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A Study Concerning Sources of Information and Knowledge about Fluoride in Logan, Milford, and Helper, Utah

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A STUDY CONCERNING SOURCES OF INFORMATION AND KNOWLEDGE ABOUT

FLUORIDE IN LOGAN, MILFORD, AND HELPER, UTAH

by

Marilyn Lorraine Geddes

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Marilyn Lorraine Geddes

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ABSTRACT

A Study Concerning Sources of Information and Knowledge about

Fluoride in Logan, Milford, and Helper, Utah

by

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A considerable amount of research has been conducted concerning the characteristics of people who are in favor of fluoridation. However, there is little information available as to what the electorate really knows about fluoride when they are forced to vote on this scientific issue.

Thus, the objectives of this study were to determine the general public's level of knowledge about fluoride, to discover what sources of information have been the greatest influence on their opinion and knowledge about fluoride, and to estimate the level of participation of dentists, general practitioners, pediatricians, and gynecologists in the education of Utahns about the use of fluoride as related to human health.

The results of this investigation revealed that the general public greatly lacks the necessary information about fluoride to vote intelligently upon the issue of fluoridation. Television, dentists, magazines, and newspapers respectively were found to have the greatest influence on the public's opinion and knowledge about fluoride. It was also determined that 68 percent of the dentists practicing in Utah provide dental

health education for their patients, but that their programs are not as effective as they could be. In addition, even though 80 percent of the pediatricians, general practitioners, and gynecologists practicing in Utah are involved in educating their patients about fluoride, the general public does not consider the physician as a major source of information about fluoride.

A statistical analysis of the data from the knowledge question-naire revealed a significant relationship between education, age, sources of information and level of knowledge about fluoride.

(148 pages)

INTRODUCTION $Intro$

Approximately 95 percent of the population of the United States is afflicted with varying degrees of dental caries, commonly called tooth decay. Since each affected tooth requires specific treatment by qualified personnel using costly, highly specialized equipment, this extremely high prevalence of dental caries imposes a vast burden on dental services. Such an enormous problem must therefore be solved through a prophlyactic measure which is safe, effective, and economical. Such a preventive measure is fluoride. Since the late 1930's, numerous studies have shown the benefits of fluoride to human health. Yet, there has been remarkable public resistance to the adoption of flouridation, despite strong endorsement by virtually every health organization in the United States. Much of the research related to the acceptance of fluoridation has been concerned with the characteristics of people who vote against fluoridation. However, there is little information available as to what people really know about fluoridation when they are forced to vote on this issue.

For these reasons, this study was undertaken to determine the level of knowledge about fluoride and the sources of information which have the greatest influence on the opinion and knowledge of people living in Utah communities. The results of this study will provide a basis for a more effect method of educating the public about the benefits and limitations of fluoride as related to human health.

REVIEW OF LITERATURE

Dental Caries

Prevalence and incidence

Although dental caries have been present in human populations for
thousands of years, massive, rampart tooth destruction by caries is
characteristic only of recent times (Lerner and Anderson, 1963). Not
only is dental caries by far the most prevalent chronic disease today
(Pelton, et al., 1969), but it begins early in childhood and continues
throughout adulthood, unless treated (Utah, 1967). Among six-year old
children an average of seven teeth have become carious, and over
90 percent of the seven-year old children have one or more decayed
teeth (Maier, 1963). On the average more than 14 teeth per person
over the age of 18 in the United States are in need of repair or re-
placement (Lerner and Anderson, 1963). For every 100 inductees, the
Armed Forces needs to supply 500 fillings, 80 extractions, 25 bridges
and 20 dentures (Gross, 1970). The average adult has only one-half of
his teeth after the age of forty (Maier, 1963). Fifty percent of the
population over 55 years of age have no natural teeth at all (Strong,
1968). It has been estimated that in the state of Utah among 357,307
public school children, grades 1-12, there are approximately 1,523,227
decayed, missing, and filled teeth, which is an average of 5.92 decayed,
missing, and filled teeth per child (Utah, 1967).

Mechanims of decay

Dental caries is a progressive, localized decay of the teeth and
an irreversible chemical and bacteriological process (Lerner and
Anderson, 1963). This process is initiated by the demineralization of
the outer surface of the tooth due to organic acids produced locally by
bacteria that ferment deposits of dietary carbohydrate (United States
Department of Health, Education, and Welfare, 1972b). This process can
be expressed by the following two equations, which are derived from
Miller's Chemico-Parasitic Theory:

(1) Bacterial enzymes + fermentable carbohydrate $\longrightarrow$ acid
(2) Acid + tooth enamel $\longrightarrow$ demineralization of tooth enamel
(Davies, 1968)

With progressive loss of tooth mineral and secondary destruction of
tooth protein by continued bacterial action, a lesion or cavity forms
which, if untreated, extends and destroys most of the tooth, often
leading to serious infection of the surrounding tissues (United States
Department of Health, Education, and Welfare, 1972b). A person's total
resistance to this process of dental decay is dependent on the follow-
ing factors:

(1) Structure and Composition of Teeth
     a.   fluoride content
     b.   permeability
     c.   trace element content of enamel
     d.   variations in the nature of organic-inorganic bond
          within the tooth substance
(2) Oral Environment
     a.   saliva
          1.   buffering capacity
          2.   hydrogen-ion concentration(pH)
          3.   salivary enzyme actions
          4.   antibodies
          5.   substances with high molecular weight that contri-
               bute to dental plaque formation
     b.   genetic factors
     c.   prenatal and postnatal maternal influences

        d.   nutrition
        e.   general metabolic functions
(3)   External Environment
        a.   presence of trace elements in soil, water, and food
        b.   acidity or alkalinity of soil
        c.   socio-economic conditions
              1.   effects diet
              2.   effects health practices
                            (World Health Organization, 1972, p. 313)

Consequences

      Since dental caries is a progressive, multifactorial, irreversible,

and cumulative disease, each affected tooth needs specific treatment by

qualified personnel using costly, highly specialized equipment (World

Health Organization, 1969). If untreated, tooth decay results in human

suffering in terms of pain, interference with primary tooth function of

chewing causing inadequate digestion and assimilation of food, infec-

tion, disfigurement of appearance, speech deformities, and psychological

problems (World Health Organization, 1969; Utah, 1967). Ultimately,

tooth decay causes total destruction and resulting loss of teeth and

stands in the way of positive health and a sense of well-being (Roener,

1965), and imposes an unnecessarily heavy burden on families by drain-

ing their monetary resources away from lesser but necessary priorities.

      This extremely high prevalence of dental caries also imposes a

vast burden on dental health services. Even in countries with the most

highly developed health systems, there is an extreme shortage of

practicing dentists. For example, the ratio of dentists to the overall

population is 1:1750 in the United States (United States Department of

Commerce, 1973), 1:2500 in Soviet Union, and 1:900 in Sweden (World

Health Organization, 1969). In addition, the dentists that do exist

are poorly distributed within each country. In the United States one

out of every seven rural counties has no dentist; counties without a
city of 5,000 or more have a ratio of dentists to their population of
1:33,333 as compared with counties with a city of 5,000 or more having
a ratio of 1:1680; and the majority of dental clinics and organized
dental health programs are concentrated in the cities (Donnelly, 1967).

Thus, it is clear that such measures as the rapid development of
national dental care programs, an enlarged network of dental services,
and the training of professional and auxiliary personnel in much great-
er number will not provide a total solution to the problems raised by
the increasing prevalence of dental caries (World Health Organization,
1969). The widely accepted belief that dental problems are inevitable
(World Health Organization, 1970), the widespread tendency to regard
dental disorders as not sufficiently serious to require immediate
attention (United States Department of Health, Education, and Welfare,
1956), the extremely high cost of adequate dental care (Maier, 1963),
and the failure of dental health education programs to improve the
public's dental health practices (Ast, 1962) further compound this prob-
lem of reducing the vast accumulation of unmet dental needs.

Methods for reduction of prevalence
and incidence

This staggering problem of dental caries thus must be realistically
solved through "preventive" measures. As Kyes (1968, p. 70) expressed,
"the only way to attack the problem is through preventing what will
happen tomorrow instead of repairing what happened yesterday." Despite
its multifactorial nature, dental caries can be reduced to manageable
proportions in the majority of people by relatively simple means
(Davies, 1968).

Reduce consumption of
dietary carbohydrate

Since tooth decay cannot occur without the presence of fermentable carbohydrate, the first means to reduce its incidence would be to decrease the consumption of dietary carbohydrate, especially sugar (Davies, 1968). Gustafson et al. (cited by Davies, 1968), however, disclosed that the incidence of caries is more closely related to the form and frequency of sugar consumed rather than to the quantity consumed. Hence, they concluded that ...

(1) if a person must consume sweet, sticky foods, it is better to do so at meals rather than between meals,

(2) if a person must consume sugar between meals, it is better to consume it in a liquid form rather than a solid, sticky form, and

(3) it is best to end meals with fibrous foods.

Toothbrushing

A second means of reducing tooth decay is to brush the teeth after every meal. However, there is considerable evidence indicating that toothbrushing does not produce a significant reduction in dental caries (Dunning, 1965).

Fluoride

Beneficial effects. If our ultimate goal is to promote total oral health rather than to temporarily cure the effects of dental caries, there is a great need for a prophylactic measure which is effective, practical, safe, and economical (Howell, 1969; Ast, 1962). Such a prophylactic measure is fluoride. Since the late 1930's, exhaustive studies have shown that fluoride in small concentrations can

reduce the incidence of caries by well over 50 percent (Dean, 1942; Ast, 1970; Cox, 1939). Several other beneficial effects of fluoride on teeth and bones have been established:

(1)   improvement of eruption time and alignment in the dental arches (Ericcson, 1970),

(2)   improvement of tooth form and appearance (Ericcson, 1970),

(3)   decreased premature loss of deciduous teeth (Brudevold and McCann, 1966),

(4)   increased incidence of children retaining their first perman- ent molars (Douglas and Coppersmith, 1966),

(5)   decreased need for operative dental care in children (Douglas and Coppersmith, 1966),

(6)   decreased loss of permanent teeth (Douglas and Coppersmith, 1966; United States Department of Health, Education, and Welfare, 1972a; Brudevold and McCann, 1966),

(7)   decreased frequency and severity of malocclusion (Douglas and Coppersmith, 1966; Brudevold and McCann, 1966; Saltzmann, 1966),

(8)   decreased frequency and severity of peridontal disease (Ericcson, 1970; McClure, 1970),

(9)   decreased decayed, missing, and filled teeth (DMF) of children (Cuzacq, 1972; Ast, 1970) and of adults (Russell, 1951; Murray, 1970),

(10) decreased need for dentures (United States Department of Health, Education, and Welfare, 1972a), and

(11) decreased prevalence of osteoporosis (Bernstein et al., 1966; World Health Organization, 1969).

It should be noted that the benefits of fluoride are not limited only to the years of childhood.

Harmful effects. Although many people believe that fluoride can cause adverse physiological and metabolic effects, various studies have shown that there is only one limitation to the use of fluoride (World Health Organization, 1969; Dean, 1942; McClure, 1970). This is fluorosis, a disease that affects the structure and appearance of tooth enamel. Fluorosis occurs only when the fluoride ingestion is in excess of 1.5 parts per million (Dean, 1942; Maier, 1972) (Figure 1). In its milder forms dental fluorosis is characterized by opaque, paper white areas scattered irregularly over surfaces of teeth. More severely affected teeth demonstrate pitting, unsightly brown to black staining and often a corroded appearance, which represents a confluence of hypoplastic areas. Teeth so affected are prone to attrition, and thus early loss (Horowitz, Maier, and Thompson, 1964).
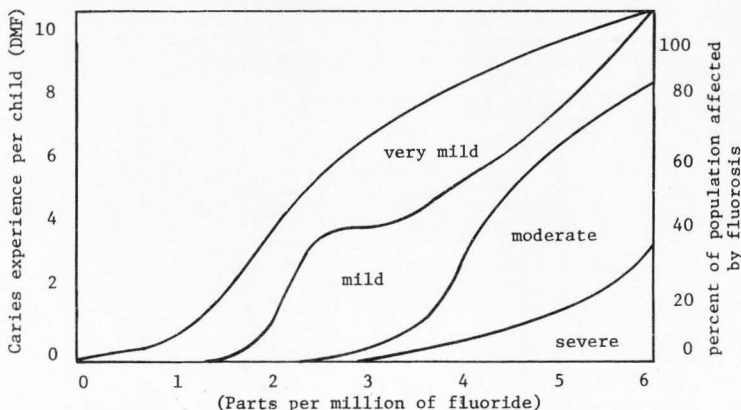
Figure 1. Dental caries and dental fluorosis in relation to fluoride in public water supplies (Dunning, 1965, p. 32)

Mechanism of action. When the enamel is forming either before or after the tooth has erupted, fluoride is deposited on the tooth and becomes a part of the chemical composition of the enamel (Utah, 1967). This reaction can be expressed by the following equation:

(1) $Ca_{10}(PO_4)_6(OH)_2 + 2F^- \rightleftharpoons Ca_{10}(PO_4)_6F_2 + 2(OH)^-$ (Adler, 1970,
hydroxyapatite $\rightleftharpoons$ fluorapatite   p. 197)
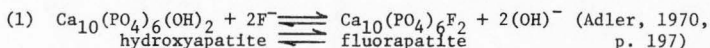
Thus, when fluoride exchanges with the hydroxl ions of the hydroxyapatite and forms fluorapatite, the new tooth structure is much more resistant to demineralization. This is due to the fact that fluorapatite is much less soluble in acid (1.44×10^{-119}) than hydroxyapatite (4.85×10^{-113}) (Adler, 1970). It has also been established that fluoride retards the activity of bacteria and/or processes that are associated with the dental caries process (Utah, 1967; Cox and Ast, 1951).

Methods of administering fluoride to the public. Since there are only trace amounts of fluoride in a person's normal daily diet, supplemental fluoride must be administered to the public. One general method of administering fluoride is systemic, which imparts fluoride to the developing enamel through the blood supply. This method can be accomplished by the addition of fluoride to water or by the ingestion of fluoride tablets or vitamins supplemented with fluoride. The other general means of administration is through topical fluoridation, which imparts fluoride directly to the enamel of the erupted or erupting tooth. This method can be accomplished by a dentist or dental hygienist, the addition of fluoride to toothpastes or tooth powders, or by the patient himself after careful instruction (Pushkin, 1971). There are also other methods of administration presently under experimentation,

such as the use of stannous fluoride zirconium silicate prophylactic
paste (Muhler, 1969), mouthwash containing fluoride (Radke et al., 1973),
and the addition of fluoride to such food sources as cereals, flour
(Switzerland), fish protein concentrate (Maier, 1963), milk (Rusoff et
al., 1962), and salt (Toth, 1972; Wespi, 1950, Ziegler, 1965; Restrepo,
1967). However, experience to date indicates that water is superior to
all other vehicles for the administration of fluoride to the public, not
only because water is the safest, most practical, and most economical
vehicle (Dunning, 1962; Ast, 1962; Cox and Ast, 1951; Anonymous, 1962),
but it is also the only vehicle which insures permanent and optimal in-
gestion of fluoride (Adler, 1970) (Appendix A).

The mechanics of water fluoridation are quite simple. A hopper
with an electric feeding machine can be installed in a water filtration
plant alongside other such hoppers used for other chemicals that are
needed in the water purification process. Expert supervision is provid-
ed by the water works engineers already in charge of the station. The
fluoride compound used costs 7 to 14 cents per person per year, and the
initial installation cost is equally low. Even if only a fraction of
the water is actually used for human consumption, this still makes
fluoridation one of the cheapest public health measures known (Dunning,
1962).

Effects of fluoridation. The fluoridation of public water supplies
has had a profound effect upon the community. First, fluoridation has
resulted in substantial savings in dental expenses (Douglas, 1966;
Gross, 1970; United States Department of Health, Education, and Welfare,
1972a; Lewis et al., 1972). The Newburgh-Kingston study revealed that
the corrective care per child per year in the unfluoridated area

(Kingston) was 219 times greater than the corrective care per child
per year in the fluoridated area (Newburgh) and that the cost of incre-
mental dental care in Newburgh was 1.9 times greater than in Kingston
(Ast. 1965). A survey in the Toronto suburb of North York showed that
those five-year old children born 14 months before the water supply of
Toronto was fluoridated had dental costs of an average of $63.00 per
child, whereas those five-year old children born 14 months after fluori-
dation had dental expenses of an average of $34.00 per child (Anonymous,
1971). The Toledo Dental Society has estimated that fluoridation in
that city has resulted in a saving of at least $29.08 per child per
year (Reports on Councils and Bureaus, 1970). The United States Depart-
ment of Health, Education, and Welfare has estimated that with universal
fluoridation, the annual savings in the United States would be about
seven hundred million, a return of about $50.00 for every dollar invest-
ed in fluoridation (Wexler, no date). Not only are the dental expenses
of children greatly reduced, but children require dental care at a later
age when living in a fluoridated area, since fluoridation has greatly
reduced their need for operative care (Douglas, 1966).

Fluoridation has also greatly affected the dental profession in the
United States (Blayney and Hill, 1967; Douglas et al., 1972). The
American Dental Association has reported that before fluoridation was
enacted, two out of every five dentists were so busy that they either
could not treat all of the people who sought appointments or they put
in more hours at the chair than they would have liked and consequently
felt rushed and overworked (Walls et al., 1941). In communities with
fluoridated water dentistry has undergone the following changes:

(1)   dentists can serve an approximately 14.5 percent larger
patient load (Douglas et al., 1972; Merhune and Muhler, 1967), thus
allowing existing dental manpower to cover a substantially larger
population (Douglas et al., 1972),

(2)   dentists feel less overworked and spend on the average
slightly more time per patient sitting (Douglas et al., 1972),

(3)   the emphasis of dentistry has shifted from an "emergency" or
purely restorative procedure to a "preventive" practice (Blayney and
Hill, 1967; Merhune and Muhler, 1967), thus allowing dentists to pay
greater attention to peridontal treatment and interceptive orthodontics
(Saltzmann, 1966), and

(4)   dentists have found an increase in their annual gross income
and an even greater increase in their net income (Douglas, 1966; Douglas
et al., 1972).

Consequently, not only has fluoridation significantly reduced the inci-
dence of dental caries, but it has also improved and extended dental
manpower facilities in the United States.   As one dentist in Connecticut
commented,

> We have had our community water supply fluoridated for the
> past fourteen years and have found an enormous change in our
> pedodontic practice.   The emphasis has shifted from restoration
> and repair to prevention and maintenance.   We find ourselves less
> involved in 'crisis' dental care and more concerned with growth
> and development and preorthodontic guidance.   We have more time
> for parent and patient conferences, and it is actually becoming
> a great pleasure to practice pedodontics (Douglas and Coppersmith,
> 1966, p. 130).

Opposition to fluoridation.   Even though numerous studies have
overwhelmingly shown the benefits of fluoride to human health and de-
spite strong endorsement by virtually every health organization in the
United States, Canada, and Great Britain (Appendix B), there has been

remarkable public resistance to the adoption of fluoridation, especially in the state of Utah (Appendix C). The following reasons have been cited for this pronounced delay in fluoridation:

(1) people have not considered their dental health problems serious enough to deserve concern and social action (Baker, 1965),

(2) the public's lack of information on fluoride and fluoridation of water (Dunning, 1962; Kyes, 1968),

(3) the public's lack of understanding of the dosage concept (Dunning, 1962; DeVilliers, 1968),

(4) allowing the ultimate decision of fluoridation to rest in the hands of the electorate (Baker, 1965),

(5) older people, in particular, have opposed fluoridation because they have thought it does them only physical harm (Baker, 1965), and

(5) enthusiasm for fluoridation was so pronounced in the beginning that it was not seen as essential to educate the public with the patience and thoroughness that were used in tuberculosis education programs or similar health measures (Baker, 1965).

