

THE DENTAL RESEARCH AND DEMONSTRATION PROJECT  
IN ELEMENTARY SCHOOLS IN SEVEN WESTERN  
MONTANA COUNTIES

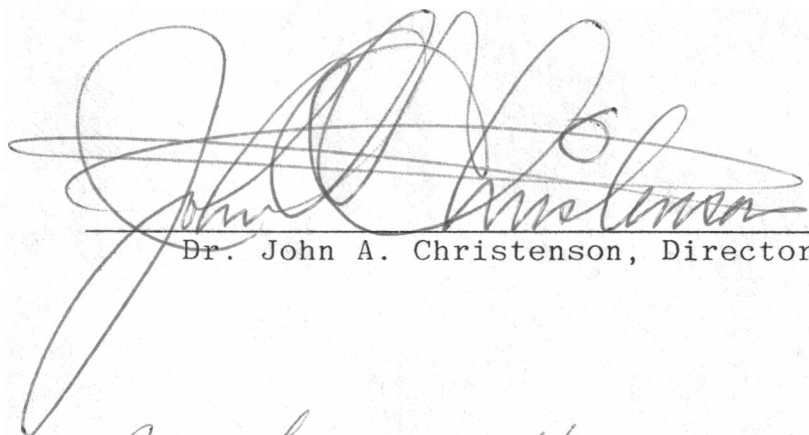
Submitted in partial fulfillment of the requirements  
for graduation with honors to the Department of Biology  
at Carroll College, Helena, Montana.

Todd James McGovern  
March 22, 1983

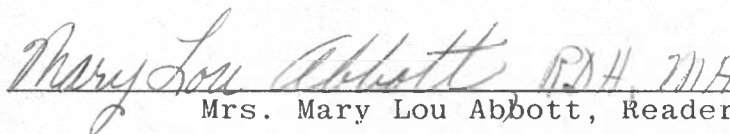


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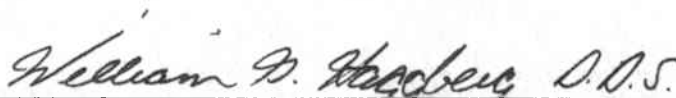
This thesis for honors recognition has been approved  
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## ABSTRACT

The Dental Research and Demonstration Project was conducted for kindergarten through sixth grade youths in seven Western Montana counties. Student screening showed Granite County generally lower and Missoula County generally higher in dental health status than the other closely grouped counties. Influences on these results appear to include dental manpower and economic factors.

The project will provide Montana with a baseline of information regarding the dental status of its elementary school students.

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## INTRODUCTION

Dental caries (tooth decay) is one of the most prevalent diseases in our society. By age twelve approximately 90 percent of the children in the United States experience dental caries (7). For years dental practitioners, educators, and researchers have endeavored to decrease this high rate of incidence. Efforts to prevent tooth decay have centered fundamentally on the promotion of community water fluoridation. But because of the incomplete success at fluoridating all the existing community water supplies, other methods of primary prevention must be enacted.

There does not exist any single way to prevent all tooth decay, but by wise use of available control measures a significant reduction in decay, along with an accompanied increase in general oral health, can be achieved. This project's goals are to demonstrate that school-based dental screening, along with fluoride mouthrinse, dental education, and referral, delivered without actual dental services can have a significant effect upon the dental status of elementary school children in Western Montana.

These results from the first year of this program

will be used as a baseline for future comparisons to identify if these previously mentioned goals are being attained. Causes for different results in the separate geographical areas are also discussed.

Dental disease can only be controlled by using effective preventive measures. Neglect of teeth in the child's early years sets the stage for decay as well as periodontal (gum) disease. However, childhood is also the best time for the establishment of proper dental hygiene habits, attitudes, and behaviors.

