there were ten of the forty who felt that fluoridation is an invasion of individual rights. Of these ten only one was strongly in agreement with this. Eight of 45 or 17.8 percent of the Salem Heights residents also agreed. On the issue that fluoridation is still in the experimental stages 37.5 percent and 24.4 percent agreed in Keizer and Salem Heights, respectively.

There were only four who felt that fluoridation had not been proven safe by science and nine who felt that fluoridation was more socialized than chlorination. Sixteen felt that fluoridation is medication and eight felt religious rights should take precedence over community practice. The last question pertaining to decision by vote received the most uniform vote by the group with 85 and 84.5 percent in Keizer and Salem Heights respectively agreeing that decision is best by vote of the people.

Question 2, Section I was designed to determine what the main issues in the fluoridation debate are. Table 38 presents a summary

of the responses. The main issues against fluoridation as listed by the respondents were not mentioned as often as was expected. The issue mentioned the most was difficulty in controlling the amount added to water (by 14. 1 percent of the respondents) and harmful to health (by 8. 2 percent). Mass medication was next mentioned by 7. 1 percent of the residents and listed by 5. 9 percent of the respondents each were cost too much, danger of poisoning, and step toward socialized medicine. Unconstitutional or individual rights was only mentioned by one person; yet this is considered to be the main issue by findings of O'Shea and Kegeles (50). The same study also found that cost was mentioned least often; yet in this study it was one of the most frequently mentioned Seventy-five percent of all antis mentioned that fluoridation is physically harmful (50); yet it was mentioned by only two of the nine antis in this study. While the Rademaker study found 17. 5 percent mentioning fluoridation as harmful only 8. 2 percent considered it harmful in this study.

There were many discrepencies in the way individuals checked these issues and answered other related questions. Two of the seven checking that fluoridation is harmful to health, on Section III, No. 1, agreed that science has proven fluoridation safe and harmless. Five of the seven answered no to question 22, Section II that fluoride in any amount is injurious to health. Three of the seven (No. 29, Section II) said that fluorides added to public water supplies will not do untold

damage to the internal organs of adults and three of the seven were undecided about it.

On the question of cost, of the five saying that it was too much, one answered No. 24, Section II, that fluoridation is not too costly for the benefits derived and two were undecided. On No. 32, Section II, three of the five were undecided on the question that experience has demonstrated that fluoridation is an expensive procedure.

Of the five believing that danger of poisoning is a main issue, three knew that fluorides in the concentrations added to the water supply are not poisonous (Section II, No. 14). Two of the five listing fluoridation as a step toward socialized medicine as a main issue felt that fluoridation is no more socialized than chlorination. Of the six feeling that fluoridation is forcing mass medication, two consider fluorides no more a medication than other substances normally found in the water (Section III, No. 8). Five of the 12 listing as a major concern the difficulty of control of amount added to water felt that adequate control can be made to insure safety (Section II, No. 31). Of the four listing the need for more study as a conern, one was undecided on Question 3, No. 2, which stated that fluoridation is still in the experimental stages.

Of the 46 listing aid to health by reduced dental decay as a main issue, three stated they would vote no on fluoridation and 14 were undecided on how they would vote. Two did not believe that research

Table 38. Main Fluoridation Issues Listed by 85 Residents of Two Communities by Opinion of Fluoridation

Main Fluoridation Issues	Total References N = 85 N	%	Reference by Pro Keizer N = 20	Salem Heights N = 36	Reference by Anti Keizer N = 6	Salem Heights N = 3	Reference by Undecided Keizer N = 14	Salem Heights N = 6
a. Harmful to health	7	8.2	2	1	1		2	1
b. Cost too much	5	5.9		1	2		2	
c. Danger of poisoning	5	5.9	2		1		1	1
d. Religious objection	0	-						
e. Step toward socialized medicine	5	5.9	1	3	1			
f. Unconstitutional	1	1.2					1	
g. Mass medication	6	7.1	2	1	2	1		
h. Aid to health by less dental decay	46	54.1	18	32	2	1	11	3
i. Difficult to control amount added to water	12	14.1	2	2	1	1	4	2
j. Needs more study	4	4.7			1	1	2	
k. Other (list)								
Danger to plant life	1	1.2				1		
Beneficial to children only	1	1.2					1	

Table 39. Recommendations of Alternate Forms of Fluoridation As Listed by 85 Residents of Two Communities

Alternate forms of fluoridation	Recommendations Yes	No	Don't Know
Public school treatment of water	21	30	34
Home installations	16	30	39
Oral Prescriptions	40	21	24
Topical applications	43	12	30
Fluoridated toothpaste	55	9	21

has proven that areas that have fluoridated water supplies have a marked reduction in the number of dental cavities.

Of those saying they would vote yes on a fluoridation referendum, three were strongly opposed to fluoridation of Salem's water supply. Of those nine saying they would vote no, one agreed that fluoridation of Salem's water was acceptable to him and three were indifferent. Of the 20 undecided on how they would vote, eight agreed that fluoridation of Salem's water was acceptable to them, 11 were indifferent and one was opposed.

Question 3 in Section II was designed to obtain information on alternate forms of fluoridation that would be recommended when water fluoridation is not available. There was some misunderstanding on how this question was to be answered and the researcher doubts the value of the response. The data are shown in Table 39. Of the nine antis in the sample, three recommended oral prescriptions and four recommended topical applications and fluoridated toothpaste. Several people in marking this question stated that they were in favor of getting fluoride to the children in any way it was possible, and then proceeded to check each one of the responses.