Greater progress toward the goal of universal acceptance of fluoridation has been hampered not only by the above factors, but also by the efforts of a small group of opponents who prey upon the public's emotions and lack of knowledge and use such propoganda techniques as distortion, untruth, and personal attack to create uncertainty and fear among the public (Anonymous, 1962). Some of the major arguments used by these anti-fluoridationists include:

(1) fluoride is a poison (DeVilliers, 1969; Easlick, 1962; Anonymous, 1966),

(2)   fluoridation has not been proven safe or effective (Gamson, 1961; Masterton; 1963; Anonymous, 1966),

(3)   fluoride causes physiological abnormalities (Kegeles, 1962),

(4)   adding fluoride to the water causes pollution (Scobie, 1971),

(5)   fluoridation is an infringement upon people's freedom of choice (DeVilliers, 1969; Easlick, 1962; Gamson, 1961; Masterton, 1963; Kegeles, 1962),

(6)   fluoridation is mass-medication (McClure, 1970, Anonymous, 1966), and

(7)   fluoridation is expensive (Easlick, 1962).

Consequently, when the public is confronted with the issue of fluoridation, "the wary are caught in a trap, the cautious are left in a maze of confusion, and the proponents are usually despaired" (McClure, 1970, p. 263).

Numerous studies have shown that people who are in favor of fluoridation have the following characteristics in common:

(1)   college education (Kegeles, 1962; McClure, 1970; Metz, 1966),

(2)   employed in a higher income bracket (Kegeles, 1972; Metz, 1966),

(3)   employed in a professional, managerial, or white-collar occupation (Hahn, 1965; McClure, 1970),

(4)   young in age (Kegeles, 1962; McClure, 1970; Metz, 1966),

(5)   have young children (Kegeles, 1962; McClure, 1970; Metz, 1966),

(6)   "liberal" in thought (Kegeles, 1962), and

(7)   unconcerned about the "threat" of science (Kegeles, 1962).

According to Dunning, therefore, the opponents of fluoridation are basically older people who have no children and earn lower incomes.

Considerable evidence has suggested that these people also have a
sense of deprivation, which may be related to economics, prestige, or
a feeling of lower political efficiency, thus making them more suscep-
tible to misinformation (Dunning, 1965).

Dental Health Education

Characteristics of people who use
preventive health measures

The major problem in dental health is not how to prevent dental
caries, but how to get a person to use the preventive health measures
which are already available to him. A United States Health Survey
conducted in 1959 discovered that only 37 percent of the population had
visited a dentist within a one-year period; 14 percent had visited a
dentist once a year; 14 percent had visited a dentist once every two to
four years; 15 percent had visited a dentist once every five years or
more; and 18 percent had never visited a dentist at all (United States
Department of Health, Education, and Welfare, 1960). Why have almost
two-thirds of the population in the United States not visited a dentist
at the recommended interval of once every six months? The data collect-
ed by numerous studies have revealed that the utilization of profession-
al dental services is related to the following factors:

(1) age (United States Department of Health, Education, and
Welfare, 1956; United States Department of Health, Education, and Wel-
fare, 1960; Vogan, 1970),

(2) sex (United States Department of Health, Education, and

Welfare, 1956; United States Department of Health, Education, and
Welfare, 1960; Vogan, 1970),

(3) race (United States Department of Health, Education, and Wel-
fare, 1956; United States Department of Health, Education, and Welfare,
1960),

(4) socioeconomic status (Howell, 1969; Kriesberg and Trieman,
1960; Vogan, 1970),

(5) educational level of household head (United States Department
of Health, Education, and Welfare, 1960; Howell, 1969),

(6) geographical location of residence (Howell, 1969; United
States Department of Health, Education, and Welfare, 1960), and

(7) accessibility of dental services (United States Department of
Health, Education, and Welfare, 1956).

A person who is most likely to regularly visit a dentist every six
months would basically be a white female adult under the age of forty
years who lives in an urban area of the Northeast section of the United
States and whose family's annual income is greater than $7000 (United
States Department of Health, Education, and Welfare, 1960).

S. Kegeles (1963, p. 90) has extensively studied the factors which
motivate people to make preventive dental visits and concludes that in
addition to the above factors, a person is more likely to seek pre-
ventive dental care if,

(1) he believes that he is susceptible to dental disease,

(2) he believes that dental problems are serious,

(3) he believes that the benefits of preventive dental measures
outweigh the disadvantages,

(4) he believes in natural causality,

(5) he is aware of the preventive measures which are available to
him,

(6) he has an aesthetic concern for his teeth,

(7) he lacks anxiety about dental treatment,

(8) he has no fear of pain, and

(9) he has a positive appraisal of the dentist.

Weaknesses in public dental health education programs

Even though the demographic characteristics of a person who is
least likely to seek preventive dental care are known, public dental
health education programs have failed to motivate the public to seek
preventive dental health care (Ast, 1962; United States Department of
Health, Education, and Welfare, 1970; World Health Organization, 1970).
This lack of success in changing dental practices through dental health
education programs may be attributed to the following weaknesses.
First, dental health programs have traditionally directed their dental
health information to children in schools. However, since minor chil-
dren are ordinarily subordinate in the power structure of the family,
children even with high motivation are in the least powerful position
for introducing change in the family. To have maximum effectiveness,
then, dental health education programs should direct their information
to the parents, especially the mother, instead of the children (United
States Department of Health, Education and Welfare, 1970).

Secondly, dental health programs have been attempting to change
dental health behavior by directly confronting a person with the

necessary information. Yet, it has been shown that people judge
health and illness not on the basis of prevalence in statistics, but
on how a condition will affect them personally. Attempts to change
dental health behavior should therefore be based on the relation of
recommended actions to things that are valued by the people involved
(World Health Organization, 1970).

Thirdly, dental health programs have been traditionally based on
the assumption that dental health behavior is simply the result of being
"dentally" uneducated, of not having enough money, or of being afraid
of dental treatment. However, several studies have shown this not to
be the case and that programs of dental health education must provide
a broad approach which considers all relevant and interrelated factors
by taking into account not only the forces within the individual that
affect his behavior (beliefs, attitudes, interests, values, needs,
motives, expectations, perceptions, biological factors, etc.), but also
the external forces that have an impact on a person's behavior (family,
kinship and friendship groups, and health and medical facilities and
services, etc.). In addition dental health education should be
flexible and should be continually tailored to take account of changing
personal and situational factors (World Health Organization, 1970).

The fourth shortcoming of existing dental health programs is that
they have failed to make adequate educational diagnosis before pre-
scribing their activities. Even when individuals with similar dental
health problems are grouped together for educational purposes, it is
necessary to take into account the differences between individuals and
to provide a variety of educational experiences (World Health Organiza-
tion, 1970).

Lastly, the ineffectiveness of many dental health education pro-
grams is due to the tendency of health workers to predetermine the goals
themselves and to plan educational activities directed towards achieving
the goals that are important to them, without attempting to involve the
learner actively in the education process (World Health Organization,
1970). Many internal and external factors and forces affect the out-
comes of the educational process and must be recognized in planning den-
tal health education programs. These include:

(1) the learner's own dental health goals, which will be con-
ditioned by a number of psychosocial and cultural factors;

(2) other goals that are of higher priority to the individual
than dental health goals, such as desire for improved social status and
increased earning capacity;

(3) the learner's attitudes towards the educator, which may be a
desire to "turn him off" or "shut him off";

(4) influences, other than the planned educational activities,
that may impinge on the learner at any time, such as misleading health
advertising and social pressures; and

(5) barriers that must be reduced, removed, or penetrated by the
educator before the learner can make any movement towards the desired
goals. These include communication difficulties, interests of the
learner, motivations, perceptions, and past experiences (World Health
Organization, 1970, p. 18).

Since all of the above forces and many others interact in complicat-
ed ways and tend to diminish, dilute, and distort the intended impact
of the educator's efforts, the greater the dental educator's awareness

and understanding of these factors and forces, the more realistic and effective will be his educational treatment plan (World Health Organization, 1970).

Responsibility for dental health education

Dental health problems cannot be solved solely by federal, state, or local government dental health education programs. Parents, dentists, and schools also have a responsibility to promote and improve the community's dental health practices. Parents, especially the mother, have the following responsibilities:

(1) to become well-informed on dental health facts and act in behalf of their children (Utah, 1967),

(2) to give guidance to their children in establishing good dental habits and attitudes, such as regular toothbrushing, cooperation with dental authorities, and realization of seriousness of dental disease (United States Department of Health, Education, and Welfare, 1970),

(3) to establish good eating habits early, provide three wholesome meals a day, and to discourage between meal snacking by their children (Utah, 1967),

(4) to provide for regular and periodic dental treatments in the family budget (Utah, 1967),

(5) to participate in school and community dental health programs (Utah, 1967), and

(6) to seek aid when they are unable to provide adequate dental care for their children (Utah, 1967).

Yet, in order for parents to promote maximum growth and development of their children, government, schools (Haag, 1972; Nyswander, 1942; Turner, Sellery, and Smith, 1966; Weber, 1964), and society as a whole must furnish reliable information to them and provide facilities and means of obtaining adequate dental care (Utah, 1967).

In addition, the dental profession has the following responsibilities to the community:

(1) to make sure that the importance of dental health is fully appreciated by all (Anonymous, 1965),

(2) to continually educate the public about dental disease and its consequences and about good dental health practices (Anonymous, 1965),

(3) to educate the public about the benefits and limitations of fluoride as related to human health (Anonymous, 1965), and

(4) to take a firm stand on the issue of fluoridation and exercise aggressive leadership in any activity which will lead to the acceptance and implementation of fluoridation (DeVilliers, 1969; Anonymous, 1962).

Consequently, not only do the government, parents, schools, and dental profession have individual responsibilities to the community's overall dental health, but coordination of effort and cooperation among these organizations must occur if the ultimate goal of creating and maintaining new behavior that will promote and improve individual, group, or community dental health practices is to be fulfilled (World Health Organization, 1970).

In conclusion, the decision of fluoridation should logically and will probably be ultimately decided by governmental experts and health authorities (Dunning, 1962; Baker, 1965). Meanwhile, if the public is

to be in a position to vote intelligently upon such a complicated

scientific issue as fluoridation, a tremendous amount of public health

education must be done (Dunning, 1962). However, additional research

is required to determine the routes by which dental health information

is passed on and the areas of greatest ignorance and misunderstanding

about fluoridation (Vogan, 1970).

OBJECTIVES

The objectives of this study were:

(1)   to determine and compare the level of knowledge about fluoride of people living in Utah communities with unfluoridated, naturally, and artifically fluoridated water,

(2)   to determine and compare the sources of information which have the greatest influence on the opinion and knowledge about fluoride of people living in Utah communities with unflouridated, naturally, and artifically fluoridated water, and

(3)   to determine the level of participation of physicians who are directly involved with young children and dentists practicing in the state of Utah in the education of the public about the use of fluoride as related to human health.

PROCEDURE

Knowledge about Fluoride

Before a person can make a "rational" decision about the issue of flouridation, he must first understand the following concepts about the use of fluoride in general:

(1) what is fluoride?

(2) what are the effects of fluoride on the human body?

(3) when can the intake of fluoride be detrimental, beneficial, and/or have no effect upon human health?

(4) what is the realtionship between fluoride and dental caries?

(5) what is fluorosis?

(6) when is the best time interval to consume fluoride?

(7) what are some of the advantages and disadvantages of the major methods of administering fluoride to the public?

(8) what is the most inexpensive, effective, and controllable method of administering fluoride to the public?

(9) what is the cost of fluoridation to the community as compared with the cost of annual dental expenses?

With these concepts in mind, a questionnaire was devised to estimate the public's knowledge about fluoride as related to the subject of fluoride and dental health were added so as to complete the spectrum of difficulty within the questionnaire.

Definition of populations

The data for this questionnaire was collected from the Utah communities of Logan, which has unfluoridated water, Milford, which has naturally fluoridated water, and Helper, which has artifically fluoridated water (Table 1).

Table 1. Communities involved in study

Community	Population	Fluoride Content of Water Supply	Source of Fluoride
Logan	22,300	insignificant	none
Milford	1,300	1.0 ppm	natural
Helper	2,000	0.8 ppm	artificial

Type of survey

A sample survey was used to obtain the data for this questionnaire.

Determination of sample size

Since this survey was concerned with estimating a proportion of percentage of correct responses, the following formula was used to derive the sample size (n) for each population (Tull and Albaum, 1973):

$$n = \frac{p(1-p)}{\dfrac{d^2}{z^2} + \dfrac{p(1-p)}{N}}$$

where

n = sample size

p = estimated proportion of interest

z = number of standard deviations for the desired precision or
level of confidence

d = allowable tolerance of variation

N = population size = the number of residential phone numbers
listed in the community telephone books

Logan. A preliminary study was conducted in Logan and a sample of
156 questionnaires was obtained. Since the estimated proportion of this
sample was unknown, the most stringent value of p, 0.5, was chosen so as
to account for all possible conditions. The z value, 1.96, which gives
a confidence level of 95 percent, was chosen and then the d value,
0.078, was derived from the above formula. Hence, where

p = 0.5

z = 1.96

d = 0.078

N = 13,300

the sample size (n) calculated to be 156. This means that with a
sample size of 156, the sample mean will be within 8 percent (7.8 per-
cent) of the population proportion 95 percent of the time.

Milford. Due to the time-consuming process of gathering the data
over the telephone, the z value, 1.96, and the d value, 0.50, were
sacrificed to 1.64 and 0.10 respectively when the sample size for Mil-
ford and Helper was calculated, because the sample size of 109 and 115
respectively would have been impossible to survey in the time allowed.
However, the p value, 0.5, remained at the same level. Hence, where

p = 0.5

z = 1.64

d = 0.10

N = 480

the sample size (n) calculated to be 59. This means that with a sample
size of 59, the sample mean will be within 10 percent of the population
proportion 90 percent of the time.

Helper. Where,

p = 0.5

z = 1.96

d = 0.10

N = 630

the sample size (n) calculated to be 61. This means that with a sample
size of 61, the sample mean will be within 10 percent of the population
proportion 90 percent of the time.

Sample design

Sampling frame. Since the data for this questionnaire was collected
over the telephone, the community telephone books of Logan, Milford, and
Helper were chosen as the sampling frame. The cities' census lists were
not used because those people on this list who did not have a telephone
or whose telephone number was unlisted would be unavailable for this sur-
vey.

Sampling unit. The sampling unit for this questionnaire was one
person over the age of sixteen from each household which had a telephone
listing in the community telephone book.

Selection process. A systematic random sample was used for this
questionnaire's selection process. This selection process had the
following characteristics:

(1) equal probability of population elements. Each element of the

population had an equal chance to be included in the sample, because the starting points of all three samples were chosen at random.

(2) elemental sampling. The sampling unit was the individual element of each of the populations.

(3) unstratified selection. The sampling units were selected from the entire population, rather than from strata based on particular homogenous characteristics.

(4) systematic sampling. The sample was systematic, because the sampling units were selected in sequences separated on lists by an interval of selection. The interval (k) was determined by the relationship between the size of the population (N) and the sample size (n) as follows (Tull and Albaum, 1973):

$$k = \frac{N}{n}$$

Logan. After the random starting point of 1 was selected from a table of random numbers, every eighty-fifth unit thereafter was chosen for the sampling unit.

$$k = \frac{13,300}{156}$$

$$k = 85$$

Milford. After the random starting point of 7 was selected from a table of random numbers, every eighth unit thereafter was chosen for the sampling unit.

$$k = \frac{480}{59}$$

$$k = 8$$

Helper. After the random starting point of 5 was selected from a table of random numbers, every tenth unit thereafter was chosen for the sampling unit.

$$k = \frac{630}{61}$$

$$k = 10$$

(5) one phase sampling. The final sample was selected directly from the entire population.

Sampling error. Since sampling error is the difference between the sample and the universe that results from the workings of chance (Simon, 1969), any sample which randomly selects its sampling units is subject to sampling error. Therefore, this study had uncontrollable sampling error resulting from the effects of chance.

Nonsampling errors. Nonsampling or systematic errors arise from the collecting, processing, and analyzing of information (Tull and Albaum, 1973). Nonsampling errors are diverse in origin, but usually arise from the following sources:

(1) surrogate information error. Error may arise from accepting substitute or surrogate information. However, since this survey did not accept substitute information, it was not subject to this nonvariable error.

(2) measurement error. Measurement error can arise in any stage of the sample survey. However, this survey tried to keep this non-variable error at a minimum by using only one surveyer, being consistent, and double-checking at each stage.

(3) frame error. Since a sampling frame is a means of accounting for all elements in the population, perfect frames are seldom available

for the sampling of human populations (Tull and Albaum, 1973). The
sampling frame used in this survey, the telephone book, automatically
introduced error because it did not list all of its subscribers, due to
requests for unlisted phone numbers. The selected sampling frame thus
introduced a bias into the survey with respect to income and education
(Tull and Albaum, 1973).

(4) selection error. Since this survey was based on a probability
sample, selection error which arises from improper selection of respon-
dents in a nonprobability sample did not occur.

(5) nonresponse error. Nonresponse error includes those errors
which arise in every survey from the inability to reach the respondent
(noncontact error) and from refusals to respond to the questionnaire
(Tull and Albaum, 1973). However, since the characteristics of non-
responders and the reasons for non-response were not related to any of
the variables of the study, non-response was ignored. If a refusal was
encountered, the following name in the sampling frame was chosen. If a
person could not initially be reached, he was called each night until
reached.

Sources of Information

To determine which sources of information most influence the pub-
lic's opinion and knowledge about fluoride and fluoridation of water, a
question was devised which listed various possible sources of information,
both reliable and unreliable, and asked the person to identify which
five sources have influenced him the most and then to rank these five
sources in order of importance to him (Appendix D).

Since this question was included as part of the knowledge question-
naire when the data was collected, the definition of the population, type
of survey, determination of sample size, and sample design for this
question was exactly the same as the knowledge questionnaire.

Dentists' Level of Participation

Since the dentist should be one of the most important reliable
sources of information about fluoride for the public, a questionnaire was
devised to estimate the dentists' level of participation in the educa-
tion of Utahns about the use of fluoride and fluoridation of water
(Appendix D). Several questions concerning dental health care in general
were included so that the dentists' role in the education of the public
about fluoride could be better ascertained.

Definition of population

The population for this questionnaire included all those dentists
practicing in the state of Utah.

Type of survey

A sample survey was used to obtain the data for this questionnaire.

Determination of sample size

Since the sample was selected to comprise fifty percent of the popu-
lation, 325 questionnaires with accompanying introductory letters were
sent to dentists throughout the state of Utah.

Sample design

Sampling frame. The sampling frame for this questionnaire was the
mailing list of the Utah Dental Association. This list included the

names of all practicing dentists in Utah, as well as those who have
retired.

Sampling unit. The sampling unit for this questionnaire was each
individual dentist.

Selection process. Since a systematic random sample was taken for
this questionnaire, the characteristics of its selection process were
exactly the same as the sample for the knowledge questionnaire, except
for the interval of selection. After the random starting point of 2
was selected from the toss of a coin, every second unit thereafter was
chosen for the sampling unit. Since,

$$k = \frac{N}{n}$$

then,

$$k = \frac{650}{325}$$

$$k = 2$$

Sampling error. This survey also had uncontrollable sampling error
resulting from the effects of chance.

Nonsampling errors. This survey was subject to the same type of
non-sampling errors as the sample for the knowledge questionnaire, except
that it did not encounter frame error. This was due to the fact that
the sampling frame accounted for all of the elements in the population,
thus eliminating frame error.

Physicians' Level of Participation

Since a child rarely visits a dentist before the age of three, and
especially since the years of childhood are the crucial years for fluo-
ride intake, any physician who is in close contact with young children

before this age should be another important reliable source of informa-
tion about fluoride. Hence, a third questionnaire was devised to
estimate these particular physicians' level of participation in the
education of Utahns about the use of fluoride as related to human
health (Appendix D).

Definition of population

The population for this questionnaire included those pediatricians,
gynecologists, and general practitioners practicing in the state of Utah
whose names appeared on the Rocky Mountain Medical Journal's membership
list or in any of the Utah community telephone books.