## LITERATURE REVIEW

### Preview Programs in Montana

The first dental test ever in Montana public schools was conducted by Dr. T.T. Rider with results being reported in The Helena Daily Independent on November 7, 1908 (16). Dr. Rider examined the teeth of children in the lower grades of Helena area public schools. His startling results showed that care of teeth among boys and girls was sadly neglected with the majority in deplorable condition. Out of 80 pupils, few had perfect teeth (only 49 had no cavities). One-third needed an extraction. Boys on the average needed three permanent teeth filled while girls averaged two teeth in need of a filling. Only one-fourth of the children questioned brushed at least once a day.

A more recent evaluation of dental health in Montana was the Flathead County Dental Project which began in 1971. The Flathead project was similar to the current Dental Research and Demonstration Project (DRDP) in that it included education, mouthrinse, screening, and referral. The one major difference between the two is that the Flathead plan offered financial help for dental treatment to qualified children. This is not

done in the DRDP. In the course of the nine years of the Flathead project (1971-1980), a marked improvement in the students' dental health was recorded. These results were much better than those Dr. Rider obtained seventy years earlier. Montana's current program is an expanded adoption of the Flathead County Dental Project due to its success in a limited area.

#### Dental Education

Optimal oral health is an important segment of an individual's total health care. This can only be completely accomplished with a strong educational component. Unless people are educated in the value of health practices, along with the various health measures available to them, full benefit of the measures can not be acquired.

One of the major objectives in a preventive dental health education program is the acquisition of knowledge of the function and design of oral tissues. Also essential is developing the proper behavior necessary for good dental health, together with acceptance of oral health information to establish proper attitudes for motivating the children to put their knowledge to work.

The fluoride rinse component of the DRDP offers an excellent opportunity for educating the students of the positive benefits of fluoride. The children need a basic understanding of three significant fluoride

concepts: (1) what fluoride is, (2) how it works to protect teeth, and, (3) what methods of administration are available, the effectiveness of each procedure, the recommended frequency of use, and duration (10). Rinsing alone is not enough. Student education is needed to ensure they understand why they are rinsing with fluoride.

### Varied Aspects of Fluoride

Fluoride is the most effective weapon known to combat tooth decay. Fluoride is found in our water, food, and air. Teeth can be made more resistant to dental decay by consuming fluoride during the time of tooth formation (systemic application) or by placing the fluoride directly onto teeth surfaces (topical application).

Fluorine is an element which exists as a trace element in water and food as chemically bound fluoride. Fluoride in water dissociates into separately charged particles called fluoride ions ( $F^-$ ). All fluorine is natural fluorine. It is so universal that it is the earth's seventeenth most abundant element (13).

The exact method by which fluoride exerts its anti-cariogenic effects is still open to debate, but numerous theories are speculated. Fluoride's overall mode of operation appears to be a combination of several effects. According to Stacey (21) the beneficial anticariogenic

action of traces of fluoride seems dependent upon three distinct factors: (1) antibacterial action, (2) anti-enzymatic action within the oral cavity, and (3) the formation of fluoroapatite ( $\text{Ca}_{10}[\text{PO}_4]_6\text{F}_2$ ) on the enamel of the tooth. Fluoroapatite is thought to be more resistant to acid erosion than hydroxyapatite,  $3\text{Ca}_3(\text{PO}_4)_2$ ,  $\text{Ca}(\text{OH})_2$ , or carbonate apatite,  $3\text{Ca}_3(\text{PO}_4)_2$ ,  $\text{CaCO}_3$ , which it replaces.

Fluoride may stimulate this conversion to fluoride-containing apatite. It has been shown that hydroxyapatite surfaces exposed to a solution with a pH less than approximately 4.5 appear to experience phase transition to dicalcium phosphate (13). Consequently, the enhancement of its conversion to fluoroapatite would decrease the loss of minerals during the acid-base cycle of the decay process. Fluoride acts to maintain the integrity of the apatite lattice over the wide pH range encountered within the mouth (25). Therefore, fluoride prevents the beginning of caries by inhibiting enamel demineralization. This is achieved by stabilizing the enamel crystal or by promoting recrystallization of previously dissolved enamel surfaces. Also, if the external mineral surfaces were converted to fluoride containing apatite the adhesion of bacterial plaques may be lessened, facilitating their removal and retarding their growth.