Analysis of Test Items Scores

As shown by Table 40, answers which were not correct were mainly don't know answers (62. 25 in Keizer and 45. 19 percent in

Salem Heights). There were very few wrong answers(6. 5 percent in Keizer and 6. 9 percent in Salem Heights). This would indicate that the public in these two communities are more uninformed than misinformed on questions of doubt. On every questionnaire item Salem Heights had slightly higher percentage of correct answers and slightly lower percentage of don't know answers. In Keizer the highest percent correct on any one item was 55, with six items having at least a 50 percent correct response. These items, indicating the highest degree of knowledge, were: fluorides were not in their water; any amount was not injurious to health; it is not too costly for the benefits derived; it will not do untold damage to internal organs; the amount added to water is not poisonous; and adequate control is possible to make fluoridation reasonably safe. The question receiving the highest percentage of wrong answers was the one that the city council can legally make the decision to add fluorides to the water supply. There were 37. 5 percent in Keizer and 44. 4 percent in Salem Heights that gave a wrong answer. Next in order of high percentage of wrong answers in Keizer were: those thinking fluorides were not helpful for all ages, 20 percent; those considering it wasteful when only a small amount is used for drinking, 20 percent; those thinking less care of teeth is required when fluorides are used, 20 percent; those considering natural fluorides different than that used to fluoridate water, 15 percent; and those who did not know that overconcentrations harm the

teeth 15 percent. The highest percentage of don't know answers were found in No. 12 which asked which of the organizations and groups listed favored or opposed fluoridation. The American Dental Association even received 72.5 percent don't know answers and the others were all over 80 percent. Other don't know responses in order of lack of knowledge shown were: overconcentrations harmful to teeth, 75 percent; causes corrosion to home equipment and city council can make decision legally, 60 percent each; natural fluoride different than that used to fluoridate, 65 percent; makes bones brittle, 62.5 percent; causes corrosion to city water system and harms lawns, shrubs, and plants, 57.5 percent each; research has proven that fluoridation has produced a marked reduction in dental decay where used and experience has demonstrated that fluoridation is an expensive procedure, 55 percent each.

In order to determine if the wrong answers were made largely by the antis, the analysis of data as shown by Table 41 was made. Many of the wrong answers were found in the pro group, and a few in the undecided group. The ones that were found to be representative most often by the anti group were: that fluoridation was considered wasteful, 55.5 percent; that the city council could not legally make a decision, 58.5 percent; that fluorides were thought to be in the water, 44.4 percent; and that fluoridation was considered helpful for only children, 44.4 percent.

Table 40. Numerical and Percent Distribution of Correct, Wrong, and Don't Know Responses to Test Items of Fluoridation Questionnaire by 85 Residents of Two Communities

Fluoridation Items Questionnaire Section II , 12-33	Area	Responses: Correct N	Correct %	Wrong N	Wrong %	Don't Know N	Don't Know %	Total N	Total %
12. Favor Fluoridation									
a. American Dental Assoc.	K.	11	27.5	0	0	29	72.5	40	100
	S.H.	22	48.9	1	2.2	22	48.9	45	100
b. County Health Council	K.	5	12.5	0	0	35	87.5	40	100
	S.H.	8	17.8	0	0	37	82.5	45	100
c. County Health Dept.	K.	5	12.5	0	0	35	87.5	40	100
	S.H.	8	17.8	1	2.2	36	80.0	45	100
d. Chiropractors	K.	0	0	0	0	40	100.0	40	100
	S.H.	2	4.4	0	0	43	95.6	45	100
e. Health Food Stores	K.	2	5.0	0	0	38	95.0	40	100
	S.H.	5	11.1	0	0	40	88.9	45	100
f. Marion-Polk Yamhill Dental Association	K.	7	17.5	0	0	33	82.5	40	100
	S.H.	12	26.7	1	2.2	32	71.1	45	100
g. Marion-Polk City Medical Society	K.	5	12.5	0	0	35	87.5	40	100
	S.H.	8	17.8	0	0	37	82.2	45	100
h. Naturopaths	K.	0	0	0	0	40	100.0	40	100
	S.H.	3	6.7	0	0	42	93.2	45	100
i. Oregon Nurses Assoc.	K.	4	10.0	0	0	36	90.0	40	100
	S.H.	5	11.1	0	0	40	88.9	45	100
13. Fluorides in your water	K.	22	55.0	3	7.5	15	37.5	40	100
	S.H.	32	71.1	5	11.1	8	17.8	45	100
14. Poisonous in concentrations added to water	K.	20	50.0	3	7.5	17	42.5	40	100
	S.H.	30	66.7	3	6.6	12	26.7	45	100
15. Natural fluoride different from that used in water	K.	8	20.0	6	15.0	26	65.0	40	100
	S.H.	11	24.5	6	13.3	28	62.2	45	100
16. Causes corrosion to home equipment	K.	16	40.0	0	0	24	60.0	40	100
	S.H.	30	66.7	0	0	15	33.3	45	100
17. Overconcentrations harm teeth	K.	4	10.0	6	15.0	30	75.0	40	100
	S.H.	11	24.4	12	26.7	22	48.9	45	100

(concluded on next page)