Type of survey

A census of the population of pediatricians, general practitioners,
and gynecologists was taken for this questionnaire. Thus, 325 question-
naires with accompanying introductory letters were sent to these
particular physicians throughout the state of Utah.

Census design

Census frame. The Rocky Mountain Medical Journal's membership list
and the listing of the physicians in the yellow pages of all of the Utah
community telephone directories made up the census frame for this
questionnaire.

Census unit. The census unit for this questionnaire was each indi-
vidual pediatrician, general practitioner, and gynecologist.

Nonsampling errors. Since nonvariable or systematic errors arise
from the collecting, processing, and analyzing of information (Tull and

Albaum, 1973), this census survey was subject to measurement and non-response error.

Dentists' and Physicians' Current Level of Effectiveness

Since the data from the physicians' and dentists' questionnaires may have been biased to present a favorable appearance, the questions from these two questionnaires were combined and incorporated into another questionnaire which was administered to the general public (Appendix D). The purpose of this questionnaire was to check on the accuracy and effectiveness of the responses made by the physicians and dentists on their questionnaires.

Definition of population

The data for this questionnaire was collected from the Utah communities of Milford, Logan, and Helper.

Type of survey

A sample survey was used to obtain the data for this questionnaire.

Determination of sample size

Since this questionnaire was designed to check on the accuracy of the physicians' and dentists' response and not to provide statistically significant results, a total sample size of 50 (30 from Logan, 15 from Milford, and 15 from Helper) was arbitrarily chosen.

Sample design

Sampling frame. The sampling frame for this questionnaire included the community telephone books of Logan, Milford, and Helper.

Sampling unit. The sampling unit for this questionnaire was one person over the age of sixteen from each household which had a telephone listing in the community telephone book.

Selection process. Since a systematic random sample was taken for this questionnaire, the characteristics of its selection process were exactly the same as the selection process of the knowledge questionnaire, except for the interval of selection. Hence,

$$k = \frac{N}{n}$$

Logan. After the position of the sampling unit in each column of the telephone book, every sixth column thereafter was chosen.

$$k = \frac{176}{30}$$

$$k = 6$$

Milford. After the random starting point of 7 was selected from a table of random numbers, every thirty-second unit thereafter was chosen for the sampling unit.

$$k = \frac{480}{15}$$

$$k = 32$$

Helper. After the random starting point of 23 was selected from a table of random numbers, every forty-second unit thereafter was chosen for the sampling unit.

$$k = \frac{630}{15}$$

$$k = 42$$

Sampling error. This survey also had sampling error resulting from the effects of chance.

Nonsampling errors. This survey was subject to the same type of nonsampling errors as the survey for the knowledge questionnaire.

Mothers' opinions about flouridated water and food sources

Another aspect of this study about fluoride involved the collection of deciduous or "baby" teeth from young children attending elementary schools in Logan, Milford, and Helper. A "packet," which contained an introductory letter, a consent form, a background information sheet on the child, and a background information sheet on the mother, was sent to each participating family. However, the information from the second page of the mothers' background information sheet provided the only information pertinent to this study (Appendix D). This second sheet asked the mother what her opinion was on the possibility of being able to buy a food, such as table salt, milk, or cereals, with or without fluoride added to it and why, and her opinion on fluoridation of water and why? The sheet also asked the mother to choose which of the following food sources in each pair she would prefer to consume fluoride in:

(1) water or salt

(2) salt or milk

(3) milk or water

(4) milk or flour

(5) fluoride tablets or water

(6) flouride tablets or salt

RESULTS AND DISCUSSION

Presentation of Data

Knowledge questionnaire

The data from this questionnaire have been divided into four groups:
(1) demographic characteristics, (2) effects of fluoride on the human
body, (3) methods of consuming fluoride, and (4) related information.
A discussion of each question will be followed by a table containing the
absolute frequency (Abs Freq), the relative frequency (Rel Freq), and the
adjusted frequency (Adj Freq) for each possible response. The correct
response will be underlined in each table. The Codebook computer program
from the Statistical Package for the Social Sciences (SPSS) was used to
obtain all of the mathematical values for the data that follows.

Demographic characteristics

Sex. Table 2 indicates that of the 276 respondents to this question-
naire, 32.6 percent (90) were males and 67.4 percent (186) were females.
Even though a larger proportion of females responded to this question-
naire, it is the female adult population which this study is more directly
concerned with, because the mother rather than the father is usually
more directly concerned with the health of their children.

Table 2. Frequency distribution of sex of respondents

Sex	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Male	90	32.6	49	31.4	22	37.3	19	31.1
Female	186	67.4	107	68.4	37	62.7	42	68.9
Population	276		156		59		61	

Age. Table 3 shows that the age of the 276 respondents ranged from 16 to 75 years. Seventy-two percent (199) of the respondents were under 50 years of age, while 28 percent (77) were over 50 years. The greatest number of respondents were in the age interval 20 to 29 years.

Table 3. Frequency distribution of age of respondents

Years	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
16-20	28	10.1	18	11.5	5	8.5	5	8.2
20-29	90	32.6	66	42.3	11	18.6	13	21.3
30-39	45	16.3	27	17.3	8	13.6	10	16.4
40-49	36	13.0	17	10.9	8	13.6	11	18.0
50-59	36	13.0	14	9.0	12	20.3	10	16.4
60-75	41	14.9	14	9.0	15	25.4	12	19.7
Population	276		156		59		61	

Marital status. Table 4 reveals that of the 276 respondents, 19.9 percent (55) were single, 75.4 percent (208) were married, 1.4 percent (4) were divorced, and 3.3 percent (9) were widowed.

Table 4. Frequency distribution of marital status of respondents

Status	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Single	55	19.9	39	25.0	7	11.9	9	14.8
Married	208	75.4	113	72.4	44	74.6	57	83.6
Divorced	4	1.4	3	1.9	1	1.7		
Widowed	9	3.3	1	0.6	7	11.9	1	1.6
Population	276		156		59		61	

Number of children. Table 5 indicates that of the 276 respondents, 26.6 percent (80) did not have any children, while 73.4 percent (196) had at least one child. The interval, one to two children, had the greatest percentage of respondents. Thus, since 72 percent of the respondents were under the age of 50 years, 80 percent were married, and 73 percent had a family, the majority of the respondents fell into the study's target group--those people who are responsible for the general health of children.

Table 5. Frequency distribution of number of children of respondents

Number	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
None	80	26.6	54	35.3	11	18.6	14	23.0
1-2	92	34.5	46	29.5	19	32.2	26	44.3
3-4	66	24.7	32	20.5	17	28.8	17	27.9
5 or more	38	14.2	23	14.7	12	20.3	3	4.9
Population	276		156		59		61	

Age of youngest child. Table 6 shows that of the 73.4 percent (196)
of the respondents who had families, the age of the youngest child ranged
from one (any child that was under the age of one year was considered
as one year for statistical purposes) to 48 years. The mean age was
13.6 years. Of those respondents who had families, 69.9 percent (137) of
the respondents' youngest child was under 20 years of age, while 30.1
percent (59) was over 20 years.

Age of oldest child. Table 7 shows that of the respondents who
had families, 79 percent (155) had more than one child and the age of
the oldest child ranged from 2 to 60 years. The age mean was 21.7
years. Of those respondents who had more than one child, 47.7 percent
(74) of respondents' oldest child was under 20 years, while 52.3 percent
(151) was over the 20 years of age.

Education. Table 8 reveals that the educational backgrounds of
the 276 respondents ranged from elementary school to graduate school.
Of these 276 respondents 0.7 percent (2) of the respondents had 6 years
or less of education, 5.8 percent (16) had from 7 to 9 years of education,
44.7 percent (123) had 10 to 12 years of education, 38.2 percent (105)
had at least one year of college, and 8.4 percent (23) had a graduate
degree. Even though the educational backgrounds of all of the respon-
dents were evenly distributed between high school (44.7 percent) and
college (46.6 percent), over twice as many of the respondents from Logan
had a college background (62.2 percent). This is because Logan is a
university town while Milford and Helper are not.

Table 6. Frequency distribution of age of the respondents' youngest child

Years	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
1	37	18.9	25	22.7	7	14.9	5	10.6
2	17	8.7	9	8.2	4	8.5	4	8.5
3	11	5.6	8	7.3	1	2.1	2	4.3
4	4	2.0	2	1.8	1	2.1	1	2.1
5	5	2.5	4	3.6			1	2.1
6	9	4.6	6	5.5	2	4.3	1	2.1
7	4	2.0	3	2.7			1	2.1
8	6	3.1	4	3.6	1	2.1	1	2.1
10	5	2.5	3	2.7			2	4.3
11	5	2.5	2	1.8	1	2.1	2	4.3
12	7	3.6	3	2.7	4	8.5		
13	5	2.5	2	1.8	2	4.3	1	2.1
14	4	2.0	3	2.7			1	2.1
15	3	1.5	2	1.8			1	2.1
16	1	0.5	1	0.9				
17	3	1.5	1	0.9	2	4.3		
18	5	2.5	1	0.9			4	8.5
19	6	3.1	2	1.8	2	4.3	2	4.3
20	3	1.5	2	1.8	1	2.1		
21	3	1.5	2	1.8	1	2.1		
22	5	2.5	1	0.9	3	6.4	1	2.1
23	1	0.5					1	2.1
24	2	1.0			1	2.1	1	2.1
25	3	1.5	2	1.8			1	2.1
26	3	1.5	1	0.9	1	2.1	1	2.1
27	4	2.0	2	1.8	2	4.3		
28	3	1.5			2	4.3	1	2.1
29	5	2.5	2	1.8	1	2.1	2	4.3
30	5	2.5	2	1.8			3	6.4
31	1	0.5			1	2.1		
32	3	1.5	1	0.9	1	2.1	1	2.1
33	2	1.0			2	4.3		
34	3	1.5	1	0.9	2	4.3		
38	2	1.0	1	0.9			1	2.1
40	3	1.5	1	0.9			2	4.3
41	4	2.0			2	4.3	2	4.3
42	2	1.0	1	0.9	1	2.1		
46	1	0.5					1	2.1
48	1	0.5			1	2.1		
Mean	13.63		9.97		17.63		17.38	
Population	196		110		47		47	

Table 7. Frequency distribution of age of the respondents' oldest child

Years	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
2	6	3.9	3	3.9	2	5.3	1	2.6
3	5	3.2	4	5.2	1	2.6		
4	4	2.6	1	1.3	1	2.6	2	5.3
5	6	3.9	3	3.9	1	2.6	2	5.3
6	7	4.5	5	6.5			2	5.3
7	3	1.9	1	1.3	1	2.6	1	2.6
8	3	1.9	2	2.6	1	2.6		
9	3	1.9	2	2.6			1	2.6
10	2	1.3	1	1.3	1	2.6		
11	3	1.9	2	2.6			1	2.6
12	3	1.9	2	2.6	1	2.6		
13	7	4.5	3	3.9	1	2.6	3	7.9
14	5	3.2	5	6.5				
15	4	2.6	2	2.6	1	2.6	1	2.6
16	3	1.9	3	3.9				
17	2	1.3	1	1.3	1	2.6		
18	2	1.3	2	2.6				
19	6	3.9	4	5.2	2	5.3		
20	7	4.5	3	3.9	1	2.6	3	7.9
21	5	3.2	1	1.3	2	5.3	2	5.3
22	3	1.9			2	5.3	1	2.6
23	3	1.9	1	1.3			2	5.3
24	4	2.6	2	2.6			2	5.3
25	4	2.6	3	3.9	1	2.6		
26	2	1.3			1	2.6	1	2.6
27	5	3.2	2	2.6	1	2.6	1	2.6
28	1	0.6	1	1.3				
29	2	1.3	1	1.3			1	2.6
30	4	2.6	2	2.6	1	2.6	1	2.6
32	4	2.6	2	2.6	2	5.3		
33	6	3.9	2	2.6	1	2.6	3	7.9
34	1	0.6					1	2.6
35	2	1.3			2	5.3		
36	4	2.6	1	1.3	2	5.3	1	2.6
37	2	1.3	2	2.6				
38	1	0.6	1	1.3				
39	2	1.3	2	2.6				
40	2	1.3	1	1.3	1	2.6		
41	3	1.9	1	1.3	2	5.3		
43	1	0.6	1	1.3				
45	1	0.6			1	2.6		
46	3	1.9	1	1.3	1	2.6	1	2.6
49	1	0.6					1	2.6
50	2	1.3	1	1.3			1	2.6
51	1	0.6			1	2.6		
52	2	1.3	1	1.3	1	2.6		
55	1	0.6					1	2.6
56	1	0.6			1	2.6		
60	1	0.6	1	1.3				
Mean	21.72		19.49		25.23		22.68	
Population	155		77		38		38	

Table 8. Frequency distribution of educational background of respondents

Education	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Elementary	2	0.7			1	1.7	1	1.6
Junior high	16	5.8	3	1.9	3	5.2	10	16.4
High school	123	44.7	56	35.9	38	65.5	29	47.5
Trade school	6	2.2			4	6.9	2	3.3
College	105	38.2	76	48.7	10	17.2	19	31.1
Graduate school	23	8.4	21	13.5	2	3.4		
Population	276		156		59		61	

Effects of fluoride on the
human body

Question 2. Of the 91.3 percent (252) of the respondents who
answered question 2, 98 percent (247) realized that fluoride decreases
cavities, but only 58.7 percent (148) of these respondents were aware
that fluroide can decrease cavities by well over 50 percent (Table 9).
The respondents from Logan and Milford did equally well on this question.
However, a higher percentage of the respondents from Helper answered this
question correctly. This may have been due to the fact that Helper is
currently adding fluoride to its water supply, thus increasing the com-
munity's awareness about the major effect that fluoride has on the human
body.

Question 3. Of the 59.8 percent (165) of the respondents who an-
swered question 3, 66.7 percent (110) realized that fluoride can improve
bone calcium content (Table 10). However, when non-response was con-
sidered, only 39.9 percent responded that fluoride can affect bone cal-
cium content. A larger percentage of the respondents from Logan answered

Table 9. Frequency distribution of question 2--"It has been established that fluoride can ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..decrease cavities by 15%	101	36.6	40.0	67	42.9	45.3	18	30.5	45.5	16	26.2	28.6
..increase cavities by 15%	1	0.4	0.4	1	0.6	0.6						
..decrease cavities by 50%	148	53.6	58.7	79	50.6	53.4	29	49.2	72.5	40	65.6	71.4
..increase cavities by 50%	2	0.7	0.7	1	0.6	0.6	1	1.7	1.7			
..no response	24	8.7		8	5.1		11	18.6		5	8.2	
Population	276			156			59			61		

Table 10. Frequency distribution of question 3--"Doctors prescribe fluoride to ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..improve bone calcium content	110	39.9	66.7	79	50.6	76.0	18	30.5	56.3	13	21.3	44.8
..improve bone protein content	31	11.2	18.8	16	10.3	15.4	5	8.5	15.6	10	16.4	34.5
..improve bone growth	9	3.3	5.5	4	2.6	3.8	3	5.1	9.4	2	3.3	6.8
..heal bone fractures	15	5.4	9.1	5	3.2	4.8	6	10.2	18.7	4	6.6	13.8
..no response	111	40.2		52	33.3		27	45.8		32	52.5	
Population	276			156			59			61		

this question correctly, which may have been due to their relatively
higher educational backgrounds.

Question 5. Of the 53.6 percent (148) of the respondents who an-
swered question 5, 28.4 percent (42) understood that fluoride can be both
beneficial and harmful to the bones, depending on the level consumed
(Table 11). However, when non-response was considered, only 15.2 percent

Table 11. Frequency distribution of question 5--"Dependong on the amount
of fluoride consumed, fluoride can ..."

Responses	Pooled			Logan			Milford			Helper		
..prevent removal of calcium from bones	58	21.0	39.2	44	28.2	42.3	8	13.6	27.6	6	9.8	40.0
..heal bones which have lost calcium	32	11.6	20.3	20	12.8	19.2	7	11.9	24.1	5	8.2	37.5
..cause re- moval of calcium from bones	16	5.8	10.8	11	7.1	10.5	3	5.1	10.3	2	3.3	12.5
..all of the above	42	15.2	28.4	29	18.6	27.9	11	18.6	37.4	2	3.3	12.5
..no response	128	46.4		52	33.3		30	50.8		46	75.4	
Population	276			156			59			61		

answered this question correctly. Since the non-response to this ques-
tion (46.4 percent) and to question 3 (40 percent) was quite high and the
number of correct responses were quite low, it leads one to believe that
the majority of respondents did not understand the relationship between
fluoride and bone calcium and the dosage or dose-response concept. Even
though these two concepts are more technical in nature and difficult to
understand, it is important for people to realize that fluoride can be
beneficial to both children (decreased incidence of tooth decay) and

adults (decreased incidence of osteoporosis). If people, expecially older people without any children, were aware of this information, they would more likely be in favor of universal fluoridation.

Question 8. Of the 39.9 percent (110) of the respondents who answered question 8, 15.5 percent (17) were aware that calcium decreases fluoride absorption (Table 12). However, when non-response was considered only 6.2 percent answered this question correctly. Since this question was included to complete the spectrum of difficulty, the high percentages of non-response and the low-percentage of correct response were expected for this question.

Table 12. Frequency distribution of question 8--"Knowledgeable scientists have repeatedly shown that ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..iron decreases fluoride absorption	10	3.6	9.1	9	5.8	11.1	1	1.7	5.0			
..phosphorus decreases fluoride absorption	11	4.0	10.0	8	5.1	9.9	2	3.4	10.0	1	1.6	11.1
..calcium decreases fluoride absorption	17	6.2	15.5	14	9.0	17.3	2	3.4	10.0	1	1.6	11.1
..minerals do not affect fluoride	72	26.1	65.5	50	32.1	61.7	15	25.4	75.0	7	11.5	77.8
..no response	166	60.1		75	48.1		39	66.1		52	85.2	
Population	276			156			59			61		

Question 9. Of the 73.9 percent (219) of the respondents who an-
swered question 9, 61.9 percent (135) realized that the benefits of
fluoride will gradually diminish throughout life (Table 13). Yet, when
non-response was considered, only 48.9 percent answered this question cor-
rectly. The respondents from each of the communities did equally well on
this question.

Table 13. Frequency distribution of question 9--"If a person stops con-
suming fluoride after childhood, any benefits which may have
been derived from the consumption of this fluoride will ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No.	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..be immed-iately lost	8	2.9	3.6	5	3.2	3.6	1	1.7	2.5	2	3.3	4.7
..last in-definitely throughout life	34	12.3	15.5	20	12.8	14.7	7	11.9	17.5	7	11.5	16.3
..gradually diminish throughout life	135	48.9	61.6	90	57.7	66.2	20	33.9	50.0	25	41.0	58.1
..rapidly diminish throughout life	42	15.2	19.2	21	13.5	15.4	12	20.3	30.0	9	14.8	20.9
..no response	57	20.7		20	12.8		19	32.2		18	29.5	
Population	276			156			59			61		

Question 11. Of the 64.5 percent (179) of the respondents who an-
swered question 11, 34 percent (61) were aware that a common character-
istic of fluorosis or over-consumption of fluoride in humans is dark
spots on the teeth (Table 14). However, when the non-response was

considered, only 22.1 percent of the respondents realized that over-
consumption of fluoride can cause permanent damage to the teeth. In
comparison, the respondents from Logan and Milford answered this question
correctly more often (20 percent) than those from Helper.

Table 14. Frequency distribution of question 11--"Of the following
characteristics, which is the most common characteristic
of over consumption of fluoride?"