Topical fluorides such as the fluoride mouthrinse can directly affect the properties of the tooth, as

earlier stated, but there also appears to be an effect on the environment of the tooth as well. These include influences on the growth of bacteria, glycolysis, and production of acid which all seem necessary for the adhesion of plaque to the teeth (18). These results are likely to occur after a concentrated topical fluoride treatment.

Unfortunately, the amount of fluoride deposited in the teeth during a topical application is limited. Therefore, the effects of fluoride can not be experienced for extended periods of time. Effects of topical fluoride on plaque are likely to be of short duration and prevention of caries through topical mechanisms requires frequent applications. The surfaces of all three dental tissues (enamel, cementum, and dentin), are capable of acquiring fluoride upon exposure to oral fluids. The mechanisms and effectiveness of these acquired fluorides in counteracting tooth decay vary depending on the agent used, its route of administration, its concentration, and how often it is used.

Fluoride occurs naturally in water supplies in varying concentrations. Water supplies in the United States range from an average of eight parts per million fluoride (8 ppm) in the Southwest to a mere 1/20th parts per million (0.05 ppm) in the Northeast (4). Fluoride is present in water as electronically charged atoms or ions. These ions are the same whether acquired by

water seeping through a rockbed or by directly adding fluoride to the water supply. Fluoride in water does not disturb the water's natural taste, odor, color, or industrial qualities.

Fluoridation of community water supplies should be the foundation upon which all programs of decay prevention are based. Community water fluoridation is the most effective public health method known in reducing the prevalence of caries. A reduction in dental caries of up to 65 percent is seen in fluoridated areas, compared to non-fluoridated areas (2). Water fluoridation is close to being an ideal public health program because benefits, in the terms of protection against dental caries, are conferred regardless of education, socioeconomic level, or availability of dental manpower. Also no cooperative effort or direct action needs to be taken by the recipients of the benefits.

Unfortunately, a disadvantage to community water fluoridation is that it is restricted to areas with central water supplies. For geographic areas which lack centralized water systems, or find it unfeasible to fluoridate, alternative methods to allow children to receive the profits of fluoride need to be initiated. Since children are the most susceptible to dental disease, they also derive the greatest benefit from fluoridation.

The practice of fluoridating water began in the United States in the 1940's. A concentration of 1 ppm



fluoride in water, which is equivalent to one drop of fluoride in a bathtub of water, has been proven to be the optimum level of fluoride concentration (3). Levels below 1 ppm do not provide maximum protection while concentration levels which are too high (greater than 2 ppm) may cause fluorosis (molting of the teeth).

While 46.0 percent of the total population of the United States consumed fluoridated drinking water in 1979, only 19.9 percent of the population of Montana drank water fluoridated to optimum levels (13). Estimates in 1981 indicate that between 108-110 million people in 7,000 United States communities drink water with sufficient amounts of fluoride.

Fluoridation of community water systems is not the whole answer in fighting tooth decay. Fluoride protects the sides of the teeth more than the tops. Adolescents especially may still develop caries in the upper grinding surfaces of their molars.

Fluoride mouthrinse is an effective alternative way to obtain the health benefits of fluoride. Five years ago there were six million children mouthrinsing in school and this number has seemed to increase steadily since that time (2). There haven't been any undesirable side effects attributed to the use of fluoride mouthrinses. Most commercial mouthrinses are primarily cosmetic for freshening breath, but these don't remove plaque. Therefore, their ability to prevent dental decay and

gum disease is virtually nonexistent.

The most common type of rinse in Fluoride programs is 0.2% sodium fluoride (NaF). Aqueous solutions of 0.2% NaF are effective and safe in reducing dental decay in a weekly program of application according to the Food and Drug Administration (6). Weekly rinses in school with 0.2% NaF have proven to cut cavities by 35 percent (12). Furthermore, if the mouthrinse would be accidentally swallowed, only 9.0 mgms fluoride would be ingested and this amount is too small to cause concern about acute toxicity (2).