Fluoridation Items Questionnaire Section II, 12-33	Area	Responses: Correct N	Correct %	Wrong N	Wrong %	Don't Know N	Don't Know %	Total N	Total %
18. Advantages over other fluoride methods	K.	17	42.5	3	7.5	20	50.0	40	100
	S.H.	26	57.8	3	6.7	16	35.5	45	100
19. Cost less than reduction of dental bills	K.	19	47.5	2	5.0	19	47.5	40	100
	S.H.	29	64.4	3	6.7	13	28.9	45	100
20. Research proven marked reduction dental decay	K.	16	40.0	2	5.0	22	55.0	40	100
	S.H.	34	75.6	1	2.2	10	22.2	45	100
21. Wasteful-only small amt. used for drinking	K.	19	47.5	8	20.0	13	32.5	40	100
	S.H.	29	64.4	3	6.7	13	28.9	45	100
22. Any amount injurious to health	K.	22	55.0	2	5.0	16	40.0	40	100
	S.H.	36	80.0	0	0	9	20.0	45	100
23. Helpful for all ages	K.	14	35.0	8	20.0	18	45.0	40	100
	S.H.	20	44.4	13	28.9	12	26.7	45	100
24. Too costly for benefits derived	K.	21	52.5	2	5.0	17	42.5	40	100
	S.H.	36	80.0	0	0	9	20.0	45	100
25. Less care of teeth required when fl. used	K.	15	37.5	8	20.0	17	42.5	40	100
	S.H.	18	40.0	17	37.8	10	22.2	45	100
26. Odor and taste affecting cooking	K.	17	42.5	5	12.5	18	45.0	40	100
	S.H.	35	77.8	3	6.7	7	15.5	45	100
27. Causes corrosion to city water supply system	K.	17	42.5	0	0	23	57.5	40	100
	S.H.	28	62.2	0	0	17	37.8	45	100
28. Causes harm to lawns, shrubs, and plants	K.	17	42.5	0	0	23	57.5	40	100
	S.H.	32	71.1	0	0	13	28.9	45	100
29. Will do untold damage to internal organs	K.	21	52.5	1	2.5	18	45.0	40	100
	S.H.	35	77.8	0	0	10	22.2	45	100
30. Makes bones brittle	K.	14	35.0	1	2.5	25	62.5	40	100
	S.H.	34	75.6	0	0	11	24.4	45	100
31. Adequate control possible to make reasonably safe	K.	21	52.5	0	0	19	47.5	40	100
	S.H.	36	80.0	0	0	9	20.0	45	100
32. Expensive procedure demonstrated by experience	K.	15	37.5	3	7.5	22	55.0	40	100
	S.H.	27	60.0	2	4.4	16	35.6	45	100
33. City council can legally make decision to fl.	K.	1	2.5	15	37.5	24	60.0	40	100
	S.H.	4	8.9	20	44.4	21	46.7	45	100
Totals	K.	375	31.25	78	6.5	747	62.25	1200	100
	S.H.	646	47.85	94	6.96	610	45.19	1350	100

Table 41. Total Distribution of Wrong Responses to Test Items of Fluoridation Questionnaire by Three Opinion Groups of the Respondents in Two Communities

Questionnaire Items Section II 12 - 33	Total Wrong Answers	Keizer Opinion Groups Pro N = 20	Anti N = 6	Undec. N = 14	Salem Hts. Opinion Groups Pro N = 36	Anti N = 3	Undec. N = 6
12 a. American Dental Association	1				1		
c. County Health Dept	1				1		
f. Tri-County Dental Association	1				1		
13. Fluorides in your water	8		2	1	3	2	
14. Poisonous in conc. added to water	6	1	1	1	2		1
15. Natural fluoride different	12	2	2	2	5		1
17. Overconcentrations harm teeth	18	6			12		
18. Advantages over other fluorides	6	1	2		2	1	
19. Cost less than reduced dental bills	5	1	1		2	1	
20. Research proven reduces dental decay	3	2			1		
21. Wasteful-only small amount for drinking	11	2	4	2	2	1	
22. Any amount injurious to health	2		1	1			
23. Helpful for all ages	21	4	2	2	11	2	
24. Too costly for benefits derived	2		2				
25. Less care of teeth required	25	8			16		1
26. Odor and taste affect cooking	8	1	3	1	3		
29. Damage to internal organs	1		1				
30. Makes bones brittle	1	1					
32. Expensive procedure	5	2	1		2		
33. City council can legally make decision	35	10	4	1	17	1	2
Total wrong responses	172	41	26	11	81	8	5
Total possible responses	2550						

Activity of Respondents

The activity of the respondents was obtained by questions 4 through 10 of Section II. These data are shown in Table 42. There were eight possible activities that could be checked by each respondent. The number of respondents in each of the categories of pro, anti, and undecided in each community was thus multiplied by eight to get the possible activities. This number was then used as the denominator and the actual responses as the numerator to figure the percentage of actual activity. In Keizer the activity was greater in the pro group than in the anti group, but in Salem Heights it was greater in the anti group. In Keizer the percentages were 26.9, 16.6, and 17.9 for the pro, anti, and undecided groups respectively. In Salem Heights it was 27.7, 29.2, and 6.25 respectively. Because of the small amount of activity revealed in the study, the hypothesis that the activity would be greater in the anti group than in the pros could not be tested. There seems to be little activity by either the pros or the antis other than reading and some discussion.