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..crooked alignment of teeth	5	1.8	2.8	2	1.3	1.6	3	5.1	7.9			
..diseased gums around teeth	25	9.1	13.9	18	11.5	15.8	2	3.4	5.5	5	8.2	23.8
..dark spots on teeth	61	22.1	34.0	43	27.6	35.8	13	22.0	34.2	5	8.2	23.8
..softened enamel of teeth	87	31.5	58.3	56	35.9	46.7	20	33.9	52.6	11	18.0	52.4
..no response	97	35.5		36	23.1		21	35.6		40	65.6	
Population	276			156			59			61		

Methods of consuming fluoride

Question 4. Of the 81.5 percent (225) of the respondents who an-
swered question 4, 58.6 percent (132) of these respondents were aware
that there were approximately one to ten communities in Utah which add
fluoride to their water (Table 15). These communities are Brigham City,
Helper, and Hill Air Force Base. When the non-response was considered,
only 47.8 percent knew that there were very few communities in Utah which

have artificially fluoridated water. The respondents from Logan and
Helper not only did equally well on this question, but also did consider-
ably better than the respondents from Milford. The ability to answer
this question correctly was probably related to the respondent's degree
of awareness about the issue of fluoridation, rather than any of the
independent variables measured in this questionnaire.

Table 15.   Frequency distribution of question 4--"How many communities
in Utah add fluoride to their water supply?"

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..none	30	10.9	13.3	26	16.7	19.8	3	5.1	7.1	1	1.9	1.9
..1 to 10	132	47.8	58.6	77	49.4	58.8	23	40.0	54.8	32	52.5	61.5
..20 to 30	36	13.0	15.3	16	10.3	12.2	7	11.9	16.7	13	21.3	25.0
..40 to 50	27	9.8	12.0	12	7.7	9.2	9	18.6	21.4	6	9.8	11.5
..no response	51	18.5		25	16.0		17	28.8		9	14.8	
Population	276			156			59			61		

Question 6. Of the 63.4 percent (175) of the respondents who an-
swered question 6, 64 percent (112) realized that when fluoride is added
to chlorinated water, the effectiveness of chlorine (and fluoride) is
unaltered (Table 16). Yet when the non-response was considered, only
40.6 percent answered this question correctly. The respondents from
Helper answered correctly more frequently than respondents from Logan
and Milford. This was probably due to the fact that both fluoride and
chlorine are already being added to their water supply.

Table 16. Frequency distribution of question 6--"When both chlorine and fluoride are added to the water, is chlorine's effectiveness ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..lost	11	4.0	6.0	9	5.8	7.6	2	3.4	6.8			
..enhanced	18	6.5	10.2	11	7.1	9.3	5	8.5	17.2	2	3.3	7.1
..unchanged	112	40.6	64.0	76	48.7	64.4	15	25.4	41.7	21	34.4	75.0
..the change cannot be predicted	34	12.3	19.4	22	14.1	18.6	7	11.9	24.1	5	8.2	17.9
..no response	101	36.6		38	24.4		30	50.8		33	54.1	
Population	276			156			59			61		

Question 7. Of the 82.2 percent (227) of the respondents who answered question 7, 58.5 percent (133) understood that the costs of fluoridation are relatively small as compared to the savings in dental expenses from consuming fluoride (Table 17). Yet, when the non-response was considered, only 48.2 percent comprehended this relationship. Even though Helper and Milford have fluoridated water, the respondents from Logan were more aware of the costs of fluoridation versus the cost of dental expenses when fluoride is not consumed. This may be explained by the differences in educational backgrounds in addition to the fact that people who do not consume fluoride are probably more aware of the high cost of dental expenses.

Question 12. Of the 92 percent (254) of the respondents who answered question 12, 66.5 percent (169) realized that water was the most effective, controllable, and inexpensive method to consume fluoride (Table 18). However, when the non-response was considered, 66.5 percent

answered this question correctly. The respondents from each of the communities did equally well on this question.

Table 17. Frequency distribution of question 7--"In the fluoridation of public water supplies, the costs to the general public are ... the savings in dental expenses."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..less than	133	48.2	58.6	91	58.3	65.9	2	37.3	48.8	20	32.8	45.4
..equal to	29	10.5	12.7	16	10.3	11.6	9	15.3	20.0	4	6.6	9.1
..more than	19	6.9	8.4	14	9.0	10.1	4	6.8	8.8	1	1.6	2.2
..there is no relation-ship	46	16.7	20.3	17	10.9	12.3	10	16.9	22.2	19	31.1	43.2
..no response	49	17.8		18	11.5		14	23.7		17	27.9	
Population	276			156			59			61		

Table 18. Frequency distribution of question 12--"Of the following types of administration of fluoride to the public, which method have scientists determined to be the most effective, controllable, and inexpensive method?"

	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..tablets	13	4.7	5.1	8	5.1	5.4	2	3.4	3.8	3	4.9	5.5
..vitamins	9	3.3	3.5	8	5.1	5.4				1	1.6	1.8
..water	169	61.2	66.5	96	61.5	65.3	35	59.3	67.3	38	62.3	69.1
..drops	4	1.4	1.6	2	1.3	1.4	1	1.7	1.9	1	1.6	1.8
..topical	9	3.3	3.5	8	5.1	5.4				1	1.6	1.8
..brushings	4	1.4	1.6	2	1.3	1.4	1	1.7	1.9	1	1.6	1.8
..toothpaste	46	16.7	18.1	23	14.7	15.6	13	22.0	24.0	10	16.4	18.2
..no response	22	8.0		9	5.8		7	11.9		6	9.8	
Population	276			156			59			61		

Related information

Question 1. Of the 88.4 percent (244) of the respondents who an-
swered question 1, 81.9 percent (220) realized that fluoride is a mineral
(Table 19). Yet, when the non-response was considered, 72.5 percent an-
swered this question correctly. The respondents from each of the com-
munities did equally well on this question.

Table 19. Frequency distribution of question 1--"What is fluoride?
Is fluoride a ..."

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..vitamin	7	2.5	2.9	4	2.6	2.9	3	5.1	5.4			
..mineral	200	72.5	81.9	110	70.5	79.7	47	79.7	83.9	43	70.5	86.0
..salt	15	5.4	6.1	11	7.1	7.9	1	1.7	1.7	3	4.9	6.0
..drug	22	8.0	9.0	13	8.3	9.4	5	8.5	8.9	4	6.6	8.0
..no response	32	11.6		18	11.5		3	5.1		11	18.0	
Population	276			156			59			61		

Question 10. Of the 91.3 percent (252) of the respondents who an-
swered question 10, 66.7 percent (168) were aware that of the food sources
listed, apple pie, because of its high sugar content, will cause the
greatest number of cavities when consumed (Table 20). Even though the
respondents from Logan and Milford did equally well on this question, the
respondents from Helper answered this question correctly somewhat more
frequently. The ability to answer this question was probably related to
the respondent's degree of dental health awareness, rather than any of
the independent variables measured in this study.

Table 20. Frequency distribution of question 10--"Of the following foods,
which food will cause the greatest number of cavities when
consumed?"

Responses	Pooled			Logan			Milford			Helper		
	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %	Abs Freq No	Rel Freq %	Adj Freq %
..peaches	22	8.0	8.7	17	10.9	11.4	3	5.1	6.1	2	3.3	3.7
..apple pie	168	60.9	66.7	93	59.6	62.4	31	52.5	63.3	44	72.1	81.5
..potatoes	21	7.6	8.3	12	7.7	8.0	7	11.9	14.3	2	3.3	3.7
..white bread	41	14.9	16.3	27	17.3	18.1	8	13.6	16.3	6	9.8	11.1
..no response	24	8.7		7	4.5		10	16.9		7	11.5	
Population	276			156			59			61		

Summary of knowledge questionnaire

The relative frequency (percentage) of correct responses to each
question ranged from 6.2 percent to 72.5 percent (Table 21). The mean
relative percentage of correct response was 43.1 percent. The total
number of correct response for each question ranged from 0 to 10 (Table
22). The mean total score was 4.60.

It was calculated from Table 22, that 84 percent (232) of all of the
respondents answered 50 percent or less of the questions correctly, while
only 16 percent (44) of the respondents answered 50 percent or more of
the questions correctly. However, 22.4 percent (35) of the respondents
from Logan answered 50 percent or more of the questions correctly, where-
as 8.4 percent (5) and 4.9 percent (3) of the respondents from Milford
and Helper respectively answered 50 percent or more of the questions cor-
rectly. This was probably due to the fact that the respondents from
Logan have higher levels of education than those respondents from Milford
and Helper.

Table 21. Percentage of correct response of each question on the knowledge questionnaire

Question	Pooled		Logan		Milford		Helper	
	Rel Freq %	Adj Freq %	Rel Freq %	Adj Freq %	Rel Freq %	Adj Freq %	Rel Freq %	Adj Freq %
1	72.5	81.9	70.5	79.7	79.7	83.9	70.5	86.0
2	53.6	58.7	50.6	53.4	49.2	72.5	65.6	71.4
3	39.9	66.7	50.6	76.0	30.5	56.3	21.3	44.8
4	47.8	58.6	49.4	58.8	40.0	54.8	52.5	61.5
5	15.2	28.4	18.6	27.9	18.6	37.9	3.3	12.5
6	40.6	64.0	48.7	64.4	25.4	51.7	34.4	75.0
7	48.2	58.6	58.3	65.9	37.3	48.8	32.8	45.4
8	6.2	15.5	9.9	17.3	3.4	10.0	1.6	11.1
9	48.9	61.6	57.7	66.2	33.9	50.0	41.0	58.1
10	60.9	66.7	59.6	62.4	52.5	63.3	72.1	81.5
11	22.1	34.1	27.6	35.8	22.0	34.2	8.2	23.8
12	61.2	66.5	61.5	65.3	59.3	67.3	62.3	69.1
Mean	43.1	55.1	46.9	56.1	37.7	52.6	38.8	53.4

Table 22. Frequency distribution of total number of correct response for the knowledge questionnaire

No.Correct	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
0	7	2.5	3	0.9	6	10.2		
1	20	7.2	9	5.8	7	11.9	4	6.6
2	23	8.3	10	6.4	6	10.2	7	11.5
3	36	13.0	14	9.0	11	18.6	11	18.0
4	45	16.3	21	13.5	7	11.9	17	27.9
5	53	19.2	36	23.1	7	11.9	10	16.4
6	48	17.4	29	18.6	10	16.9	9	14.8
7	23	8.3	17	10.9	2	3.4	3	4.9
8	16	5.8	13	8.3	3	5.1		
9	4	1.4	4	2.6				
10	1	0.4	1	0.6				
Mean	4.6		5.1		4.0		4.0	

Table 23 shows that the number of questions not responded to ranged
from 0 to 12. The mean number of questions left unanswered was 4.00.
It was calculated from Table 23 that 86 percent (237) of all of the
respondents answered 50 percent or more of the questions. Yet, 92.9 per-
cent (145) of the respondents from Logan answered 50 percent or more of
the questions, whereas 78 percent (46) and 77 percent (47) of the respon-
dents from Milford and Helper respectively answered 50 percent or more of
the questions on the knowledge questionnaire.

Table 23. Frequency distribution of total number of non-response for
the knowledge questionnaire

No. Unanswered	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
0	61	22.1	45	28.8	11	18.6	6	9.8
1	37	13.4	28	17.9	7	11.9	2	3.3
2	42	15.2	25	16.0	10	16.9	6	9.8
3	32	11.6	21	13.5	3	5.1	8	13.1
4	26	9.4	12	7.7	9	15.3	5	8.2
5	23	8.3	3	1.9	5	8.5	15	24.6
6	17	6.2	11	7.1	1	1.7	5	8.2
7	11	4.0	5	3.2	1	1.7	5	8.2
8	9	3.3	4	2.6	1	1.7	4	6.6
9	12	4.3	1	0.6	7	11.9	4	6.6
10	2				1	1.7	1	1.6
11	1	0.4			1	1.7		
12	3	1.1	1	0.6	2	3.4		
Mean	4.0		3.3		4.7		5.0	

The above data thus indicate that a great majority of the respondents
and thus a great majority of the people living in Logan, Milford, and
Helper understand very little about fluoride. This confirms Dunning's
(1962), Kyes' (1968), and Vogan's (1970) conclusion that the public

greatly lacks the necessary information about fluoride to vote intelligently upon the issue of fluoridation.

Sources of fluoride information

Question 13 on the knowledge questionnaire was used to determine what sources of information most often influence the public about fluoride. This question asked the respondent to decide which _five_ of the sixteen sources of information listed influenced their opinion and knowledge the most about fluoride and then to rank these five sources in order of their influence upon the respondent (Appendix E).

Tables 24 and 25 and Appendix E reveal that the three major mass medias--television, newspaper, and magazines--and the dentist were the four sources of information most frequently indicated by the respondents as the sources of information which had the greatest influence on their opinion and knowledge about fluoride. The next three most influential sources of information appeared to be friends and relatives, the radio, and schools. It is also evident from Tables 24 and 25 that sales pamphlets, spouse, popular books, private organizational pamphlets, and textbooks had the least influence upon the respondent's opinion and knowledge about fluoride. These findings contradict those of Shaw (1969), who found that radio, television, and newspapers did not influence the public's response to fluoridation.

Dentists' and physicians' questionnaires

The data from the dentists' and physicians' questionnaires and the questionnaire given to the public as a check on dentists' and physicians' responses will be considered together (Appendix E).

Table 24. Number and percentage of respondents who ranked each source
of information as any <u>one</u> of the five most important
sources of information

Source	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
radio	78	28.3	48	30.8	19	32.2	11	18.0
physician	49	17.8	31	29.9	8	13.6	10	16.4
newspaper	120	43.5	83	53.2	23	39.0	14	33.0
private organization pamphlets	34	12.3	29	18.6	2	3.4	3	4.9
sales pamphlets	1	0.4	1	0.6				
state and gov't pamphlets	60	21.7	37	23.7	13	22.0	10	16.4
television	178	64.5	102	65.4	38	64.4	38	62.3
magazines	128	46.4	84	53.8	26	44.1	18	29.1
dentist	155	56.2	91	58.3	29	49.2	35	57.3
schools	79	28.6	41	26.3	16	27.1	22	36.1
friends and relatives	80	29.0	54	34.6	13	22.0	13	21.3
personal experience	77	27.9	37	23.7	14	23.7	26	42.6
popular books	13	4.6	6	3.8	4	6.8	3	4.9
textbooks	29	10.5	20	12.8	6	10.2	3	4.9
advertising	67	24.3	36	23.1	21	35.9	10	16.4
spouse	9	3.3	7	4.5	2	3.4		
Population	276		156		59		61	

<u>Dentists' locations</u>. Table 26 shows that of the 34.5 percent (112)
of the dentists who responded to this questionnaire, 40.2 percent (45)
were located in Salt Lake City, 11.6 percent (13) in Provo, 10.7 percent
(12) in Ogden, and 39.5 (44) were in the smaller communities throughout
Utah.

<u>Physicians' locations</u>. Table 27 indicates that of the 44.6 percent
(145) of the physicians who responded to this questionnaire, 31.7 percent
(46) were located in Salt Lake City, 15.2 percent (22) in Ogden, 8.3

percent (12) in Provo, 5.5 percent (8) in Logan, and 39.3 percent (57)

were in the smaller communities throughout Utah.

Table 25. Overall ranking of sources of information

	Pooled	%	Logan	%	Milford	%	Helper	%
	Source	%	Source	%	Source	%	Source	%
1	television	64.5	television	64.5	television	64.4	television	62.3
2	dentist	56.2	dentist	58.3	dentist	49.2	dentist	57.4
3	magazines	46.4	magazines	53.8	magazines	44.1	personal experience	42.6
4	newspaper	43.5	newspaper	53.2	newspaper	39.9	schools	36.1
5	friends & relatives	29.0	friends & relatives	34.6	advertising	35.6	newspaper	33.0
6	schools	28.6	radio	30.8	radio	32.2	magazines	29.5
7	radio	28.3	schools	26.3	schools	27.1	friends & relatives	21.3
8	personal experience	27.9	state and government pamphlets	23.7	personal experience	23.7	radio	18.0
9	advertising	24.5	personal experience	23.7	friends and	22.0	physician	16.4
10	state and government pamphlets	21.7			state and government pamphlets	22.0	advertising	16.4
11	physician	17.8	physician	19.9	physician	13.6	state and government pamphlets	16.4
12	private organization pamphlets	12.3	private organization pamphlets	18.6	textbooks	10.2	popular books	4.9
13	textbooks	12.3	textbooks	12.8	popular books	6.8	textbooks	4.9
14	popular books	4.7	spouse	4.5	private organization pamphlets	6.8	private organization pamphlets	4.9
15	spouse	3.3	popular books	3.8	spouse	3.4	spouse	0.0
16	sales pamphlets	0.4	sales pamphlets	0.6	sales pamphlets	0.0	sales pamphlets	0.0

Table 26. Frequency distribution of the location of dentists practicing
in Utah who responded to their questionnaire

Number	Location
1	American Fork
3	Bountiful
3	Brigham City
2	Cedar City
1	Clearfield
1	Helper
1	Kaysville
1	Lehi
5	Logan
3	Midvale
12	Ogden
1	Orem
1	Park City
1	Price
13	Provo
2	Roy
2	St. George
45	Salt Lake City
1	Spanish Fork
1	Springville
1	Tooele
2	Monument Valley
2	Taylorsville
1	Southern Utah

Population 112

Table 27. Frequency distribution of the location of physicians
practicing in Utah who responded to their questionnaire

Number	Location
3	American Fork
3	Bountiful
4	Brigham City
1	Cedar City
1	Delta
2	Helper
1	Kaysville
1	Layton
1	Lehi
8	Logan
2	Moab
1	Monticello
2	Mount Pleasant
3	Nephi
22	Ogden
2	Orem
2	Panguitch
1	Payson
1	Pleasant Grove
1	Price
12	Provo
2	Richfield
1	Roosevelt
2	St. George
46	Salt Lake City
1	Sevier
2	Smithfield
1	Snowville
1	Spanish Fork
2	Springville
1	Tooele
2	Tremonton
3	Vernal
1	Eastern Utah
2	Rural Utah
3	Urban Utah

Population 145

Sex. Table 28 shows that of the 60 respondents who answered the questionnaire which checked on the responses made by dentists and physicians, 36.7 percent (22) were males and 63.3 percent (38) were females.

Table 28. Frequency distribution of sex of respondents

Sex	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Male	22	36.7	12	40.0	5	33.3	5	33.3
Female	38	63.3	18	60.0	10	66.7	10	66.7
Population	60		30		15		15	

Age. Table 29 reveals that the age of the respondents ranged from 16 to 75 years. The age interval, 60 to 75 years, had the greatest number of respondents.

Table 29. Frequency distribution of age of respondents

Years	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
16-20	6	10.0	2	6.7	2	13.3	2	13.3
20-29	13	21.7	13	43.3				
30-39	6	10.0	2	6.7	3	20.0	1	6.7
40-49	11	18.3	7	23.3	2	13.3	2	13.3
50-59	10	16.7			7	46.7	3	20.0
60-75	14	23.3	6	20.0	1	6.7	7	46.7
Population	60		30		15		15	

Marital status. Table 30 reveals that of the 60 respondents who answered the questionnaire which checked on the responses made by the dentists and physicians, 23.3 percent (14) were single, 66.7 percent (40) were married, 1.7 percent (1) were divorced, and 8.3 percent (5) were widowed.

Table 30. Frequency distribution of marital status of respondents

Status	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
single	14	23.3	8	26.7	3	20.0	3	20.0
married	40	66.7	19	63.3	11	73.3	10	66.7
divorced	1	1.7	1	3.3				
widowed	5	8.3	2	6.7	1	6.7	2	13.3
Population	60		30		15		15	

Education. Table 31 shows that educational backgrounds of the 60 respondents ranged from elementary school to graduate school. Fifteen percent (9) of these respondents had 6 years or less of education, 8.3 percent (5) had 7 to 9 years of education, 36.7 percent (22) had 10 to 12 years of education, 26.7 percent (16) had at least one year of college, and 10.0 percent had a graduate degree.