Weekly school mouthrinses have many advantages. Frequent rinsing for children of this age group provides topical effects which can reach teeth soon after eruption and before they have a chance to decay. The technique is easy for school children of all ages to learn. The treatment requires few supplies and disposal is simple and avoids any cross-contamination. With minimal training, non-dental personnel (teachers) can supervise the procedure for a whole class. The application of the fluoride mouthrinse requires little time out of the academic program, only 5 to 10 min or 15 hr of classroom time per year. It is also very inexpensive, costing approximately only 60 cents per child per school year (10).

There are other methods of fluoride application used throughout the nation to a smaller degree. Topical

applications to erupted teeth of fluoride gel containing 2% NaF, 8% stannous fluoride, or acidulated phosphate fluoride are possible alternative approaches. The drawback with these is that they have to be professionally applied. Other methods such as school water fluoridation and supervised fluoride tablets have proven to be feasible alternatives. Although water fluoridation is still the primary source of fluoride in most human diets, fluoride is also frequently added to toothpastes, chewing gums, vitamin supplies, and some commercial mouthwashes.

It should be noted that there have been attacks on the safety of fluoride. It has been said that fluoride is the cause of a multitude of difficulties ranging from cancer, heart disease, and birth defects to loss of teeth and brittle nails. High concentrations of fluoride have been used as a poison for rodents but for a human to get a lethal dose, you would have to drink so much fluoridated water (1 ppm) that the volume of the water alone would kill you (4).

The past dozen years has witnessed a large mass of evidence verifying the efficiency of fluoride in the prevention of dental caries while no scientific studies have shown evidence challenging the safety of this preventive agent (5). Fluoride has been recommended as effective and safe by the American Dental Association, American Medical Association, American Public Health Association, National Institute of Dental Health, and

the World Health Organization.

The only ill side effect seen is the staining of teeth in areas where the concentration of fluoride in the water is naturally several times too high (this effect is not seen at a concentration of 1 ppm). The mechanism of this staining or molting of the tooth's enamel seems to be caused by manganese incorporation in the apatite molecule which is facilitated in some unknown way by excess fluoride ion.

#### Screening Procedures

Screening the students is a way of determining the need of dental care. A common system of measurement is by classifying the child as a Class I, II, or III. Class I indicates that the child is in immediate need of dental care. Criteria for a Class I includes the existence of dental abscesses, pulp exposure, advanced caries showing long-term neglect, or pain (6). Class II means that the child requires some form of dental care. This may be due to the presence of caries, a fractured tooth, calculus, maintained deciduous teeth, or severe malocclusion (6). The visual screening of a Class III child does not indicate any problems which require non-scheduled dental care.

Classification screening was done with the participants in the Anaconda Fluoride Mouth Rinse Study between 1975-1979. In 1975-1976, of the 1,182 children screened,

12% were Class I, 56% were Class II, and 32% were Class III. Results improved substantially in 1978-1979, when out of the 1,250 children screened, only 1.5% were Class I, 36.0% were Class II, and now 62.5% were Class III.

The Flathead Children's Dental Health Project between 1971-1980 also produced a large decrease in the percent of Class I and II. In 1971-1972, out of the total 1,548 children screened, 12% were Class I, 44% were Class II, and 44% were Class III. Nine years later, in 1979-1980, results showed only 2% in Class I, 10% in Class II, and now 88% in Class III. There were 5,336 children screened. Screening was conducted every year and a steady decrease in Class I and II was recorded each year. It must be noted that this program did have the benefit of providing actual dental treatment along with education, mouthrinse, referral and screening. Along with classification, another widely accepted estimate of dental needs and dental care is a listing of decayed, missing, and filled teeth (DMF). When this data is totaled, it is the DMF-T. The total DMF count represents the cumulative attack of dental disease up to the time of screening. For grade school children, the majority of the DMF-T is due to caries (24). DMF is actually a better measure of susceptibility than care. A more accurate measurement of dental care can be accomplished by comparing the number of DMF teeth which have been filled to the total count: Filled (F) teeth divided

by DMF teeth. This is termed the filled-tooth ratio.