Answers to question 8, requesting the source of the literature read, were predominently the newspaper. For the pro literature, the answers given were: newspaper, six; brochures, one; pamphlets at dentist's office, one; handbills, one; ballot, one; and magazines, four. For the anti literature the answers given were: newspapers, seven;

Table 42. Activity in the Fluoridation Issue for Three Opinion Groups of 85 Residents of Two Communities

Activities in the Fluridation Issue	Keizer Opinion Groups Pro N = 20	Anti N = 6	Undecided N = 14	Salem Hts. Opinion Groups Pro N = 36	Anti N = 3	Undecided N = 6
Discussed question	15	4	7	29	3	1
Attended meetings - pro	1	0	2	7	0	0
- anti	0	0	1	1	0	0
Distributed literature	1	0	0	2	0	0
Letter to newspaper	0	0	0	0	0	0
Read literature - pro	15	2	6	25	2	1
- anti	11	2	4	16	2	1
Member organization	0	0	0	0	0	0
Total Activities	43	8	20	80	7	3
Total Possible	160	48	112	288	24	48
Total % of possible	26.9	16.6	17.9	27.7	29.2	6.25

brochures, one; handbills, one; ballot, one; and Portland Fluoridation Commission, one.

Question No. 11, Section II was designed to obtain data indicating advice sought from professional people concerning fluoridation. As shown by Table 43, this activity was chiefly by the pro group. In response to the question "what did they say?" only one reported that a dentist said "it should be for individual use." The rest of the comments were all favorable. The comments as given for physicians advice were "good for kids," "would be helpful," "mostly favored," and "strongly favored." The dentist's advice as given by the respondents were "favor it" by six, "reduced tooth decay," "heartily recommend

Table 43. Number of 85 Residents of Two Communities, by Three Opinion Groups, Who Have Consulted Professional People Concerning Fluoridation

Professional People Consulted About Fluoridation	Keizer Opinion Groups			Salem Heights Opinion Groups		
	Pro N= 20	Anti N = 6	Undecided N = 14	Pro N = 36	Anti N = 3	Undecided N = 6
Physician	3	0	3	13	0	0
Dentist	11	1	3	26	2	0
Dental Hygienist	1	0	0	1	0	0
Naturopath	0	0	0	0	0	0
Nurse	2	2	0	4	0	0
Chiropractor	0	0	0	0	0	0
Total consulted	17	3	6	44	2	0
Total Possible	120	36	84	216	18	36
Total % of possible	14.2	8.3	7.1	20.4	11.1	0

it," "couldn't get enough from toothpaste," "best protection for children's teeth," "mostly favor," and "advised consulting physician." There were no comments for the dental hygienist and only one for a nurse which was "favor it."

There were six possible professional people who could have been consulted by each respondent. The number of respondents in each of the categories of pro, anti, and undecided in each community was multiplied by six to get the total possible consulted. The actual number consulted over the total possible consulted was used to calculate the percentage of possible consultations made. This number means nothing except to compare the amount of consultation in each of the opinion groups. The amount of consultation in the pro groups in each

community was greater than either the anti or undecided groups. This indicates that opinion of professionals may have some influence on the public although the relationship is not too clear.

To test this relationship a Chi-Square test was computed of those who have and those who have not consulted professional people about fluoridation against their formed opinion of fluoridation. Using the totals for the two communities combined (see Table 44) Chi-Square was 20. 68 (df 2) and significant at the . 01 level. However, when testing for a relationship in Keizer, the non-fluoridated community, the Chi-Square was 4. 26 (df 2) and not significant. This means that advice from professionals in the non-fluoridated community is not significantly related to a favorable opinion of fluoridation.

Looking for a statistical relationship between professional advice and knowledge of fluoridation the mean scores of those who had consulted professional people was compared with those who had not for each community. The t-tests between the means of those who had consulted professionals and those who had not were significantly different in both communities (See Table 45). In Keizer it was 4. 299 (df 38) and significant at the . 01 level. In Salem Heights it was significant at the . 05 level with a t- test of 2. 58 (df 43). Since Salem Heights has fluoridated water, the effect of consulting professional people would not be expected to make as much difference in knowledge as it would in Keizer, the non-fluoridated community. In comparing

Table 44. Numerical Distribution of 85 Residents of Two Communities by Three Fluoridation Opinion Groups and If Professionals Have Been Consulted

Fluoridation Opinion by Community	Have consulted Professional People	Have not consulted Professional People	Total	Chi-Square
Keizer				
Pro	12	8	20	4.26
Anti	1	5	6	
Undecided	5	9	14	
Totals	18	22	40	
Salem Heights				
Pro	31	5	36	
Anti	0	3	3	
Undecided	2	4	6	
Totals	33	12	45	
Communities Comb.				
Pro	43	13	56	20.68**
Anti	1	8	9	
Undecided	7	13	20	
Totals	51	34	85	

**Significant at .01 (df 2)

Table 45. Comparison of Mean Scores of Those Consulting or Not Consulting Professional People About Fluoridation In Two Communities

	Have Consulted Professional People			Have Not Consulted Professional People			
Area	N	Mean	S. D.	N	Mean	S. D.	t
Keizer	18	14.3	6.89	22	5.4!	6.18	4.299**
S. H.	33	15.8	5.54	12	10.8!	6.42	2.58*

*Significant at .05
**Significant at .01
!Means compared by t-test = 2.403 (df 32) p = <.05

Keizer with Salem Heights, there was no significant difference found between those who had consulted professionals. However, the mean scores of those who had not consulted professional people were significantly different with a t-test of 2. 4 (df 32) and a probability of less than . 05. In Salem Heights the experience of having fluoridated water may have helped to increase the knowledge of fluoridation for those who have not consulted professional people.