Questions

By averaging the percent of the affirmative responses for questions 1 through 9, 17, 18 and 20 in each questionnaire (Table 32) it was calculated that 67.8 percent of the dentists were involved in educating their patients about dental health, whereas only 29 percent of the

Table 31. Frequency distribution of educational background of respondents

Education	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
elementary	9	15.0	1	3.3	2	13.3	6	40.0
junior high	5	8.3	1	3.3	2	13.3	2	13.3
high school	22	36.7	10	33.3	8	53.3	4	26.7
trade school	2	3.3			2	13.3		
college	16	26.7	13	43.3	1	6.7	2	13.3
graduate	6	10.0	5	16.7			1	6.7
Population	60		30		15		15	

public stated that their dentists had educated them about dental health and fluoride. However, a national poll discovered that approximately 50 percent of the dentists in their survey said they provided dental health education for their patients (cited by Baker, 1965), which is a somewhat smaller figure than that of the present study. A possible explanation may be that the survey cited was representative of the entire nation, whereas the present survey represented only Utah.

Table 33 reveals that the majority of dentists (67.9 percent) spend 10 minutes or less educating their patients about dental health. This coincides with the data of the national survey (cited by Baker, 1965) which indicates that dentists spent very little time in educating their patients about dental health.

It was also calculated from Table 32 that the average of the differences between the affirmative responses of the dentists and the public was 39 percent. Therefore even though the dentist was ranked as the second most influential source of information about fluoride, the

Table 32. Comparison of the frequency distributions of the responses
made by the physicians/dentists and the public about the
dentists and physician's involvement in dental health and
fluoride education in Utah

Question	Dentists		Public	
	Absolute Frequency No	Relative Frequency %	Absolute Frequency No	Relative Frequency %

Question 1[+]--Did (you/the dentist) discuss tooth decay with (your patients/you)?

yes	84*	75.0	26	43.3
no	20	17.9	24	40.0
no response	8	7.1	10	16.7

Question 2--Did (you/the dentist) discuss toothbrushing with (your patients/you)?

yes	83**	74.1	32	53.3
no	20	17.9	18	30.0
no response	9	8.0	10	16.7

Question 3--Did (you/the dentist) discuss the use of dental floss with (your patients/you)?

yes	80***	71.4	30	50.0
no	22	19.6	20	33.3
no response	10	8.9	10	16.7

Question 4--Did (you/the dentist) discuss the effects of sweets on the teeth with (your patients/you)?

yes	75	66.9	22	36.7
no	28	25.0	28	46.7
no response	9	8.0	10	16.7

Question 5--Did(you/the dentist) emphasize the importance of having a dental examination twice a year with (your patients/you)?

yes	80	71.4	35	48.3
no	19	16.9	14	23.3
no response	13	11.6	11	18.3

Question 6--Did (you/the dentist) discuss the use of fluoride with (your patients/you)?

yes	91	81.2	13	21.7
no	12	10.7	37	61.7
no response	9	8.0	10	16.7

Question 7--Did (you/the dentist) show charts and/or movies concerning dental health care to (your patients/you)?

yes	50	44.6	8	13.3
no	51	45.5	42	70.0
no response	11	9.8	10	16.7

Table 32. Continued

Question	Dentists		Public	
	Absolute Frequency No	Relative Frequency %	Absolute Frequency No	Relative Frequency %

Question 8--Did (you/the dentist) give any pamphlets concerning dental
health care to (your patients/you)?

yes	67	59.8	10	16.7
no	34	30.4	40	66.7
no response	11	9.8	10	16.7

Question 9--Did (you/the dentist) give any pamphlets concerning the
use of fluoride to (your patients/you)?

yes	41	36.6	1	1.7
no	58	51.7	49	61.7
no response	13	11.6	10	16.7

Question 17--(Are/were) there any pamphlets in (your/the) waiting room
which (are/were) available for (your patients/you) to
look over and/or keep concerning dental health care?

yes	87	77.7	21	35.0
no	17	15.2	20	33.3
no response	8	7.1	10	16.7
don't remember			0	15.0

Question 18--(Are/were) there any pamphlets in (your/the) waiting room
which (are/were) available for (your patients/you) to look
over and/or keep concerning bluoride supplementation?

yes	62	55.4	7	11.7
no	38	33.9	24	40.0
no response	12	10.7	10	16.7
don't remember			19	31.7

Question 20--Did (you/the dentist) discuss the advantages and dis-
advantages of the major methods of taking fluoride with
(your patients/you)?

yew	97	86.6	9	15.0
no	4	3.6	4	6.7
no response	11	9.8	47	78.3

Table 32. Continued

Question	Physicians		Public	
	Absolute Frequency No	Relative Frequency %	Absolute Frequency No	Relative Frequency %
Question 33--Did (you/the physician) discuss the advantages and disadvantages of the major methods of taking fluoride with (your patients/you)?				
yes	102	70.3	4	6.7
no	35	24.1	2	3.3
no response	8	5.5	54	90.0
Question 34--Did (you/the physician) recommend the use of supplementa fluoride to (your patients/you)?				
yes	131	90.3	4	6.7
no	10	6.9	2	3.3
no response	4	2.8	54	90.0
Population	145		60	

[+] The question numbers correspond to the questionnaire which was given to the public.
*This value was derived by averaging the responses from questions 1 and 2 of the dentist's questionnaire.
**This value was derived by averaging the responses from questions 3 and 4 of the dentist's questionnaire.
***This value was derived by averaging the responses from questions 5 and 6 of the dentist's questionnaire.

Table 33. Frequency distribution of the amount of time that dentists and the public indicated (the dentists spent in educating them about dental health and fluoride) was spent by dentists in dental health and fluoride education

Minutes	Dentists		Public	
	Absolute Frequency No	Relative Frequency %	Absolute Frequency No	Relative Frequency %
1 to 5	43	38.4	17	28.3
5 to 10	22	19.6	11	18.3
10 to 15	36	32.1	8	13.3
over 15			12	20.0
no response	11	9.8	12	20.0
Population	112		60	

results of these two questionnaires indicate that their dental health education programs were not as effective as would be desired.

When these same calculations were carried out for questions 33 and 34 of the physicians' questionnaire, it was calculated that 80 percent of the general practitioners, pediatricians, and gynecologists practicing in Utah provide information about fluoride to their patients, while only 6.7 percent of the public stated that their physician had discussed fluoride with them (Table 33). The results of the sources of information question (Table 25) im which the physician was ranked eleventh in importance of influencing the public about fluoride, and from both the physicians' and public's questionnaires reveal that the public does not consider and thus does not use the physician as a major source of information about fluoride.

Mothers' questionnaire

Another part of this study about fluoride involved the determination of mothers' opinions about fluoridated water and the possibility of being able to buy a food in either a fluoridated or unfluoridated form. Tables 37, 38, and 39 summarize the results obtained from this questionnaire.

Demographic characteristics

Age. Table 34 shows that the age of the mothers ranged from 20 to 59 years. The majority of the mothers fell into the 30 to 39 year age interval.

Number of children. Table 35 indicates that there was an even distribution of mothers with small, medium, and large families.

Table 34. Frequency distribution of age of mothers

Years	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
20-29	16	17.2	2	54.0	2	9.5	12	34.3
30-39	55	59.1	23	62.6	16	76.2	16	45.7
40-49	20	21.5	10	27.0	3	14.3	7	14.3
50-59	2	2.2	2	5.4				
Population	93		37		21		35	

Table 35. Frequency distribution of number of children of mothers

Number	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
1-2	26	27.9	8	21.6	5	23.8	13	37.1
3-4	37	39.8	12	32.4	8	38.1	17	48.6
5 or more	30	32.3	16	45.9	8	38.1	5	14.3
Population	93		37		21		35	

Questions

Table 36 reveals that of the sources of food which could be fluoridated, the mothers most frequently preferred water. Table 37 shows that 76.3 percent (71) of the mothers were in favor of fluoridation of water. The reasons most often given by mothers for being in favor of fluroidation were improved dental health and easiest and simplest method of consuming fluoride. Table 38 indicates that 62.4 percent (58) of the mothers were in favor of having the option of buying a particular food in either a fluoridated or unfluoridated form. The reason most often given by the mothers in favor of this option was that it gave people a

"choice" about consuming fluoride. The mothers felt that this would be a good way for children to have fluoride and for older people not to have fluoride. Thus, even though the majority of the mothers were in favor of fluoridation of water, they also wanted to choose whether or not to consume fluoride.

Table 36. Frequency distribution of question 13--"If fluoride were added to either a food or water source, which of the two sources in each pair would you prefer?"

Alternative	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
1 water or	64	68.8	22	59.5	16	76.2	26	74.3
salt	21	22.6	14	37.8	4	19.0	3	8.6
no response	8	8.6	1	2.7	1	4.8	6	17.1
2 salt or	57	61.3	31	83.8	13	61.9	13	37.1
milk	26	28.0	4	10.8	6	28.6	16	45.7
no response	9	9.7	2	5.4	1	4.8	6	17.1
3 water or	72	77.4	28	75.7	17	81.0	27	77.1
milk	11	11.8	6	16.2	3	14.3	2	5.7
no response	10	10.8	3	8.1	1	4.8	6	17.1
4 milk or	53	57.0	17	45.9	13	61.9	23	65.7
flour	29	31.2	17	45.9	6	28.6	6	17.1
no response	11	11.8	3	8.1	2	9.6	6	17.1
5 water or	59	63.4	24	64.9	14	66.7	21	60.0
fluoride tab-lets	26	28.0	12	32.4	6	28.6	8	22.4
no response	8	8.6	1	2.7	1	4.8	6	17.1
6 salt or	36	38.7	17	45.9	9	42.9	10	28.6
fluoride tab-lets	46	49.5	18	48.6	10	47.6	18	51.4
no response	10	10.8	2	5.4	2	9.6	7	20.0
Population	93		37		21		35	

Table 37. Frequency distribution of question 15--"Are you in favor of adding fluoride to water?"

Response	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
yes	71	76.3	27	73.0	11	52.4	33	94.3
no	19	20.4	8	21.6	9	42.9	2	5.7
undecided	1	1.1	1	2.7				
no response	2	2.2	1	2.7	1	4.8		
Population	93		37		21		35	

Table 38. Frequency distribution of question 14--"Are you in favor of adding fluoride to a food source which would be available in both the fluoridated and unfluoridated forms?"

Response	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
yes	58	62.4	27	73.0	10	47.6	21	60.0
no	25	26.9	6	16.2	10	47.6	9	25.7
undecided	6	6.5	4	10.8	1	4.8	1	2.9
no response	4	4.3						
Population	93		37		21		35	

Analysis of Data

Knowledge questionnaire

A special stepwise multiple regression program written by Dr. Rex Hurst, Department head and Professor of Applied Statistics and Computer Science at Utah State University (Hirschi, 1969), was used as the statistical instrument for determining the degree of influence of the selected independent variables upon the respondent's level of knowledge.

The independent variables, which are the variables that describe and identify the personal characteristics of the respondent, selected for this study were sex, marital status, age, number of children, age of youngest child, age of oldest child, education, and sources of information which the respondent ranked as having the greatest influence on his opinion and knowledge about fluoride. These eight independent variables were analyzed with two dependent variables, which were the total number of correct response and the total number of non-response. This second dependent variable was added to the multiple regression analysis because of the high percentage of non-response to specific questions encountered in the data from this questionnaire.

The sixteen individual sources of information were categorized into three main groups--media, medical-educational, and personal (Table 39)-- and then regrouped into ten variables which represented the ten possible permutations for these three groups, as shown in Table 40. This new variable then became the eighth independent variable so that the influence of the respondent's five major sources of information about fluoride on his level of knowledge could be analyzed. Table 41 indicates that of the three groups of sources of information, media influenced the public's opinion and knowledge the most about fluoride, thus confirming the study's previous data that the majority of the respondents received a large part of their information about fluoride from the media (Table 25).

The first step in the analysis procedure was to run a multiple regression program on the complete model (all variables included) with the program "geared" for a stepwise mode. The stepwise mode interrogates the sum of the squares of each independent variable or group of variables

Table 39. Categorization of sources of information for regression
analysis

Personal	Media	Medical-educational
friends and relatives	radio	physician
personal experience	television	dentist
spouse	newspaper	schools
	magazines	state and government
	advertising	pamphlets
	popular books	testbooks
	private organization	
	pamphlets	
	sales pamphlets	

Table 40. Regrouped variables used in the regression analysis

Variable	Sources of information groups
1	all media*
2	all medical-educational*
3	all personal*
4	1/2 personal, 1/2 media
5	1/2 medical-educational, 1/2 media
6	1/2 media, 1/2 medical-educational
7	1/2 personal, 1/2 medical-educational
8	1/2 medical-educational, 1/2 personal
9	1/2 media, 1/2 personal
10	mixture of all three groups

*If four or more of the respondent's sources of information were in the
same group, he was given variable 1, 2, or 3 respectively.

until the variable is found that gives the least amount of information.
This variable is then deleted from the model and the problem is recom-
puted as a new problem with that particular variable excluded (Hirschi,
1969). This process continues until all of the variables have been
deleted from the model. Tables 42 and 43 show the results of this
computation.

Table 41. Frequency distribution of the regrouped sources of information which influenced the public's opinion and knowledge about fluoride

Group	Pooled		Logan		Milford		Helper	
	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
all media	81	29.3	50	32.1	20	33.9	11	18.0
1/2 media, 1/2 med-educ.	53	19.2	24	15.4	20	33.9	9	14.8
1/2 med-educ., 1/2 media	47	17.0	30	19.2	4	6.8	12	19.7
mixture of all three	29	10.5	23	14.7	1	1.7	5	8.2
all med-educ	18	6.5	50	32.1	20	33.9	11	18.0
1/2 media, 1/2 personal	12	4.3	1	0.6	2	3.4	9	14.8
1/2 med-educ., 1/2 personal	8	2.9	3	1.9	4	6.8	1	1.6
1/2 personal, 1/2 media	7	2.5	4	2.6	1	1.7	2	3.3
all personal	5	1.8	3	1.9	1	1.7	1	1.6
no response	12	4.3	6	3.8	5	8.5	2	3.3
Population	276		156		59		61	

The R^2 column represents the percentage of variation being explained by the variables remaining in the model. The total R^2 (found at the bottom of each model) is the mathematical computation for the relationship between the variability of people's knowledge about fluoride and the selected independent variables. A R^2 of .375 for non-response (Table 42) and .284 for correct-response (Table 43) were computed, which means that 37.5 percent (for non-response) and 28.4 percent (for correct-response) of the variability in the level of knowledge about fluoride can be explained by the eight variables in the model. The following formula was used to determine the significance of the R^2 values (Clark and Schkade, 1969):

Table 42. Stepwise regression summary of total number of non-response for knowledge questionnaire

Community	X	Subset	Source	R^2	Proportion of variation
pooled	X_2	5	marital status	.3747	.000029
	X_5	1	age of youngest child	.3747	.000072
	X_1	3	sex	.3746	.0045
	X_8	8	sources of information	.3702	.0445
	X_6	2	age of oldest child	.3257	.0127
	X_4	6	number of children	.3130	.0138
	X_7	7	education	.2992	.0590
	X_3	4	age of respondent	.2402	.2402
			$R^2 = .3747$		
Logan	X_7	7	education	.3302	.0123
	X_2	5	marital status	.3179	.0081
	X_3	4	age of respondent	.3098	.0253
	X_1	3	sex	.2845	.0059
	X_5	1	age of youngest child	.2786	.0078
	X_4	6	number of children	.2708	.0167
	X_8	8	sources of information	.2541	.0944
	X_6	2	age of oldest child	.1598	.1598
			$R^2 = .3302$		
Milford	X_2	5	marital status	.7164	.0003
	X_5	1	age of youngest child	.7161	.0030
	X_7	7	education	.7131	.0193
	X_3	4	age of respondent	.6938	.0835
	X_4	6	number of children	.6103	.0552
	X_8	8	sources of information	.5551	.3463
	X_1	3	sex	.2087	.0946
	X_6	2	age of oldest child	.1141	.1141
			$R^2 = .7164$		
Helper	X_2	5	marital status	.5433	.00028
	X_6	2	age of oldest child	.5430	.00367
	X_3	4	age of respondent	.5394	.01978
	X_8	8	sources of information	.5196	.09567
	X_7	7	education	.4239	.08544
	X_4	6	number of children	.3385	.07139
	X_1	3	sex	.2671	.05599
	X_5	1	age of youngest child	.2111	.21111
			$R^2 = .5433$		

Table 43. Stepwise regression summary of total number of correct
response for knowledge questionnaire

Community	X Subset		Source	R^2	Proportion of variation
Pooled	X_6	2	age of oldest child	.2838	.0000003
	X_2	5	marital status	.2838	.000214
	X_1	3	sex	.2836	.00138
	X_3	4	age of respondent	.2822	.01609
	X_4	6	number of children	.2661	.01372
	X_8	8	sources of information	.2524	.07641
	X_7	7	education	.1760	.07058
	X_5	1	age of youngest child	.1055	.1055

$$R^2 = .2838$$

Logan	X_1	3	sex	.2825	.00014
	X_2	5	marital status	.2824	.00609
	X_5	1	age of youngest child	.2763	.00798
	X_3	4	age of respondent	.2683	.03964
	X_4	6	number of children	.2286	.02920
	X_6	2	age of oldest child	.1994	.01707
	X_8	8	sources of information	.1824	.09302
	X_7	7	education	.0921	.09211

$$R^2 - .2825$$

Milford	X_2	5	marital status	.6773	.000037
	X_6	2	age of oldest child	.6773	.0018
	X_1	3	sex	.6755	.00379
	X_5	1	age of youngest child	.6717	.0195
	X_8	8	sources of information	.6522	.1338
	X_4	6	number of children	.5183	.0796
	X_7	7	education	.4387	.1346
	X_3	4	age of respondent	.3041	.3041

$$R^2 = .6773$$

Helper	X_6	2	age of oldest child	.4409	.000058
	X_7	7	education	.4409	.02687
	X_1	3	sex	.4140	.00659
	X_3	4	age of respondent	.4074	.03805
	X_2	5	marital status	.3694	.03532
	X_4	6	number of children	.3340	.0472
	X_8	8	sources of information	.2868	.2454
	X_5	1	age of youngest child	.0414	.04143

$$R^2 = .4409$$

$$F = \frac{\dfrac{R^2}{r-1}}{\dfrac{1-R^2}{n-r}}$$

where,

R^2 = coefficient of determination

r = total number of variables

n = sample size

Both of these R^2 values were significant at the .001 level (Tables 44 and 45). However, since only 28.4 percent of the variability of the level of knowledge about fluoride could be explained by this model, it appears that variables other than the ones used in this model, such as opinion about fluoridation, have a significant effect on the variability of level of knowledge about fluoride. Tables 42 and 43 also show that the model used in this study best explained the level of knowledge about fluoride in the smallest community, Milford, because 72 percent (R^2 = .717 for non-response) and 68 percent (R^2 = .678 for correct response) of the variability of the level of knowledge could be explained in Milford, whereas only 33 percent (R^2 = .33 for non-response) and 28 percent (R^2 = .283 for correct response) of the variability of the level of knowledge about fluoride could be explained in the largest community, Logan.

The proportion of variation column in Tables 42 and 43 indicates the percentage of variation being explained by each variable. This figure was derived by subtracting the R^2 value of that variable from the R^2 value of the preceding variable. For example, X_7, education, corresponds to a R^2 value of .2992. When X_7 was deleted from the model, the next R^2 computation was .2402. The difference between .2992 and .2402 is .0590 (6 percent), which is the amount or proportion of variability explained by having X_7, education, in the model.