#### Primary Care

Nearly all dental health care services provided in conjunction with schools in the United States are primary prevention programs. Primary prevention includes education, certain fluoride deliveries such as mouthrinse or tablets, and screening. Secondary care includes X-rays, teeth cleaning, and fillings. Tertiary care is advanced treatment such as dentures or orthodontic work. The services provided in the DRDP fall under the primary prevention category. The logic behind employing primary prevention activities is based on the theory of helping prevent difficulties in the period of pre-pathogenesis, before dental disease has struck.

#### Reasons for Implementation in Schools

One of the goals of public health is to produce significant and rapid results for the largest number of people possible. Criteria used as a guide in evaluating which problems should receive priority include: (1) a disease or threat to health is widespread, (2) the knowledge exists on how to prevent this condition, and (3) this available knowledge is not being efficiently applied (23). School dental health projects meet all of these requirements. Dental disease is one of the most common health problems in our society. Knowledge

of how to prevent or alleviate this disease, such as the use of fluoride and preventive education, is well documented. The best preventive measure, fluoride in the community water supply, is not done in all of Montana.

For preventive procedures to have a positive impact on the control of disease, they must be acceptable to the target population (19). School children appear to be a target population, which is both in need of, and can be benefited by, current dental health practices. Elementary school teachers are in a unique position to help prevent dental diseases through guidance and motivation of their students.

Schools are more and more being recognized as appropriate locations for health services, medical and dental, for children. There are several obvious reasons for school-based health services. The first is that you have an accessible target population to work with since public education is mandatory in the United States. The children are, therefore, a captive audience. Health education is an integral part of any successful health program and the school environment provides an excellent educational environment (24). With this group, services can begin at an early age, thus escaping many of the preventable health problems. Preventing problems before they occur is both less expensive and more effective than curing the difficulty once it is initiated.

Schools also function well with a mouthrinse program because they operate on a more rigid schedule than home environments rinsing on a set schedule is easier. Another benefit of the school setting is that the concentrated fluoride can be guarded, eliminating the possibility of an accidental infusion of toxic quantities by a youngster, which could possibly happen in the home. So school-based health care delivery systems are among the most current alternatives in improving the health of American children.

#### School's Role in Dental Programs

The schools should take an active role in effecting the dental health of their students. Dental instruction emphasizing brushing, diet, and regular dental visits is probably the most common method directed at meeting dental needs through the school setting (15). Ultimate aims of school dental health instruction are to help the students understand basic facts of dental health and to develop proper dental health behavior. Students are also taught to appreciate the relationship of good dental health to total health and appearance.

#### Results from Previous Studies

A study in the late 1930's by the United States Public Health Service measured the DMF-T rate of children in areas of varying fluoride content (18). There were



7,257 children between the ages of 12 to 14 in 21 cities in 4 states examined. It can be seen by studying these results that there existed an inverse relation between the DMF-T and the concentration of fluoride, i.e., as fluoride content increased, DMF-T decreased:

<u># of cities studied</u>	<u># of children examined</u>	<u># of DMF teeth per 100 examined (approx)</u>	<u>Fluoride Content of H<sub>2</sub>O (ppm)</u>
11	3867	740	<0.5
3	1140	410	0.5-0.9
4	1403	285	1.0-1.4
3	847	205	>1.4

Pilot studies in the United States in the 1940's on the use of fluoride-containing mouthrinses and its effect on the DMF-T produced uncertain or negative findings (18). In contrast, promising results have been received in subsequent studies conducted in Sweden, United Kingdom, and the United States.