While the residents of the non-fluoridated community, who had consulted professionals, were significantly better informed than those who had not consulted professionals, they were not significantly more in favor of fluoridation. This would indicate that something more than professionals' recommendations is needed for many to be convinced of the merits of fluoridated water.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

In the summer of 1963, 40 residents of Keizer and 45 of Salem Heights, two suburbs of Salem, Oregon, completed a questionnaire on their opinion and knowledge of fluoridation of public drinking water. The test was administered for the purpose of obtaining an indication of how well-informed the people really are regarding fluoridation and what opinions are held by people in the two areas, one with fluoridated water and the other without it. The two communities were compared on these two variables: knowledge of fluoridation and opinion of it. The two variables were then related to each other, in an attempt to determine if opinion is influenced by knowledge of facts. An attempt was then made to see if these two variables had any relationship to the following factors: sex, age, education, children in the home, income, occupation, length of residence in the community, previous experience living in a fluoridated community, and activity related to fluoridation. Knowledge of the main issues and the amount of misinformation or lack of knowledge held by the residents on each of the fluoridation facts used on the questionnaire was sought.

The two areas chosen for the study are very similar with the

exception that one has fluoridated water. Both communities are suburbs of Salem, Oregon and both are under consideration for annexation. The sample was made by choosing a random sample of the members of the two separate water districts.

The research form, based on fluoridation facts and common controversial issues, was constructed so that respondents could be analyzed in several ways, and so that the following hypotheses could be tested from the data:

1. Those individuals with well authenticated knowledge of fluoridation are more likely to support fluoridation than those who lack knowledge or are misinformed.

2. Residents of an area that has fluoridation are more likely to be well-informed regarding the benefits of fluoridation and favor it more than residents of an area that does not have fluoridation.

3. Social characteristics representative of those favoring fluoridation will be the younger age group, those with young children in the family, and the higher educational, occupation, and income level groups. Sex and length of residence in the area will not be significant characteristics.

4. Those with young children, those in the younger age groups, and those in the higher income, occupational and educational levels are more likely to be well informed. Sex and length of residence in the area will make no significant difference in knowledge.

5. Those favoring fluoridation are doing little publicly to advance the knowledge of its benefits as compared to those who openly are opposed.

Letters and return cards were mailed to and presumably received by 60 residents of each community requesting their willingness

to participate and asking for an appointment to administer the questionnaire. Letters were followed up with telephone calls. The home visits to administer the questionnaire were completed during July with 85 completed: 40 or 66.7 percent in Keizer and 45 or 75 percent in Salem Heights.

Upon completion of the survey the replies were categorized for ease of tabulation by use of Keysort cards. Section II, Items 12 through 20, were graded and a score was given to each participant. These scores were then used to obtain a mean and standard deviation for the total sample. Those whose scores were more than one-half standard deviation above the mean were classified as well-informed, and those whose scores were less than one-half standard deviation below the mean were classified poorly or misinformed. Respondents were also classified by opinion of fluoridation as pro, anti, or undecided. These two classifications were then compared to each other and also to each of the other variables.

Statistical techniques were used to compare the responses and to indicate the probability of getting a difference equal to or greater than that which was observed within and between the category system. The results of the tabulations and statistical tests are presented in Chapter III of this report. A brief summary of the findings, resulting from the testing of the hypotheses formulated at the outset of this study, follows:

1. Well-informed individuals are significantly more favorable to fluoridation than those individuals who are misinformed or poorly informed.

2. Residents of the fluoridated community were significantly more favorable to fluoridation than residents of the non-fluoridated community.

3. Residents of the fluoridated community were significantly more informed regarding the facts of fluoridation than the residents of the non-fluoridated community.

4. A significant relationship is indicated between sex and knowledge of fluoridation with males slightly better informed. This relationship, however, is not supported when mean scores are used. No relationship between sex and opinion of fluoridation was found.

5. No significant relationships were found between age and opinion of fluoridation or knowledge of it. Data are not adequate to support a claim of association between elderly persons opposing fluoridation.

6. The data suggest a statistically significant relationship between higher education and being well-informed. This relationship, however, is true only in the non-fluoridated community when mean scores are used. The college group had significantly higher scores than the high school or the grade school groups. No relationship between education and opinion was found.

7. A statistically significant relationship is suggested between favorable opinion of fluoridation and children in the home. In the fluoridated community there is a significant relationship between lower scores for the parents of only pre-school children. There was no relationship between knowledge of fluoridation and children in the home in the non-fluoridated community.

8. A very slight relationship was found between income and opinion of fluoridation with the highest income group more favorable. The middle and high income groups were both significantly better informed than the low income group.

9. A significant relationship was found between occupation and opinion of fluoridation with the professional and technical group more favorable than the service and laborer group. Data are not adequate to support a claim of association between retired persons opposing fluoridation. Data were also not adequate to support the relationship between occupation and knowledge of fluoridation. Retired individuals' mean score was significantly lower than those in the professional and technical group.

10. Length of residence in the community was not found to be related to opinion of fluoridation or to knowledge groups. In the non-fluoridated community, however, those of more than five years residency had a significantly higher mean score than those of less than five years.