Table 44. Analysis of variance of total number of non-response for knowledge questionnaire

Com- munity	X	Sub- set	Independent variables	d.f.	S.S.	F Ratio	Signifi- cance
Pooled	X_1	3	sex	1	0.07	0.0115	
	X_2	5	marital status	1	9.51	1.68	
	X_3	4	age of respondent	5	84.05	2.983	.025
	X_4	6	number of children	3	40.85	2.416	.100
	X_5	1	age of youngest child	1	0.16	0.029	
	X_6	2	age of oldest child	1	20.73	3.679	.100
	X_7	7	education	4	119.63	5.308	.001
	X_8	8	sources of information	10	99.99	1.774	.100
			error	249	1402.9	5.634	
			$R^2 = .3747$ (R = .612)			5.968	.001
Logan	X_1	3	sex	1	8.13	1.770	
	X_2	5	marital status	1	8.42	1.833	
	X_3	4	age of respondent	5	34.45	1.500	
	X_4	6	number of children	3	27.84	2.020	
	X_5	1	age of youngest child	1	17.92	3.902	.100
	X_6	2	age of oldest child	1	39.92	8.561	.005
	X_7	7	education	4	10.92	0.594	
	X_8	8	sources of information	10	76.92	1.675	.100
			error	129	592.35	4.592	
			$R^2 = .3305$ (R = .5748)			2.547	.001
Milford	X_1	3	sex	1	48.50	7.924	.010
	X_2	5	marital status	1	0.22	0.035	
	X_3	4	age of respondent	5	55.95	1.828	
	X_4	6	number of children	3	49.45	2.692	.100
	X_5	1	age of youngest child	1	2.09	0.341	
	X_6	2	age of oldest child	1	30.22	4.037	.050
	X_7	7	education	4	14.97	0.615	
	X_8	8	sources of information	10	144.32	2.357	.050
			error	32	195.88	6.121	
			$R^2 = .7165$ (R = .8464)			3.234	.010
Helper	X_1	3	sex	1	43.87	7.982	.010
	X_2	5	marital status	1	0.12	0.021	
	X_3	4	age of respondent	5	4.97	0.181	
	X_4	6	number of children	3	23.85	1.446	
	X_5	1	age of youngest child	1	10.03	1.825	
	X_6	2	age of oldest child	1	1.54	0.279	
	X_7	7	education	4	31.14	1.416	
	X_8	8	sources of information	10	39.15	0.712	
			error	34	186.86	5.4958	
			$R^2 = .4409$ (R = .664)			1.618	

Table 45. Analysis of variance of total number of correct response
for knowledge questionnaire

Community	X	Subset	Independent variables	d.f.	S.S.	F Ratio	Significance
Pooled	X_1	3	sex	1	1.49	0.436	
	X_2	5	marital status	1	0.25	0.073	
	X_3	4	age of respondent	5	18.42	1.072	
	X_4	6	number of children	3	18.04	1.75	
	X_5	1	age of youngest child	1	7.75	2.256	
	X_6	2	age of oldest child	1	0.00	0.00008	
	X_7	7	education	4	102.37	7.448	.001
	X_8	8	sources of information	10	68.73	2.000	.050
			error	249	855.78	3.436	
			$R^2 = .2838$ (R = .5327)			3.87	.001
Logan	X_1	3	sex	1	0.09	0.025	
	X_2	5	marital status	1	3.69	0.998	
	X_3	4	age of respondent	5	31.77	1.721	
	X_4	6	number of children	3	34.28	3.094	.050
	X_5	1	age of youngest child	1	6.39	1.732	
	X_6	2	age of oldest child	1	16.93	4.584	.050
	X_7	7	education	4	64.79	4.386	.005
	X_8	8	sources of information	10	55.67	1.507	
			error	129	476.36	3.692	
			$R^2 = .2825$ (R = .5315)			2.03	.050
Milford	X_1	3	sex	1	1.36	0.455	
	X_2	5	marital status	1	0.01	0.004	
	X_3	4	age of respondent	5	32.87	2.206	.100
	X_4	6	number of children	3	21.42	2.396	.100
	X_5	1	age of youngest child	1	4.08	1.372	
	X_6	2	age of oldest child	1	0.55	0.183	
	X_7	7	education	4	29.94	2.512	.100
	X_8	8	sources of information	10	35.90	1.205	
			error	32	95.38	2.980	
			$R^2 = .6774$ (R = .823)			2.687	.010
Helper	X_1	3	sex	1	2.14	0.878	
	X_2	5	marital status	1	6.32	2.598	.050
	X_3	4	age of respondent	5	7.70	0.633	
	X_4	6	number of children	3	9.94	1.362	
	X_5	1	age of youngest child	1	5.02	2.063	
	X_6	2	age of oldest child	1	0.00	0.003	
	X_7	7	education	4	3.36	0.340	
	X_8	8	sources of information	10	22.63	0.930	
			error	34	82.63	2.433	
			$R^2 = .4409$ (R = .664)			1.07	

Tables 42 and 43 thus indicate that of the eight independent vari-
ables selected, age* explained the greatest amount of variability in the
model (24 percent for non-response, 11 percent for correct response).
This confirms a study conducted by Vogan (1970) who discovered that age
had the largest effect on dental knowledge and attitudes. Shaw (1969),
Metz (1966), Masterton (1963), and Kegeles (1963) also found that age was
a significant factor in predicting a person's response to fluoridation.
They found that as a person's age increases (especially after the age
of 40), his opinion about fluoride becomes more negative. Education and
sources of information were the only other variables found to signifi-
cantly contribute to the total variability of the model. Masterton (1963),
Metz (1966), and Kegeles (1963) also found that education significantly
affects a person's response to fluoridation. A study conducted by Metz
(1966) revealed that a possible reason why younger people are more likely
to give a favorable response to fluoridation may be because they tend to
be more exposed to the mass media. The fact that the present study found
that the most important sources of information influencing the public
about fluoride were the media, and that sources of information as an
independent variable significantly contributed to the total variability
of the model, directly support Metz's findings. Sex and marital status
appeared to contribute the least amount of variability in the model.
Vogan (1970) also found that sex had the smallest effect on dental
knowledge and attitudes.

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*
Since the age of the youngest child and the age of the oldest child
are closely related to the age of the respondent (for example, it would
be highly unlikely for a 60-year old woman to have a five-year old child
or a 20-year old woman to have a thirty-year old child), all three ages
have been considered as one variable.

The second step in the analysis procedure was to determine the significance of those variables which most contributed to the total variability of the two models. An F test was computed on all variables using the following formula (Clark and Schkade, 1969):

$$F = \frac{\text{mean associated sum of squares}}{\text{mean unassociated sum of squares}} = \frac{\dfrac{S.S._1}{d.f._1}}{\dfrac{S.S._2}{d.f._2}}$$

where,

$S.S._1$ = sum of squares of the particular variable

$S.S._2$ = sum of squares of the residual variation (error)

$d.f._1 = r - 1$ = total number of variables - 1

$d.f._2 = n - r$ = sample size = total number of variables

Tables 44 and 45 show only those F values which were significant at the .100 level or higher. The larger the F value, the more the variable is contributing to the total variation in the model. Therefore, it appears that education was the variable with the most unique contribution towards predicting a person's level of knowledge about fluoride. Table 44 also shows that age, number of children, and sources of information significantly contribute to a person's lack of knowledge about fluoride (non-response to questions). Metz's (1966) finding that people with young children are more sensitive to information involving health matters relating to children is not confirmed by the present study's results.

SUMMARY

The objectives of this study were to determine the general public's level of knowledge about fluoride, to discover what sources of information have the greatest influence on their opinion and knowledge about fluoride, and to estimate the level of participation of dentists, general practitioners, pediatricians, and gynecologists in the education of Utahns about the use of fluoride as related to human health.

Five questionnaires, one for knowledge, one for dentists, one for physicians, one for a check on physicians and dentists responses, and one for mothers, were used to obtain the desired information. A frequency distribution of all of the data was then calculated by computer. An analysis of variance and stepwise multiple regression program were used to analyze the relationship between a person's level of knowledge and the personal characteristics describing and identifying that person.

The following information regarding fluoride was discovered from the above procedure:

(1) eighty-four percent of the respondents to the knowledge questionnaire answered 50 percent or less of the questions correctly, while only 16 percent answered 50 percent or more of the questions correctly;

(2) of the sources of information listed on the questionnaire, television, dentists, magazines, and newspapers in that order were found to have the greatest influence on the respondent's opinion and knowledge about fluoride;

(3) of the dentists practicing in Utah, 67.8 percent indicated that they provide dental health education for their patients, while 29 percent of the respondents indicated that they had received dental health information from their dentists;

(4) eighty percent of the general practitioners, pediatricians, and gynecologists practicing in Utah indicated that they provide fluoride education for their patients, while 6.7 percent of the respondents indicated that they had received fluoride information from their physician;

(5) seventy-six percent of the mothers involved in the collection of deciduous teeth indicated that they were in favor of water fluoridation; however, 70 percent of the mothers stated that they wanted a "choice" about consuming fluoride; and

(6) a significant relationship was found between education, age, sources of information and the level of knowledge about fluoride.

CONCLUSIONS

Within the limits of this study, the following conclusions seem
justified:

(1) The public greatly lacks the necessary information about
fluoride to vote intelligently upon the issue of fluoridation.

(2) The media and dentists have the greatest influence upon the
public's opinion and knowledge about fluoride.

(3) Dental health educational programs of dentists in Utah are
not as effective as may be desired by these dentists.

(4) The majority of the general practitioners, pediatricians, and
gynecologists in Utah are involved in educating the public about fluoride.

(5) The public does not consider and thus does not use the physi-
cian as a major source of information about fluoride.

(6) The people in Utah desire a "choice" about the consumption of
fluoride.

(7) Education, age, the media and the dentist appear to have the
greatest influence on a person's level of knowledge about fluoride.

(8) Because the total variation of the responses to the knowledge
questionnaire could not be explained by the independent variables in
this study's statistical model, there are other variables which influence
a person's level of knowledge about fluoride.

RECOMMENDATIONS

From the results of this study and findings from previous studies, the investigator believes the following recommendations are warranted:

(1) To increase their effectiveness, Utah dental health education programs must redirect their information from children to the adult population, because children will not continue a practice or habit unless their parents reinforce the desired behavior.

(2) Utah dental health education programs must present their information in such a way that it is personally meaningful to Utahns. For example, to make the statement that fluoride significantly decreases tooth decay more meaningful, they could also state that fluoride significantly decreases dental expenses, thus making this new piece of information personally meaningful to a person.

(3) Utah dental health education programs must present their information in terms which can be easily understood by the general public.

(4) In addition to current material disseminated by Utah dental health education programs, information must also be presented on the following concepts:

   (a) importance of the teeth and dental health care,

   (b) effects of fluoride on the bone,

   (c) dosage or dose-response concept,

   (d) "poison" concept, and

   (e) advantages and disadvantages of all of the methods of consuming fluoride.

(5)   Utah dental health education programs must concentrate on disseminating their information to people who have no children, who earn lower incomes and have relatively little education, and who are over the age of forty years old.

(6)   Utah dental health education programs must emphasize that fluoridated water is the best method for consuming fluoride, and that other more costly and less effective alternative methods are available and should be used until their community water is fluoridated.

(7)   Further research is required to determine the effect of a person's opinion about fluoridation on his level of knowledge about fluoride and vice versa.

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APPENDICES

APPENDIX A

A Comparison of Eleven Major Methods of
Administering Fluoride to the Public

(1) Fluoridated Flour
(2) Fluoridated Milk
(3) Fluoridated Salt
(4) Fluoridated Water
(5) Fluoride Brushings (school administered)
(6) Fluoride Mouthwashes
(7) Fluoride Tablets
(8) Prenatal Fluoride
(9) Self-Application of Fluoride
(10) Topical Fluoridation (dentist administered)
(11) Vitamins Supplemented with Fluoride

A Comparison of the Costs of Various Methods
of Administering Fluoride to the Public

Literature Cited, Appendix A

A Comparison of Eleven Major Methods of
Administering Fluoride to the Public

Fluoridated Flour

Advantages

1. one alternative to fluoridated water

Disadvantages

1. wide variation of individual consumption of flour (1)*
2. difficult to regulate fluoride level in flour (2)
3. level of effectiveness reported

Fluoridated Milk

Advantages

1. one alternative to fluoridated water
2. fluoridated milk is more readily available to areas without public water supplies (3)
3. absorption of fluoride in milk is equal to that of fluoridated water (2)
4. older people who do not want to consume fluoride do not have to drink fluoridated milk (3)
5. prohibitive cost of defluoridators is avoided (3)

Disadvantages

1. wide variation of individual consumption of milk (2,4,5)
2. difficult to regulate fluoride level in milk (1,2,3)
3. level of effectiveness unreported

Fluoridated Salt

Advantages

1. best alternative to fluoridated water (5,6,7)
2. good form of fluoride supplementation when fluoridated water is not available (2,5,6,7,8,9,10)
3. an inexpensive method (6,7,8)
4. simple administration (6)
5. safe method of administration (6)
6. not a compulsory method of consuming fluoride (6,7)

Disadvantages

1. wide variation of individual consumption of salt (5)
2. difficult to regulate fluoride level in salt (5)
3. not as an effective method as fluoridated water (8)
4. small children do not ordinarily consume table salt (11)

* see bibliography following comparison table of costs

Fluoridated Water

Advantages

1. the simplist method of administering fluoride to the public (11,12,13,14)
2. the most inexpensive method of administering fluoride to the public (11,12,15,16)
3. the most effective method of administering fluoride to the public (2,15,17) because it reduced dental caries from 60 to 70% (14,18,19,20)
4. the safest method of administering fluoride to the public (12,15)
5. requires no conscious effort on the part of the individual (21)
6. fluoride will be consumed by everyone (21)
7. the only effective mass-method of administering fluoride to the public (6,14)

Disadvantages

1. wide variation of individual consumption of water (9)
2. must carefully regulate the amount of fluoride which is added to the water supply (9)
3. does not allow for individual choice about the use of fluoride (6)

Fluoride Brushings (school administered)

Advantages

1. one alternative to fluoridated water
2. a simple method (22)
3. an inexpensive method (22)
4. a practical method (22)

Disadvantages

1. technique must be carefully controlled (22)
2. frequency of brushings must be carefully controlled (22)
3. level of effectiveness unreported

Fluoride Mouthwashes

1. one alternative to fluoridated water

1. unsuitable for pre-school children, because of the amount of mouthwash that would inevitably be swallowed (23)
2. patient must be highly cooperative (23)
3. fluoride in this form is rapidly metabolized in the body (2)
4. level of effectiveness unreported

Fluoride Tablets

Advantages	Disadvantages
1. one alternative to fluoridated water	1. less effective than fluoridated water, because fluoride is consumed in one dose each day instead of small doses throughout the day (2,14,24)
2. good means of receiving fluoride if fluoridated water is not available (2,21)	
3. daily ingestion of fluoride tablets containing 1 mg. fluoride results in a greater amount of fluoride available for metabolic utilization than derived from fluoridated water (2)	2. people tend to forget to take the tablet every day (1,25,26)
	3. must be used regularly during the first fourteen years of life to reproduce the results of fluoridated water (14,27)
4. less amounts of fluoride are excreted when ingested in a tablet rather than solution form (2)	4. should be prescribed only where the fluoride concentration of the water is less than 0.7 parts per million (14,27)
	5. the usual dosage of 1 mg. sodium fluoride does not allow for variation of fluoride levels in water (23,27)
	6. only limited quantities of sodium fluoride can be dispensed at one time (14,27)
	7. may have possible side effects (28)

Prenatal Fluoride

Advantages	Disadvantages
1. may impart fluoride to the developing enamel of teeth	1. no significant benefit to tooth development has been shown
	a. there is no concrete evidence that fluoride passes through the placenta
	b. calcification of teeth occurs postnatally (18,27,29,30)

Self-Application of Topical Fluoride

Advantages

1. one alternative to fluoridated water
2. eliminates expense of topical fluoride treatments (31)
3. eliminates shortage of dental manpower (31)

Disadvantages

1. requires careful instruction by a dental professional
2. repetition
3. level of effectiveness unreported

Topical Fluoridation (dentist administered)

Advantages

1. one alternative to fluoridated water
2. significantly reduces dental caries (23)
3. has beneficial effects during both childhood and adulthood (25)
4. advisable to use when cessation of systemic fluoride therapy occurs (27)

Disadvantages

1. an expensive method (1,31,32)
2. requires trained personnel (21)
3. less effective than fluoridated water (1,21,32)
4. a time-consuming method (1,23 32)
5. applications must be repeated regularly to be effective (23)

Vitamins Supplemented with Fluoride

Advantages

1. one alternative to fluoridated water
2. an inexpensive method (33)
3. simple administration (33)
4. good form of fluoride supplementation (34)
5. equal effectiveness of reducing dental caries as fluoridated water (33,34,35)

Disadvantages

1. difficult to adjust fluoride allowance in accordance with the varying levels of fluoride in community's water supplies (23,27)
2. lack of scientific evidence to substantiate the effectiveness of fluoride vitamins preventing dental caries (27)
3. should prescribe fluoride vitamins only when the water does not contain any fluoride(25)
4. should not be given to children unless the child also needs the vitamins (25,36)
5. parent needs to be highly motivated to maintain regular use of fluoride vitamins for his or her children (25,35)

A Comparison of the Costs of Various Methods
of Administering Fluoride to the Public

Vehicle	Cost
Fluoridated Water	$ .05–.15 per person per year (5,11 14)
	$.25–.75 per child per year (11)
	$1.23 per million gallons of water treated (37)
	cost = cost fluoride compound + size and degree of sophistication of water plant installation (9,14)
Fluoride Tablets	$3.65 per person per year (14)
	$4.49 per 1000 tablets (38)
Vitamins Supplemented with Fluoride	$3.49 per 100 vitamins (38)
	$3.69 per 100 vitamins (38)
Fluoride Drops with Vitamins A,C,D	$2.79 (38)
Fluoride Topical Treatments	$14.00 per person per year (39)

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APPENDIX B

Organizations Which Endorse Fluoridation

Organizations Which Oppose Fluoridation

Organizations Which Endorse Fluoridation*

United States

American Academy of Pediatrics
American Association of Dental Schools
American Association for Advancement of Science
American Association of Industrial Dentists
American Association of Public Health Dentists
American Cancer Society
American College of Dentists
American Commission on Community Health Services
American Dental Association
American Dental Health Society
American Heart Association
American Hospital Association
American Institute of Nutrition
American Legion
American Medical Association
American Nurses Association
American Osteopathic Association
American Pharmaceutical Association
American Public Health Association
American Public Welfare Association
American School Health Association
American Society of Dentistry for Children
American Veterinary Medical Association
American Water Works Association
Association of Public Health Veterinarians
Association of State and Territorial Health Officers
Child Study Association of America
College of American Pathologists
Commission of Chronic Illness
Conference of State Sanitary Engineers
Federation of American Societies for Experimental Biology
Food and Nutrition Board of the National Research Council
Heads of Departments of Preventive Medicine at 68 Accredited
    Medical Colleges
Industrial Medical Association
Inter-Association Committee on Health
National Education Association
National Institute of Municipal Law Officers
Pan American Health Organization
United States Department of Health, Education, and Welfare
United States Junior Chamber of Commerce
World Health Organization

*McClure, Frank. 1970. Water fluoridation: the search and the victory.
    United States Department of Health, Education, and Welfare, Bethesda,
    Maryland. pp. 245-255.