Sweden showed significant reductions in caries after one year of weekly rinsing with neutral NaF solution. In the last few years, there has been accumulating encouraging data from regions in the United States, also. Because of these facts, along with weekly fluoride mouthrinses in schools being inexpensive and cost-efficient, by 1991, many more communities will have adopted fluoride mouthrinse programs. In 1981, about 20% of

the schools had a mouthrinse program, and by 1991, that may increase to 45% (11).

## METHODS AND MATERIALS

### Target Population

The target groups addressed by the program for which results were compiled included elementary school students from Dental Health Districts X, XI, and XII in Western Montana. These three districts include the seven counties of Beaverhead, Deer Lodge, Granite, Powell, Ravalli, Silver Bow, and Missoula. There was a total of 71 schools with 13,055 students screened. The students ranged from kindergarten to sixth grade.

Schools in Western Montana were used to initiate the program because the area west of the Continental Divide generally has a lower fluoride content than the area east of the divide due to the source of water and the minerals in the soil. This area is also closer to Helena, which simplifies coordination of the project.

### Permission Forms

A permission form is sent home with each child previous to the initiation of the program in that school. The form states that the students are being offered a fluoride mouthrinse program. The parents mark whether or not they wish their child to participate in the

fluoride rinse program. These consent forms are then returned to school and only those students with parental permission are allowed to participate in the rinse.

### Dental Health Education

Dental education is provided to the students before the rinse and screening. Personal responsibility for their own oral care and nutrition is emphasized. The specific information given to the students varies depending on which grade is being taught.

A general outline of topics discussed in each grade includes:

- K) explaining the importance of teeth  
why we need teeth
- 1) basic tooth structure  
developing habits of proper oral hygiene  
the dentist is a friend
- 2) loss of teeth  
basic food groups and balanced diet
- 3) importance of regular dental visits  
acid formation and reducing sugar consumption
- 4) a closer look at diet  
introduce plaque control
- 5) structure and formation of teeth  
reasons for fluoridated water
- 6) dental disease progression  
dental accidents

These are just an outline, for topics are often altered and repeated depending on the situation. Objectives of the education program are for the students to gain knowledge, change attitudes, and establish proper

dental health behaviors.

### Mouthrinse

The mouthrinse materials include 0.2% NaF packets, dispenser pumps, jugs, tissues, and paper cups. The fluoride solution is easily mixed and should be prepared in advance. Each cup is filled with 10 ml of the 0.2% neutral NaF. The cups, along with a tissue, are distributed to each student.

The students rinse once a week throughout the school year. The cups are emptied into their mouths and the solution is swished for 60 sec. After the time is up, the solution is expelled back into the cups. The solution is not to be swallowed. After wiping their mouths, the tissue is placed in the cup to absorb the solution. Cups are discarded in the trash. Students should not eat or drink for 30 min after rinsing.

### Screening

The only instruments used in the visual screening process are a headlight, an instrument mirror, a tongue blade, and a cold sterilizer. Observations are recorded on the dental inspection forms.

The initial step in screening is to ask if the student has ever been to a dentist before, and how long has it been. The student is also asked if they are experiencing any pain in their mouth. Screening for

classification, Class I, II, and III, is then conducted. The remarks area on the inspection form is to record any special situations such as malocclusion, poor hygiene habits, broken fillings, etc. DMF-T counts are done on the second and fifth graders only. Referrals are made in the necessary situations.

#### Statistical Analysis

Data of the grade levels, number of students, classes, DMF-T, dental visits, number of students in the fluoride rinse program, and percent in the program are recorded for each school. This data is tabulated into summation results for counties and a total for all seven counties. The tabulated data gives us a Montana baseline of dental health to work with.

Fluoride analysis of municipal water supplies were obtained from the Montana State Department of Health and Environmental Sciences. A single town in each county was chosen, and their mean fluoride content (ppm) was calculated to use as a comparison against the classification of that county.

Populations and income levels were obtained from the most recent state census (1980) from the Montana State Bureau of Records and Statistics. Those numbers will also be used in discussing their relations to classification levels.