11. Comparison of activity of the pros and antis could not be tested because of insufficient data.

Other factors were analyzed with the following findings made:

1. The data suggest that the majority of people in these two communities favor fluoridation and a relatively small percentage oppose it.

2. The pros' mean score was significantly higher than the undecided in each community but only significantly higher than the antis' in the non-fluoridated community. There was no significant difference in the mean scores of the anti and undecided groups.

3. Residents of the fluoridated community were significantly better informed about fluoridation than the non-fluoridated community but not for: the college and grade school groups in education; the childrens groups of no children, all preschoolers, or both pre and school age; the low income group the group of over five years residency; and those who have consulted professional people.

4. The respondent's own concept of his knowledge of fluoridation was significantly related to his actual knowledge.

5. A significant relationship between favorable opinion to fluoridation and previous experience in a fluoridated community was found.

6. The most commonly mentioned categories of main issues on fluoridation were:

   a. Aid to health by reduced dental decay - 54.1 percent
   b. Difficult to control amount added to water - 14.1 percent
   c. Harmful to health - 8.2 percent
   d. Mass medication - 7.1 percent
   e. Danger of poisoning - 5.9 percent
   f. Cost too much - 5.9 percent
   g. Step toward socialized medicine - 5.9 percent

7. Both communities had a much higher percentage of don't know responses than wrong answers. The most frequent wrong responses in the non-fluoridated community were:

   a. City council cannot legally make the decision - 37.5 percent
   b. Fluorides not helpful for all ages - 20 percent
   c. Considered wasteful - 20 percent
   d. Less care of teeth when fluorides in water - 20 percent
   e. Considered different than natural fluorides - 15 percent
   f. Overconcentrations not harmful to teeth - 15 percent

8. There was a statistically significant relationship found between consultation of professional people about fluoridation and a favorable opinion of fluoridation in the fluoridated community but not in the non-fluoridated community.

9. Those who had consulted professional people about fluoridation had significantly more knowledge of fluoridation than those who had not consulted professionals.

Conclusions

From the findings of this study, the following conclusions have been drawn concerning the relationship of opinion and knowledge of fluoridation of residents of the two communities:

1. Opinions about fluoridation (pro, anti, or undecided) are influenced by knowledge of the facts.

2. People who have experienced the benefits of fluoridation are better informed of the facts and are more favorable toward it.

3. Social characteristics influencing opinion about fluoridation are level of income, type of occupation and presence of children in the home.

4. Social characteristics representative of the well informed about fluoridation are higher level of education, higher level of income, and greater length of residence in the community.

5. There is much indecision in the minds of many regarding fluoridation as a sound health measure.

6. A considerable amount of education among the residents is needed. Some of the factors which need to be emphasized, especially in the non-fluoridated community, are:

    a. Knowledge of who is legally and ultimately responsible for making the decision to fluoridate.

    b. That fluorides are beneficial for all ages.

    c. That fluoridation is not uneconomical.

    d. That fluorides added to the water supply are the same as those occuring naturally.

    e. That slight overconcentrations of fluorides in the body are only harmful by causing mottled teeth.

Recommendations

In view of the findings of this study it is recommended that:

1. The design of this study be refined and parallel studies done in other communities on a larger scale.

2. Since knowledge of fluoridation was found to be related to opinion, studies be designed to determine: the effects of mass communication versus personal communication on knowledge and vote; how information on fluoridation can best be communicated and not intensify anxieties; and factors responsible for "no" and "don't know" opinions of fluoridation.

3. Design studies looking for influences on opinion other than knowledge of fluoridation and demographic variables.

4. A follow-up study be made of the fluoridated community to determine opinions both before and after fluoridation and attempt to determine factors influencing change of opinion.

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APPENDIX A

CORRESPONDENCE

Letter to Individuals Requesting Participation in the Study

Dear

As a graduate student enrolled in the University of Oregon School of Nursing, I am preparing a thesis in partial fulfillment of the requirements for the degree of Master of Science. The purpose of this thesis is to obtain the opinions of residents of this area regarding fluoridation of the water supply. I am interested only in the perceptions held by residents of your area and am not interested in names.

You probably know that fluoridation of the water is a controversial issue in many areas and my purpose is to investigate just how people feel about it here. You have been selected to participate.

A questionnaire and personal information check list has been prepared to gain the necessary data. This information can be obtained from you in approximately twenty minutes. Your name will be entirely confidential and will not be published in the written thesis. Upon completion of the study, copies of the report will be placed in the library at the University of Oregon Medical School.

Will you return the enclosed reply card indicating whether or not you are willing to participate in this study. If you reply affirmatively, I will call at your home at your convenience to administer the questionnaire in July.

It is hoped that this study will have valuable implications in the role of fluoridation and your participation is vital.

Thank you for your assistance and cooperation.

Sincerely yours

(Mrs.) Mary Wade

- -

This appendage is to attest that Mrs. Mary Wade is a regularly enrolled student at the University of Oregon School of Nursing. Your serious consideration and kind efforts to assist Mrs. Wade in this undertaking will be sincerely appreciated.

Yours very truly,

Lucile Gregerson
Associate Professor
Thesis Adviser

Sample Postcard for Participants Reply

I am willing to participate in the study_____
I do not wish to participate in the study_____

The visits will be made during July 1963. Please indicate the most convenient week and time for a visit.