Canada

    Canadian Dental Association
    Canadian Medical Association
    Canadian Nurses Association
    Health League of Canada

Great Britain

    Association of Municipal Corporations
    British Dental Association
    British Medical Association
    Central Council for Health Education
    Central Health Services Council
    County Councils Association
    Executive Councils Association
    General Dental Council
    Joint Sub-Committee of the Standing Medical Advisory Committee
      (Scotland and Wales)
    Royal Society of Health
    Scottish Health Services Council
    Society of Medical Officers of Health
    Standing Dental Advisory Committee (Scotland, England, and Wales)
    Standing Medical Advisory Committee (England and Wales)

Organizations Which Oppose Fluoridation*

United States

    American Academy of Nutrition
    American Association for Medico-Physical Research
    American Capsule News
    American Mercury
    Americanism Bulletin
    Association of American Physicians and Surgeons
    Citizens Medical Reference Bureau
    Delaney Committee
    Electronic Medical Foundation
    John Birch Society
    Ku Klux Klan
    Medical-Dental Ad Hoc Committee
    National Health Federation
    Natural Food Associates
    Prevention Magazine

* Bureau of Public Information, American Dental Association. 1965.
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APPENDIX C

Status of Fluoridation in the United States (1965)

Status of Fluoridation in the United States (1965)*

	Percent of population of public water supplies with natural or controlled fluoridation	State's rank according to percent of water fluoridated
Maryland	94.5	1
Wisconsin	91.4	2
Virginia	90.4	3
Michigan	90.0	4
Rhode Island	89.9	5
Colorado	86.9	6
Iowa	85.2	7
Minnesota	84.8	8
North Dakota	83.3	9
Indiana	82.2	10
New Mexico	79.5	11
West Virginia	79.4	12
Illinois	78.7	13
Kentucky	77.9	14
New York	74.3	15
Texas	72.6	16
Oklahoma	72.5	17
North Carolina	72.3	18
Connecticut	71.6	19
Tennessee	63.7	20
Missouri	57.8	21
Kansas	56.5	22
Arkansas	54.2	23
Delaware	54.1	24
South Carolina	48.0	25
Idaho	46.0	26
Pennsylvania	45.3	27
Georgia	44.5	28
South Dakota	43.0	29
Ohio	41.8	30
Alabama	37.9	31
Montana	37.3	32
Wyoming	36.9	33
Maine	36.3	34
Florida	31.2	35
Mississippi	26.7	36
Vermont	23.6	37
Oregon	19.0	38
Washington	16.8	39
California	13.3	40
Hawaii	13.1	41
Nebraska	12.3	42
New Hampshire	11.4	43
New Jersey	11.4	44
Louisiana	9.3	45
Arizona	8.7	46
Alaska	7.8	47
Massachusetts	7.8	48
Nevada	6.3	49
Utah	4.8	50

*McClure, Frank. 1970. Water fluoridation: the search and the victory. United States Department of Health, Education, and Welfare, Bethesda, Maryland. p. 259.

APPENDIX D

Questionnaires Used in This Study

(1) Knowledge Questionnaire and sources of information question (p. 108)

(2) Dentists's Questionnaire (p. 112)

(3) Physician's Questionnaire (p. 114)

(4) Dentist's and Physician's Level of Effectiveness questionnaire (p. 115)

(5) Mother's Questionnaire (p. 118)

Knowledge Questionnaire

Location

_____ Cache Valley
_____ Milford
_____ Helper
_____ Salt Lake City
_____ Other

Sex

_____ Male
_____ Female

Age

_____ Under 20
_____ 20-29
_____ 30-39
_____ 40-49
_____ 50-59
_____ 60 and over

Marital Status

_____ Single
_____ Married
_____ Divorced
_____ Widowed

Number of Children

_____ None
_____ 1 - 2
_____ 3 - 4
_____ 5 or more
_____ Age of youngest child
_____ Age of oldest child

Highest level of education reached

_____ Elementary school (6th grade) or less
_____ Junior high school (7th grade to 9th grade)
_____ High school (10th grade to 12th grade)
_____ Trade school
_____ College
_____ Graduate school

(1) Fluoride is a

    a. _____ vitamin
    b. _____ mineral
    c. _____ salt
    d. _____ drug

(2) It has been established that fluoride

    a. _____ decreases the number of tooth cavities by about 15%
    b. _____ increases the number of tooth cavities by about 15%
    c. _____ decreases the number of tooth cavities by about 50%
    d. _____ increases the number of tooth cavities by about 50%

(3) Doctors prescribe fluoride to

    a. _____ improve bone calcium content
    b. _____ improve bone protein content
    c. _____ improve longitudinal bone growth
    d. _____ heal bone fractures

(4) Fluoride is added to the water supply in

    a. _____ none of the communities in Utah
    b. _____ 1 - 10 of the communities in Utah
    c. _____ 20 - 30 of the communities in Utah
    d. _____ 40 - 50 of the communities in Utah

(5) Depending on the amount of fluoride consumed, fluoride

    a. _____ can prevent the removal of calcium from bones
    b. _____ can heal bones which have lost calcium
    c. _____ can cause the removal of calcium from bones
    d. _____ all of the above

(6) When both chlorine and fluoride are added to the water,

    a. _____ chlorine loses its effectiveness
    b. _____ chlorine has its effectiveness enhanced
    c. _____ chlorine's effectiveness is unchanged
    d. _____ the change in chlorine's effectiveness cannot be predicted

(7) In the fluoridation of public water supplies, the costs to the general public are

    a. _____ considerably less than the potential savings in dental expenses
    b. _____ approximately equal to the potential savings in dental expenses
    c. _____ considerably more than the potential savings in dental expenses
    d. _____ not related to the potential savings in dental expenses

(8) Knowledgeable scientists have repeatedly shown that

    a. _____ iron decreased fluoride absorption
    b. _____ phosphorus increases fluoride absorption
    c. _____ calcium decreases fluoride absorption
    d. _____ minerals do not affect fluoride absorption

(9) If a person stops consuming fluoride after childhood, any benefits which may have been derived from the consumption of fluoride will

    a. _____ be immediately lost
    b. _____ last indefinitely throughout life
    c. _____ gradually diminish throughout life
    d. _____ rapidly diminish in several years

(10) Of the following foods, which food will cause the greatest number of dental cavities?

    a. _____ peaches
    b. _____ apple pie
    c. _____ potatoes
    d. _____ white bread

(11) Of the following characteristics, which is the most common characteristic of over-consumption of fluoride?

    a. _____ crooked alignment of teeth
    b. _____ diseased gums around teeth
    c. _____ dark spots on teeth
    d. _____ softened enamel of teeth

(12) Of the following types of administration of fluoride to the public, which method have scientists determined to be the most effective, controllable, and inexpensive?

    a. _____ fluoride tablets
    b. _____ vitamins supplemented with fluoride
    c. _____ fluoridated water
    d. _____ fluoride drops
    e. _____ fluoride topical treatments by a dentist
    f. _____ fluoride brushings at school
    g. _____ fluoride toothpastes

From the following sources of information please label the five sources which have influenced your opinion the most about fluoride and fluoridation of water. Label your most important source as number one and so on down to five.

(13)	_____	radio
(14)	_____	physician
(15)	_____	newspaper
(16)	_____	pamphlets - private organizations
(17)	_____	pamphlets - sales
(18)	_____	pamphlets - state and government
(19)	_____	television
(20)	_____	magazines
(21)	_____	dentist
(22)	_____	public schools
(23)	_____	friends and relatives
(24)	_____	personal experience
(25)	_____	popular books
(26)	_____	text books
(27)	_____	advertisements
(28)	_____	spouse
(29)	_____	other (please specify) _____

LOCATION OF PRACTICE: _____
NAME OF DENTAL SCHOOL FROM WHICH YOU GRADUATED: _____
DATE OF GRADUATION: _____

WHEN A PATIENT VISITS YOUR OFFICE, DO YOU	NEW PATIENT IN GOOD DENTAL HEALTH		NEW PATIENT IN POOR DENTAL HEALTH		REGULAR PATIENT IN GOOD DENTAL HEALTH		REGULAR PATIENT IN POOR DENTAL HEALTH	
	(1) YES	(2) NO	(1) YES	(2) NO	(1) YES	(2) NO	(1) YES	(2) NO
(1-4) DISCUSS WHAT TOOTH DECAY ACTUALLY IS?								
(5-8) DISCUSS THE FACTORS WHICH CONTRIBUTE TO TOOTH DECAY?								
(9-12) DISCUSS THE PROPER METHOD OF BRUSHING TEETH?								
(13-16) DISCUSS IMPROPER METHODS OF BRUSHING THE TEETH?								
(17-20) DISCUSS THE PROPER METHOD OF USING DENTAL FLOSS?								
(21-24) DISCUSS IMPROPER METHODS OF USING DENTAL FLOSS?								
(25-28) DISCUSS THE RELATIONSHIP OF NUTRITION (DIET) TO DENTAL HEALTH?								
(29-32) DISCUSS THE USE OF FLUORIDES AS RELATED TO DENTAL HEALTH CARE?								
(33-36) EMPHASIZE THE IMPORTANCE OF HAVING ONE'S TEETH EXAMINED TWICE A YEAR?								
(37-40) SHOW CHARTS AND/OR MOVIES (TAPES) CONCERNING DENTAL HEALTH CARE?								
(41-44) GIVE HIM ANY PAMPHLETS CONCERNING DENTAL HEALTH CARE?								
(45-48) GIVE HIM ANY PAMPHLETS CONCERNING FLUORIDE SUPPLEMENTATION?								

<u>PLEASE</u> CIRCLE <u>YOUR</u> ANSWERS <u>UNLESS</u> OTHERWISE INDICATED

(49) Approximately how long do you spend discussing dental health care with your patients?
(a) 0 minutes   (b) 1-5 minutes   (c) 5-10 minutes   (d) 10-15 minutes

(50) Who discusses dental health care with your patients?
(a) no one does
(b) dental hygienist
(c) dental assistant
(d) dentist

(51-52) Are there any pamphlets in your waiting room which are available for your patients to look over and/or keep concerning ...
(a) dental health care
yes / no
(b) fluoride supplementation
yes / no

(53) Approximately what percentage of your patients ask you about fluoride?
(a) 0-25%   (b) 25-50%   (c) 50-75%   (d) 75-100%

(54-55) When a patient asks you about fluoride, do you ...
(a) discuss the advantages and disadvantages of the major methods of administering fluoride?
yes / no
(b) recommend the use of supplemental fluorides if the water supply does not contain significant amounts of fluoride (0.7 ppm)?
yes / no

(56) In what order would you recommend using the following forms of fluoride supplementation to your patients? (Please rank your first choice as number one and so on down.)
_____ fluoride tablets
_____ fluoride drops
_____ vitamins supplemented with fluoride
_____ fluoridated water
_____ fluoride topical treatments
_____ fluoride brushings (school administered)
_____ fluoridated toothpastes
_____ fluoridated salt

(57) In what order of importance do you feel the following methods contribute to a significant reduction in dental caries? (Please rank your first choice as number one and so on down.)
_____ proper tooth brushing
_____ dental floss
_____ diet (good eating habits)
_____ fluoride supplementation and/or fluoridation of water
_____ regular dental check-ups
_____ other (Please specify) _____

(58) Are you in favor of fluoridation of water?
(a) strongly against
(b) against
(c) neither for nor against
(d) for
(e) strongly for

PHYSICIAN'S QUESTIONNAIRE

Location of practice: _____

Type of practice: _____

(1) Approximately what percentage of your patients inquire about the use of fluoride as related to human health?
_____ (a) 0-25%
_____ (b) 25-50%
_____ (c) 50-75%
_____ (d) 75-100%

When a patient asks you about fluoride, do you ...
(2) discuss the advantages and disadvantages of the major methods of administering fluoride to the public?
_____ yes
_____ no
(3) recommend the use of supplemental fluorides if the water supply does not contain significant amounts of fluoride (0.7 ppm)?
_____ yes
_____ no

(4) In what order would you recommend using the following forms of fluoride supplementations to your patients? (Please rank your first choice as number one and so on down.)
_____ fluoride brushings (school administered)
_____ vitamins supplemented with fluoride
_____ fluoridated toothpastes
_____ fluoride tablets
_____ fluoride topical treatments (dentist administered)
_____ fluoridated salt
_____ fluoride drops

(5) Approximately how many prescriptions for fluoride supplementation do you give out each month?
_____ (1) 1-10
_____ (2) 10-20
_____ (3) 20-30
_____ (4) 30-40
_____ (5) over 40 (please specify_____)

(6) Are you in favor of fluoridation of water?
_____ (1) strongly against
_____ (2) against
_____ (3) neither for nor against
_____ (4) for

(7) Please list any comments you might have concerning a doctor's role in relation to dental health care and fluoride education.

DENTAL HEALTH QUESTIONNAIRE

Location
_____ (1) Cache Valley
_____ (2) Milford
_____ (3) Helper
_____ (4) Salt Lake City
_____ (5) Other _____

Sex
_____ (1) male
_____ (2) female

Age
_____ (1) under 20
_____ (2) 20-30
_____ (3) 30-40
_____ (4) 40-50
_____ (5) 50-60
_____ (6) over 60

Marital status
_____ (1) single
_____ (2) married
_____ (3) divorced
_____ (4) widowed

Highest level of education reached
_____ (1) elementary school or less
_____ (2) junior high school
_____ (3) high school
_____ (4) trade school
_____ (5) college
_____ (6) graduate school

During your last several visits to a dentist, did he . . .
        (1)   (2)
        YES   NO
(1)   _____   _____   discuss tooth decay with you?
(2)   _____   _____   discuss brushing your teeth with you?
(3)   _____   _____   discuss the use of dental floss?
(4)   _____   _____   discuss the effects of sweets on the teeth?
(5)   _____   _____   emphasize the importance of having your teeth examined
                       twice a year?
(6)   _____   _____   discuss the use of fluorides?
(7)   _____   _____   show you charts and/or movies concerning dental health
                       care?
(8)   _____   _____   give you any pamphlets concerning dental health care?
(9)   _____   _____   give you any pamphlets concerning the use of fluoride?

(10) Who did you discuss this information with? Was it a . . .
_____(1) dental hygienist   _____(2) dental assistant   _____(3) dentist

(11) How much time did this person spend discussing this information with you?

_____ (1) 1-5 minutes
_____ (2) 5-10 minutes
_____ (3) 10-15 minutes
_____ (4) over 15 minutes

Were there any pamphlets in the dentist's waiting room which you either looked over and/or kept concerning . . .

	(1) YES	(2) NO	(3) DON'T REMEMBER	
(12)	_____	_____	_____	dental health care?
(13)	_____	_____	_____	the use of fluoride?

Have you ever asked a dentist about fluoride?

	(1) YES	(2) NO
(14)	_____	_____

If so, did he discuss the advantages and disadvantages of the major methods of taking fluoride?

	(1) YES	(2) NO	(3) DON'T REMEMBER
(15)	_____	_____	_____

---

*If this person lives in Cache Valley or Salt Lake City, ask him the next question.

Did the dentist recommend the use of supplemental fluorides, such as fluoride drops, fluoride tablets, vitamins supplemented with fluoride, or fluoride topical treatments?

	(1) YES	(2) NO	(3) DON'T REMEMBER
(16)	_____	_____	_____

---

(17) How do you feel about the fluoridation of water? Are you . . .

_____ (1) strongly against
_____ (2) against
_____ (3) neither for nor against
_____ (4) for
_____ (5) strongly for

	(1) YES	(2) NO	
(18)	_____	_____	Do you brush your teeth at least twice a day?
(19)	_____	_____	Do you use dental floss once a day?
(20)	_____	_____	Do your gums often bleed when you either eat and/or brush your teeth?
(21)	_____	_____	Do you frequently have sores in your mouth?
(22)	_____	_____	Do you use any type of fluoride supplement regularly?

If so, who did you get your prescription from?
```
     (1)        (2)        (3)
     DEN.       DOC.       OTHER _____
(23) _____      _____      _____
```

How often do you visit a dentist?
```
     (1)        (2)        (3)        (4)
     2/yr.      1/yr.      1/2 yrs.   1/3 = years
(24) _____      _____      _____    _____
```

Why do you go to the dentist?
```
              (1)                  (2)              (3)
     Out of necessity           routine           both
       (toothache, broken
        tooth, wisdom teeth
        mouth sores,)
(25)     _____               _____          _____
```

Do you wear dentures?
```
     (1)        (2)
     YES        NO
(26) _____      _____
```

Have you ever asked a physician about fluoride?
```
     (1)        (2)
     YES        NO
(27) _____      _____
```

If so, did he discuss the advantages and disadvantages of the major
methods of taking fluoride?
```
     (1)        (2)
     YES        NO
(28) _____      _____
```

*If this person lives in Cache Valley or Salt Lake City, ask him the next
question.

Did the physician recommend the use of supplemental fluorides to you?
```
     (1)        (2)
     YES        NO
(29) _____      _____
```

Background Information of Participating Mother

(All information obtained below will be confidential and used by the Nutrition Department of Utah State University for statistical purposes.)

1. Name _____

2. Height _____ Weight _____ Age _____

   Number of Children _____

3. Mailing Address _____

4. Telephone Number _____

5. How long have you lived in this community? _____years
   If you were not born in this community, please list where and how
   long you have resided in previous communities and if the communities' water contained fluoride.

	CITY	STATE	DATES	FLUORIDATED WATER
1.				
2.				
3.				
4.				
5.				

6. Does the water in this community contain fluoride? Yes / No

7. Did you receive any prenatal fluoride care? Yes / No

8. How often do you visit a dentist?
   _____ twice a year
   _____ once a year
   _____ once every two years
   _____ rarely

9. Do you receive 'fluoride' treatments from a dentist? Yes / No

10. What brand of toothpaste do you use? _____

11. How much milk do you drink per day?
    _____ seldom
    _____ 1 glass
    _____ 2 glasses
    _____ 3 glasses
    _____ 4 or more glasses

12. Have you had any abnormal diseases that your doctor has indicated
    might affect teeth or bone? Yes / No
    If so, please list them below.
    1.
    2.
    3.

13. If fluoride were added to either a food or water source, which of
    the two sources would you prefer. Please circle one of the alterna-
    tives in each pair.
    a. water or salt
    b. salt or milk
    c. milk or water
    d. milk or flour
    e. fluoride tablets or water
    f. fluoride tablets or salt

14. Are you in favor of adding fluoride to a food source which would be
    available in both the fluoridated and unfluoridated forms? Yes / No
    Why?

15. Are you in favor of adding fluoride to water? Yes / No   Why?

APPENDIX E

Frequency Distribution of Raw Data

Sources of Information Question

Source	Ranking	Pooled		Logan		Milford		Helper	
		Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Radio	1	8	2.9	4	2.6	1	1.7	3	4.9
	2	24	8.7	14	9.0	7	11.9	3	4.9
	3	16	5.8	8	5.1	5	8.5	3	4.9
	4	13	4.7	10	6.4	3	5.1		
	5	17	6.2	12	7.7	3	5.1	2	3.3
	N.R.*	198	71.7	108	69.2	40	67.8	50	82.0
Physician	1	11	4.0	7	4.5	1	1.7	3	4.9
	2	12	4.3	12	7.7				
	3	8	2.9	7	4.5			1	1.6
	4	8	2.9	2	1.3	4	6.8	2	3.3
	5	10	3.6	3	1.9	3	5.1	4	6.6
	N.R.	227	82.2	125	80.1	51	86.4	51	83.6
Newspaper	1	24	8.7	16	10.3	4	6.8	4	6.6
	2	24	8.7	15	9.6	6	10.2	3	4.9
	3	33	12.0	22	14.1	7	11.9	4	6.6
	4	20	7.2	16	10.3	2	3.4	2	3.3
	5	19	6.9	14	9.0	4	6.8	1	1.6
	N.R.	156	56.5	73	46.8	36	61.1	47	77.0
Private Organization Pamphlets	1	5	1.8	3	1.9			2	3.3
	2	4	1.4	4	2.6				
	3	5	1.8	5	3.2				
	4	14	5.1	12	7.7	2	3.4		
	5	6	2.2	5	3.2			1	1.6
	N.R.	242	87.7	127	81.4	57	96.3	58	95.1
Sales Pamphlets	1								
	2								
	3								
	4								
	5	1	0.4	1	0.6				
	N.R.	275	99.6	155	99.4	59	100.0	61	100.0
State and Government Pamphlets	1	5	1.8	4	2.6	1	1.7		
	2	6	2.2	3	1.9	2	3.4	1	1.6
	3	21	7.6	10	6.4	7	11.9	4	6.6
	4	16	5.8	10	6.4	1	1.7	5	8.2
	5	12	4.3	10	6.4	2	3.4		
	N.R.	216	78.3	119	76.3	46	78.0	51	83.6

*N.R. means non-response or that this number of people did not consider this source of information as one of the five major sources of information influencing their opinion and knowledge about fluoride.