Week of July 8th_____ 15th_____ 22nd____ 29th___

	Morning	Afternoon	Evening
Any Day	_____	_____	_____
Monday	_____	_____	_____
Tuesday	_____	_____	_____
Wednesday	_____	_____	_____
Thursday	_____	_____	_____
Friday	_____	_____	_____

Signed_____

Telephone No._____

Address_____

Letter to Chairmen of Water Boards Requesting Participation in The Study

Dear

As a graduate student enrolled in the University of Oregon School of Nursing, I am preparing a thesis in partial fulfillment of the requirements for the degree of Master of Science. The purpose of this study (in fluoridation) is to determine how much knowledge residents of the area have concerning actual facts about fluoridation. By comparing the results of two areas, one with fluoridation and the other without, I hope to determine what factors might be the influencing ones resulting in favor of fluoridation. I also hope to prove that those opposing fluoridation are either misinformed or uninformed.

I have chosen for the study the areas of Keizer and Salem Heights. In order to make the study valid, I need to choose scientifically a random sample of the people in the two areas. The most logical place to find a complete list of the residents of these areas is the water district, and I am therefore asking permission of the water board to obtain this random sample from your files. It will not be made known to the participants how their names were chosen.

My plan is to mail a letter to the participants requesting their willingness to participate. Anyone wishing not to participate will be omitted. I will then go to the home and administer a questionnaire which I will be glad to share with you if you desire. The visits I hope to make during June 1963 and will complete my thesis by March 1964. Copies of the complete study will be placed in the library of the University of Oregon Medical School.

It is hoped that this study will have valuable implications in the role of fluoridation and your assistance will be greatly appreciated. I will be glad to answer any questions you may have regarding the study. A self-addressed envelope is enclosed for your reply.

Sincerely,

(Mrs.) Mary Wade

Enclosure

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Mrs. Mary Wade is a regularly enrolled graduate student at the University of Oregon School of Nursing. Any assistance you can offer Mrs. Wade will be greatly appreciated.

Lucile Gregerson
Associate Professor
Thesis Advisor

APPENDIX B

INSTRUMENT FOR KNOWLEDGE AND OPINION ON FLUORIDATION

I. Instructions: Check the answers as instructed. Ask about anything that is not clear to you. If more space is needed or you want to make a comment use the back of the page.

1. How well are you acquainted with the fluoridation question? (Check one)
   a. Have studied the problem intensely - very well acquainted a.____
   b. Have done some reading or discussing - well acquainted b.____
   c. Have some knowledge of question - just acquainted c.____
   d. Understand only slightly - barely acquainted d.____
   e. Not familiar with the problem - not acquainted e.____

2. What are the main issues to you in the fluoridation debate?
   (Check all that apply)
   a. Harmful to health a.____
   b. Cost too much b.____
   c. Danger of poisoning c.____
   d. Religious objection d.____
   e. Step toward socialized medicine e.____
   f. Unconstitutional f.____
   g. Forces mass medication g.____
   h. Aid to health by reduction of dental decay h.____
   i. Difficult to control amount added to water i.____
   j. Needs more study before adoption j.____
   k. Other (list)_____

II. Answer the following by checking the approriate column

	YES	NO	DON'T KNOW
1. If the question of fluoridation of water were to be voted upon soon, would you vote for it?	___	___	_____
2. Have you lived in an area which added fluoride to the water? If so, where?_____How long?_____	___	___	_____
3. Would you recommend an alternate form of fluoridation?			
a. Public school treatment of water	___	___	_____
b. Installations supply fluoride to the individual	___	___	_____
c. Oral prescriptions taken at home	___	___	_____
d. Direct application to the teeth by dentist or hygienist	___	___	_____
e. Fluoridated toothpaste	___	___	_____
4. Have you ever discussed the question of fluoridation with others?	___	___	_____
5. Have you attended meetings where the question of fluoridation was discussed? Favoring?_____ Opposing?_____	___	___	_____

	YES	NO	DON'T KNOW
6. Have you ever participated in the distribution of literature concerning fluoridation? Favoring?_____ Opposing?_____	___	___	___
7. Have you ever written a letter to the newspaper editor concerning the question of fluoridation? Favoring?_____ Opposing?_____	___	___	___
8. Have you read literature discussing the question of fluoridation? Favoring?_____ Source?_____ Opposing?_____ Source?_____	___	___	___
9. Are you a member of any organization opposing fluoridation? Name?_____	___	___	___
10. Are you a member of any organization supporting it? Name?_____	___	___	___
11. Have you consulted professional people concerning the question of fluoridation? Physician?_____ Dentist?_____ Dental Hygienist?_____ Naturopath?_____ Nurse?_____ Chiropractor?_____ What did they say?_____ _____	___	___	___
12. Indicate whether the following groups in Salem favor fluoridation.			
a. American Dental Association	a. ___	___	___
b. County Health Council	b. ___	___	___
c. County Health Department	c. ___	___	___
d. Chiropractors	d. ___	___	___
e. Health food stores	e. ___	___	___
f. Marion-Polk-Yamhill Dental Association	f. ___	___	___
g. Marion-Polk City Medical Society	g. ___	___	___
h. Naturopaths	h. ___	___	___
i. Oregon Nurses Association District #3	i. ___	___	___
j. Others (list)_____	j. ___	___	___
13. Are there fluorides in your area water supply?	___	___	___
14. Fluorides are poisonous in the concentrations added to the water supply.	___	___	___
15. There is a difference between natural fluoride and that used to fluoridate drinking water.	___	___	___
16. Fluoridation causes corrosion to home equipment.	___	___	___
17. Overconcentration of fluoride in the body can harm the teeth.	___	___	___