Source	Ranking	Pooled Abs Freq No	Pooled Rel Freq %	Logan Abs Freq No	Logan Rel Freq %	Milford Abs Freq No	Milford Rel Freq %	Helper Abs Freq No	Helper Rel Freq %
Television	1	71	25.7	36	23.1	22	37.3	13	21.3
	2	45	16.3	22	14.1	12	20.3	11	18.0
	3	16	5.8	12	7.7	1	1.7	3	4.9
	4	28	10.1	18	11.5	2	3.4	8	13.1
	5	18	6.5	14	9.0	1	1.7	3	4.9
	N.R.	98	35.5	54	34.6	21	35.6	23	37.7
Magazines	1	13	4.7	9	5.8	2	3.4	2	3.3
	2	35	12.7	22	14.1	6	10.2	7	11.5
	3	39	14.1	27	17.3	8	13.6	4	6.6
	4	33	12.0	22	17.1	8	13.6	3	4.9
	5	8	2.9	4	2.6	2	3.4	2	3.3
	N.R.	148	53.6	72	46.2	33	55.9	43	70.5
Dentist	1	61	22.1	36	23.1	7	11.9	18	29.5
	2	34	12.3	20	12.8	7	11.9	7	11.5
	3	21	7.6	13	8.3	3	5.1	5	8.2
	4	19	6.9	12	7.7	5	8.5	2	3.3
	5	20	7.2	10	6.4	7	11.9	3	4.9
	N.R.	121	43.8	65	41.7	30	50.8	26	42.6
Schools	1	16	5.8	10	6.4	1	1.7	5	8.2
	2	16	5.8	5	3.2	2	3.4	9	14.3
	3	12	4.3	5	3.2	5	8.5	2	3.3
	4	17	6.2	6	3.8	7	11.9	4	6.6
	5	18	6.5	15	9.6	1	1.7	2	3.3
	N.R.	197	71.4	115	73.7	43	72.9	39	63.9
Friends and Relatives	1	9	3.3	5	3.2	3	5.1	1	1.6
	2	9	3.3	6	3.8			3	4.9
	3	16	5.8	11	7.1	1	1.7	4	6.6
	4	23	8.3	18	11.5	3	5.1	2	3.3
	5	23	8.3	14	9.0	6	10.2	3	4.9
	N.R.	196	71.0	102	65.4	46	78.0	48	78.7
Personal Experience	1	25	9.1	14	9.0	4	6.8	7	11.5
	2	14	5.1	6	3.8	2	3.4	6	9.8
	3	16	5.8	5	3.2	6	10.2	5	8.2
	4	8	2.9	4	2.6			4	6.6
	5	14	5.1	8	5.1	2	3.4	4	6.6
	N.R.	199	72.1	119	76.3	45	76.3	35	57.4

Source	Ranking	Pooled		Logan		Milford		Helper	
		Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %	Abs Freq No	Rel Freq %
Popular	1	1	0.4					1	1.6
Books	2	2	0.7			1	1.7	1	1.6
	3	1	0.4			1	1.7		
	4	3	1.1	2	1.3			1	1.6
	5	6	2.2	4	2.6	2	3.4		
	N.R.	263	95.3	150	96.2	55	93.2	58	95.1
Textbooks	1	4	1.4	2	1.3	2	3.4		
	2	7	2.5	6	3.8	1	1.7		
	3	10	3.6	6	3.8	1	1.7	3	4.8
	4	5	1.8	4	2.6	1	1.7		
	5	3	1.1	2	1.3	1	1.7		
	N.R.	247	89.5	136	87.2	53	89.8	58	95.1
Advertising	1	13	4.7	5	3.2	7	11.9	1	1.6
	2	17	6.2	9	5.8	6	10.2	2	3.3
	3	17	6.2	11	7.1	2	3.4	4	6.6
	4	7	2.5	3	1.9	3	5.1	1	1.6
	5	13	4.7	8	5.1	3	5.1	2	3.3
	N.R.	209	75.7	120	76.9	38	64.4	51	83.6
Spouse	1	1	0.4	1	0.6				
	2	1	0.4	1	0.6				
	3	2	0.7	2	1.3				
	4	2	0.7			2	3.4		
	5	3	1.1	3	1.9				
	N.R.	267	96.7	149	85.5	57	96.6	61	100.0

Dentists' Questionnaire

Question	Response	Absolute Frequency No	Relative Frequency %
1	yes	74	66.1
	no	32	28.8
	no response	6	5.4
2	yes	99	88.4
	no	8	7.1
	no response	5	4.5
3	yes	43	38.4
	no	55	49.1
	no response	14	12.8
4	yes	43	38.4
	no	55	49.1
	no response	14	12.8
5	yes	88	78.6
	no	17	15.2
	no response	7	6.3
6	yes	106	94.6
	no	1	0.9
	no response	5	4.5
7	yes	66	58.9
	no	31	27.7
	no response	15	13.4
8	yes	101	90.2
	no	2	1.8
	no response	9	8.0
9	yes	96	85.7
	no	11	9.8
	no response	5	4.5
10	yes	108	96.4
	no response	4	3.6
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
11	yes	73	65.2
	no	24	21.4
	no response	15	13.4
12	yes	105	93.8
	no	1	0.9
	no response	6	5.4
13	yes	70	62.5
	no	33	29.5
	no response	9	8.0
14	yes	81	72.3
	no	23	20.5
	no response	8	7.1
15	yes	54	48.2
	no	42	37.5
	no response	16	14.3
16	yes	73	65.2
	no	28	25.0
	no response	11	9.8
17	yes	96	65.7
	no	11	9.8
	no response	5	6.5
18	yes	100	89.3
	no	5	4.5
	no response	7	6.3
19	yes	78	69.6
	no	21	18.8
	no response	13	11.6
20	yes	100	89.3
	no	4	3.6
	no response	8	7.1
21	yes	65	58.0
	no	37	33.0
	no response	10	8.9
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
22	yes	73	65.2
	no	27	24.1
	no response	12	10.7
23	yes	52	46.4
	no	43	38.4
	no response	17	15.2
24	yes	70	62.5
	no	29	25.9
	no response	13	11.6
25	yes	63	56.3
	no	41	36.6
	no response	8	7.1
26	yes	96	85.7
	no	10	8.9
	no response	6	5.4
27	yes	48	42.9
	no	49	43.8
	no response	15	13.4
28	yes	91	81.3
	no	12	10.7
	no response	9	8.0
29	yes	90	80.4
	no	14	12.5
	no response	8	7.1
30	yes	100	89.3
	no	4	3.6
	no response	6	7.1
31	yes	71	63.4
	no	26	23.2
	no response	15	13.4
32	yes	101	90.2
	no	3	2.7
	no response	8	7.1
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
33	yes	77	68.8
	no	25	22.3
	no response	10	8.9
34	yes	91	81.3
	no	9	8.0
	no response	12	10.7
35	yes	62	55.4
	no	32	28.6
	no response	18	16.1
36	yes	90	80.4
	no	10	8.9
	no response	12	10.7
37	yes	49	43.8
	no	52	46.4
	no response	11	9.8
38	yes	60	53.6
	no	44	39.3
	no response	8	7.1
39	yes	35	31.3
	no	61	54.5
	no response	16	14.3
40	yes	53	47.3
	no	47	42.0
	no response	12	10.7
41	yes	62	55.4
	no	39	34.8
	no response	11	9.8
42	yes	81	72.3
	no	24	21.4
	no response	7	6.3
43	yes	50	44.6
	no	46	41.4
	no response	16	14.3
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
44	yes	74	66.1
	no	26	23.2
	no response	12	10.7
45	yes	37	33.0
	no	62	55.4
	no response	13	11.6
46	yes	48	42.9
	no	54	48.2
	no response	10	8.9
47	yes	31	27.2
	no	64	57.1
	no response	17	15.2
48	yes	46	41.1
	no	53	47.3
	no response	13	11.6
49	0 minutes	1	0.9
	1-5 minutes	43	38.4
	5-10 minutes	22	19.6
	10-15 minutes	36	19.6
	no response	10	8.9
50	no one	0	
	dental hygienist	25	22.3*
	dental assistant	70	62.5*
	dentist	102	91.1*
51	yes	87	77.7
	no	17	15.2
	no response	8	7.1
52	yes	62	55.4
	no	38	33.9
	no response	12	10.7
53	0-25%	55	49.1
	25-50%	30	26.8
	50-75%	18	16.1
	75-100%	4	3.6
	no response	5	4.5
	population	112	

* more than one answer was given in this question

Question	Response	Absolute Frequency No	Relative Frequency %
54	yes	91	81.3
	no	9	8.9
	no response	12	10.7
55	yes	97	86.6
	no	4	3.6
	no response	11	9.8
56	fluoride tablets		
	1	22	19.6
	2	40	33.7
	3	18	16.1
	4	11	9.8
	5	6	5.4
	6	2	1.8
	7	3	3.7
	no response	10	8.9
	fluoride drops		
	1	6	6.5
	2	22	19.6
	3	31	27.7
	4	10	8.9
	5	11	9.8
	6	9	8.0
	7	2	1.8
	8	1	0.9
	no response		
	vitamins supplemented with fluoride		
	1	2	1.8
	2	20	17.9
	3	28	25.0
	4	17	15.2
	5	14	12.5
	6	7	6.3
	7	4	3.6
	no response	20	17.9
	fluoridated water		
	1	79	70.5
	2	7	6.3
	3	5	4.5
	4	5	4.5
	5	3	2.7
	6	2	1.8
	7	1	0.9
	8	1	0.9
	no response	9	8.0
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
56	fluoride topical treatments		
	1	6	5.4
	2	25	22.3
	3	22	19.6
	4	24	21.4
	5	19	17.0
	6	7	6.3
	7	3	2.7
	no response	6	5.4
	fluoride brushings		
	1		
	2	4	3.6
	3	3	2.7
	4	9	8.0
	5	18	16.1
	6	23	20.5
	7	25	22.3
	8	8	7.1
	no response	22	19.6
	fluoridated toothpastes		
	1	5	4.5
	2	5	4.5
	3	13	11.6
	4	21	18.8
	5	17	15.2
	6	25	22.3
	7	16	14.3
	8	2	1.8
	no response	8	7.1
	fluoridated salt		
	1		
	2	2	1.8
	3	1	0.9
	4	3	2.7
	5	8	7.1
	6	7	6.3
	7	16	14.3
	8	40	35.7
	no response	35	31.3
57	proper toothbrushing		
	1	39	34.8
	2	36	32.1
	3	23	20.5
	4	9	8.0
	5	3	2.7
	no response	2	1.8
	population	112	

Question	Response	Absolute Frequency No	Relative Frequency %
57	dental floss		
	1	30	26.8
	2	31	27.7
	3	19	17.0
	4	17	15.2
	5	9	8.0
	no response	6	5.4
	diet		
	1	25	22.3
	2	21	18.8
	3	32	28.6
	4	24	21.4
	5	7	6.3
	no response	3	2.7
	fluoride supplementation		
	1	29	25.9
	2	18	16.1
	3	18	16.1
	4	30	26.8
	5	13	11.6
	6	1	0.9
	no response	3	2.7
	regular dental check-ups		
	1	4	3.6
	2	10	8.9
	3	16	14.3
	4	17	15.2
	5	56	50.0
	6	3	2.7
	no response	6	5.4
58	strongly against	4	3.6
	against	2	1.8
	neither for nor against	1	0.9
	for	16	14.3
	strongly for	88	78.6
	no response	1	0.9
	population	112	

Physicians' Questionnaire

Question	Response	Absolute Frequency No	Relative Frequency %
1	0-25%	115	79.3
	25-50%	18	12.4
	50-75%	7	4.8
	75-100%	2	1.4
	no response	3	2.1
2	yes	102	70.3
	no	35	24.1
	no response	8	5.5
3	yes	131	90.3
	no	10	6.9
	no response	4	2.8
4	fluoride brushings		
	2	6	4.1
	3	7	4.8
	4	11	7.6
	5	13	9.0
	6	16	11.0
	7	17	11.7
	8	2	1.4
	no response	73	50.4
	vitamins supplemented with fluoride		
	1	61	42.1
	2	19	13.1
	3	14	9.7
	4	10	6.9
	5	4	2.8
	6	3	2.1
	7	2	1.4
	no response	32	22.1
	fluoride toothpastes		
	1	6	4.1
	2	24	16.6
	3	20	13.8
	4	20	13.8
	5	10	6.9
	6	11	7.6
	7	3	2.1
	no response	51	35.2
	population	145	

Question	Response	Absolute Frequency No	Relative Frequency %
4	fluoride tablets		
	1	26	17.9
	2	32	22.1
	3	17	11.7
	4	9	6.2
	5	11	7.6
	6	3	2.1
	7	2	1.4
	no response	45	31.0
	fluoride topical treatments		
	1	19	13.1
	2	12	8.3
	3	24	16.6
	4	17	11.7
	5	15	10.3
	6	7	4.8
	7	1	0.7
	no response	50	34.5
	fluoridated salt		
	1	1	0.7
	2	5	3.4
	3	2	1.4
	4	7	4.8
	5	8	5.5
	6	14	9.7
	7	26	17.9
	no response	82	56.6
	fluoride drops		
	1	9	6.2
	2	20	13.8
	3	21	14.5
	4	12	8.3
	5	7	4.8
	6	6	4.1
	7	8	5.5
	no response	62	42.8
5	1-10	62	42.8
	10-20	33	22.8
	20-30	24	16.6
	30-40	10	6.9
	over 40	10	6.9
	no response	6	4.1
6	strongly against	10	6.9
	against	7	4.8
	neither for nor against	9	6.2
	for	37	25.5
	strongly for	80	55.2
	no response	2	1.4
	population	145	

Questionnaire Used to Check on the Responses
Made by the Dentists and Physicians

Question	Response	Pooled Abs No	Rel %	Logan Abs No	Rel %	Milford Abs No	Rel %	Helper Abs No	Rel %
1	yes	26	43.3	15	50.0	5	33.3	6	40.0
	no	24	40.0	13	43.3	7	46.7	4	26.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
2	yes	32	53.3	16	53.3	8	53.3	8	53.3
	no	18	30.0	12	40.0	4	26.7	2	13.3
	no response	10	16.7	2	6.7	3	20.0	5	33.3
3	yes	30	50.0	17	56.7	7	46.7	6	40.0
	no	20	33.3	11	36.7	5	33.3	4	26.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
4	yes	22	36.7	10	33.3	6	40.0	6	40.0
	no	28	46.7	18	60.0	6	40.0	4	26.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
5	yes	35	58.3	16	53.3	11	73.3	8	53.3
	no	14	23.3	11	36.7	1	6.7	2	13.3
	no response	11	18.3	3	10.0	3	20.0	5	33.3
6	yes	13	21.7	6	20.0	5	33.3	2	13.3
	no	37	61.7	22	73.3	7	46.7	8	53.3
	no response	10	16.7	2	6.7	3	20.0	5	33.3
7	yes	8	13.3	6	20.0	2	13.3		
	no	42	70.0	22	73.3	10	66.7	10	66.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
8	yes	10	16.7	5	16.7	4	26.7	1	6.7
	no	40	66.7	23	76.7	8	53.3	9	60.0
	no response	10	16.7	2	6.7	3	20.0	5	33.3
9	yes	1	1.7	1	3.3				
	no	49	81.7	27	90.0	12	80.0	10	66.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
10	dental hy-gienist	2	3.3	2	6.7				
	dental assistant	2	3.3	2	6.7				
	dentist	45	75.0	24	80.0	12	80.0	9	60.0
	no response	11	18.3	2	6.7	3	20.0	6	40.0
	population	60		30		15		15	

Question	Response	Pooled Abs No	Pooled Rel %	Logan Abs No	Logan Rel %	Milford Abs No	Milford Rel %	Helper Abs No	Helper Rel %
11	1-5 minutes	17	28.3	12	40.0	4	26.7	1	6.7
	5-10 min.	11	18.3	4	13.3	4	26.7	3	20.0
	10-15 min.	8	13.3	5	16.7			3	20.0
	over 15 min.	12	20.0	6	20.0	4	26.7	2	13.3
	no response	12	20.0	3	10.0	3	20.0	6	40.0
12	yes	21	35.0	12	40.0	6	40.0	3	20.0
	no	20	33.3	9	30.0	5	33.3	6	40.0
	don't re-member	9	15.0	7	23.3	1	6.7	1	6.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
13	yes	7	11.7	6	20.0			1	6.7
	no	24	40.0	11	36.7	6	40.0	7	46.7
	don't re-member	19	31.7	11	36.7	6	40.0	2	13.3
	no response	10	16.7	2	6.7	3	20.0	5	33.3
14	yes	16	26.7	10	33.3	4	26.7	2	13.3
	no	40	66.7	20	66.7	11	73.3	9	60.0
	no response	4	6.7	0		0		4	26.7
15	yes	12	20.0	9	30.0	2	13.3	1	6.7
	no	4	6.7	3	10.0	1	6.7		
	don't re-member	1	1.7					1	6.7
	no response	43	71.7	18	60.0	12	80.0	13	66.7
16	yes	9	15.0	9	30.0	0		0	
	no	4	6.7	3	10.0	0		1	
	no response	47	78.3	18	60.0	15		14	93.3
17	strongly against	2	3.3	1	3.3	1	6.7		
	against	4	6.7	2	6.7	1	6.7	1	6.7
	neither	20	33.3	13	43.3	5	33.3	2	13.3
	for	21	35.0	9	30.0	6	40.0	6	40.0
	strongly for	11	18.3	5	16.7	1	6.7	5	33.3
	no response	2	3.3			1	6.7	1	6.7
18	yes	39	65.0	22	73.3	11	73.3	6	40.0
	no	11	18.3	6	20.0	1	6.7	4	26.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
	population	60		30		15		15	

Question	Response	Pooled Abs No	Pooled Rel %	Logan Abs No	Logan Rel %	Milford Abs No	Milford Rel %	Helper Abs No	Helper Rel %
19	yes	16	26.7	10	33.3	3	20.0	3	20.0
	no	34	56.7	18	60.0	9	60.0	7	46.7
	no response	10	16.7	2	6.7	3	20.0	5	33.3
20	yes	8	13.3	4	13.3	3	20.0	1	6.7
	no	42	40.0	22	80.0	9	60.0	9	60.0
	no response	10	16.7	2	6.7	3	20.0	5	33.3
21	yes	2	3.3	1	3.3			1	6.7
	no	48	80.0	27	90.0	12	80.0	9	60.0
	no response	10	16.7	2	6.7	3	20.0	5	33.3
22	yes	4	.67	4	13.3				
	no	38	63.3	21	70.0	12	80.0	5	33.3
	no response	18	30.0	5	16.7	3	20.0	10	66.7
23	dentist	3	5.0	3	10.0	0		0	
	physician	5	8.3	5	16.7	0		0	
	no response	52	86.7	22	80.0	15	100.00	15	100.00
24	twice/year	26	43.3	16	53.3	4	26.7	6	40.0
	once/year	16	26.7	10	16.7	4	26.7	2	13.3
	once/2 yr.	7	11.7	2	6.7	3	20.0	2	13.3
	once/3+ yr.	2	3.3	1	3.3	1	6.7		
	no response	9	15.0	1	3.3	3	20.0	5	33.3
25	out of necessity	16	26.7	6	20.0	6	40.0	4	26.7
	routine	18	30.0	9	30.0	7	46.7	2	13.3
	both	17	28.3	13	43.3			4	26.7
	no response	9	15.0	2	6.7	2	13.3	5	33.3
26	yes	21	35.0	6	20.0	9	60.0	6	40.0
	no	37	61.7	23	76.7	9	40.0	8	53.3
	no response	2	3.3	1	3.3	0		1	
27	yes	6	10.0	5	16.7	0		1	6.7
	no	49	81.7	21	70.0	15	100.00		
	no response	5	8.3	4	13.3	0		14	93.3
	population	60		30		15		15	

Question	Response	Pooled		Logan		Milford		Helper	
		Abs No	Rel %	Abs No	Rel %	Abs No	Rel %	Abs No	Rel %
28	yes	4	6.7	3	10.0	0		1	6.7
	no	2	3.3	2	6.7	0		0	
	no response	54	90.0	25	83.3	15	100.00	14	93.3
29	yes	4	6.7	4	13.3	0		0	
	no	2	3.3	2	6.7	0		0	
	no response	54	90.0	24	80.0	15	100.0	15	100.00
	population	60		30		15		15	

VITA

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