	Yes	No	Don't Know
18. Fluoridation of the water supply has advantages over direct application to the teeth or the use of fluoridated toothpaste.	___	___	___
19. The cost of fluoridation of water is much less than the reduction of dental bills when it is used.	___	___	___
20. Research has proved that areas that have fluoridated water supplies have a marked reduction in the number of dental cavities.	___	___	___
21. It is wasteful to fluoridate all the water when only small amount of it used for drinking purposes.	___	___	___
22. Fluoride in any amount is injurious to health	___	___	___
23. Fluoride is helpful for all ages.	___	___	___
24. Fluoridation is too costly for the benefits derived.	___	___	___
25. Less personal and professional care of teeth is required when fluorides are used.	___	___	___
26. Fluoridation in water has an odor and taste that affects cooking.	___	___	___
27. Fluoridation causes corrosion to the city water supply system.	___	___	___
28. Fluoridation causes harm to lawns. shrubs. and plants.	___	___	___
29. Fluorides added to public water supplies will do untold damage to the internal organs of adults.	___	___	___
30. Fluorides in the water make bones brittle.	___	___	___
31. Adequate control of the addition of fluorides to the water supply can be made to insure reasonable safety.	___	___	___
32. Experience has demonstrated that fluoridation is an expensive procedure.	___	___	___
33. The city council can legally make the decision to add fluoride to the water	___	___	___

III. Check the column which corresponds with your opinion of each issue.
SO - Strongly opposed: O-opposed; I-indifferent; A-agree; SA-Strongly agree

	SO	O	I	A	SA
1. Science has proved that fluoridation is safe and harmless	___	___	___	___	___
2. Use of fluoridation in the water supply is an invasion of individual rights.	___	___	___	___	___
3. Fluoridation is still in the experimental stages.	___	___	___	___	___

	SO	O	I	A	SA
4. Fluoridation is no more socialized than is chlorination	___	___	___	___	___
5. Fluoridation is being promoted by communistic means.	___	___	___	___	___
6. Fluoridation is being emphasized by political groups.	___	___	___	___	___
7. Fluoridation of Salem's water supply is acceptable to me.	___	___	___	___	___
8. Fluoride in water supplies is no more a medication than other substances normally found in water.	___	___	___	___	___
9. The right to practice one's religion should not interfere with the right of a community to practice what is beneficial for its well-being.	___	___	___	___	___
10. Fluoridation should be put to a vote for all people in the area to decide.	___	___	___	___	___

IV. Social Data

1. Sex? M_____F_____

2. Marital Status: S_____M_____D_____W_____Sep_____

3. Age:
   - Under 25 ____
   - 25 - 35 ____
   - 36 - 45 ____
   - 46 - 55 ____
   - 56 - 65 ____
   - 66 - 75 ____
   - Over 75 ____

4. How long have you lived in Salem?
   - Less than 1 year ____
   - Over 1 yr - less than 3 yr ____
   - Over 3 yr - less than 5 yr ____
   - Over 5 yr - less than 7 yr ____
   - Over 7 years ____

5. How many children in this household?

Total		Preschoolers		School Age	
None	____	None	____	None	____
1 - 2	____	1 - 2	____	1 - 2	____
3 - 4	____	3 - 4	____	3 - 4	____
5 or more	____	5 or more	____	5 or more	____

6. Which of the following educational levels have you completed?
   - Less than grade school ____
   - Grade School ____
   - High School ____
   - College ____
   - Higher Degree ____

7. Income bracket of the household:

$ 0 - 2.999	____	6,000 - 8,999	____
3,000 - 5,999	____	9,000 - 11,999	____
		12,000 - over	____

8. What is the present occupation of each person contributing to the support of the household? Job title and industry?

a. _____

b. _____

APPENDIX C

STATISTICAL FORMULAE

Standard Deviation $s = \sqrt{\frac{\Sigma X^2}{N} - \bar{X}^2}$ or $\sqrt{\frac{\Sigma (X - \bar{X})^2}{N - 1}}$

Chi-Square $X^2 = \Sigma \frac{(fo - fe)^2}{fe}$

$X_c^2 =$ (for 4 cell tables with small fe) $\Sigma \frac{(|fo - fe| - .5)^2}{fe}$

Yates' correction

t-test $t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{s^2}{n_1} + \frac{s^2}{n_2}}}$ $S^2 = \Sigma \frac{(X - \bar{X})_1^2 + (X - \bar{X})_2^2}{n_1 + n_2 - 2}$

Analysis of Variance

$$F = \frac{S_b^2}{S_w^2}$$

$$S^2(\text{Total}) = \Sigma\Sigma X^2 - \frac{(\Sigma\Sigma X)^2}{N}$$

$$S^2(\text{within}) = \Sigma\Sigma X^2 - \Sigma \frac{(\Sigma X)^2}{m}$$

$$S^2(\text{between}) = \Sigma \frac{(\Sigma X)^2}{m} - \frac{(\Sigma\Sigma X)^2}{N}$$

Pearson Product-Moment Coefficient of Correlation

$$r = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N \Sigma X^2 - (\Sigma X)^2][N \Sigma Y^2 - (\Sigma Y)^2}}$$