Calculations were also conducted to derive the

tooth filled ratio for second and fifth graders. This is applied to the degree of dental care or prevalence of dentists in the tested area.

## RESULTS

All of the individual student dental inspection forms were compiled onto a single school dental health reporting form for each school in the project. These forms were then totaled into results for the entire county. The seven counties were also grouped to achieve overall project figures.

Table 1 shows a breakdown by county of classification and percent of children whose parents allowed participation in the fluoride rinse portion of the project.

Table 2 contains the filled tooth ratio along with a dentist population ratio per county. This indicates the statistical number of dentists for every 1000 population in the county. A dentist working part-time or practicing in a split practice was tabulated with a value of one-half of a full-time practice. The dental density was calculated from the 1980 census from the U.S. Census Bureau and the listing of dental practices came from the Montana Department of Health and Environmental Sciences (17, 22). This was also the source of the fluoride analysis of municipal water supplies for the seven selected cities (one from each county) in Table 3.



The totals on tables 1, 2, and 3 are from summation of all individual results without respect to which county they pertain to. The means represents the average by working with county totals, without respect to differences in county populations.

Figure I graphically compares the percent of students in need of dental care (Class I and II) in each of the seven counties. Figure 2 shows dentist population density against the filled tooth ratio which is an estimate of dental care.

Figures 3 and 4 demonstrate city water fluoride concentration versus percent Class I and II, and DMF-T respectively.

Table 1.

County	# of Schools	Class I %	Class II %	Class III %	Fluoride Mouthrinse Acceptance %
Beaverhead	6	3.2	9.7	87.1	86.5
Deer Lodge	4	4.4	11.6	84.0	96.0
Granite	3	6.3	28.1	65.6	89.0
Powell	8	3.4	9.4	87.2	87.4
Ravalli	8	0.8	14.0	85.2	72.3
Silver Bow	15	4.2	9.3	86.5	87.7
Missoula	27	2.3	8.8	88.9	77.0
Totals	71	2.8	10.3	86.9	82.2
Mean Standard Deviation		$\bar{x}=3.5$ $s=1.7$	$\bar{x}=13.0$ $s=6.9$	$\bar{x}=83.5$ $x=8.0$	

Results of classification screening and mouthrinse acceptance per county

Table 2.

County	# of 2 & 5 Grade Students	# of Filled Teeth	Total # DMF Teeth	Filled Tooth Ratio	# Dentists per 1000 Population
Beaverhead	34	94	128	.73	.67
Deer Lodge	301	1011	1107	.91	.44
Granite	78	201	274	.73	.37
Powell	163	464	540	.86	.57
Ravalli	568	1639	1933	.85	.62
Silver Bow	890	3371	3855	.87	.68
Missoula	1531	4976	5392	.92	.79
Totals	3565	11,852	13,133	.90	
Mean Standard Deviation				$\bar{x} = .84$ $s = .08$	$\bar{x} = .59$

Filled tooth ratio and dental manpower  
per county

Table 3.

Cities (County)	# Kids per City	Class I (%)	Class II (%)	Class III (%)	Class I & II (%)	DMF-T Ratio	Ave. Content ppm
Lima (Beaverhead)	56	2	15	83	17	3.77	.30
Butte (Silver Bow)	3480	4	9	87	13	4.36	.23
Hamilton (Ravalli)	568	1	15	84	16	3.70	.13
Anaconda (Deer Lodge)	1097	4	12	84	16	3.67	.33
Deer Lodge (Powell)	515	3	9	88	12	3.57	.27
Philipsburg (Granite)	193	7	25	68	32	3.45	.50
Missoula (Missoula)	3907	2	6	92	8	3.45	.19
Totals	9816						
Mean Standard Deviation		$\bar{x}=3.3$ $s=2.0$	$\bar{x}=13.0$ $s=6.2$	$\bar{x}=83.7$ $s=7.6$	$\bar{x}=16.3$ $s=7.6$	$\bar{x}=3.71$ $s=0.31$	$\bar{x}=.28$

Screening results and fluoride content  
per city

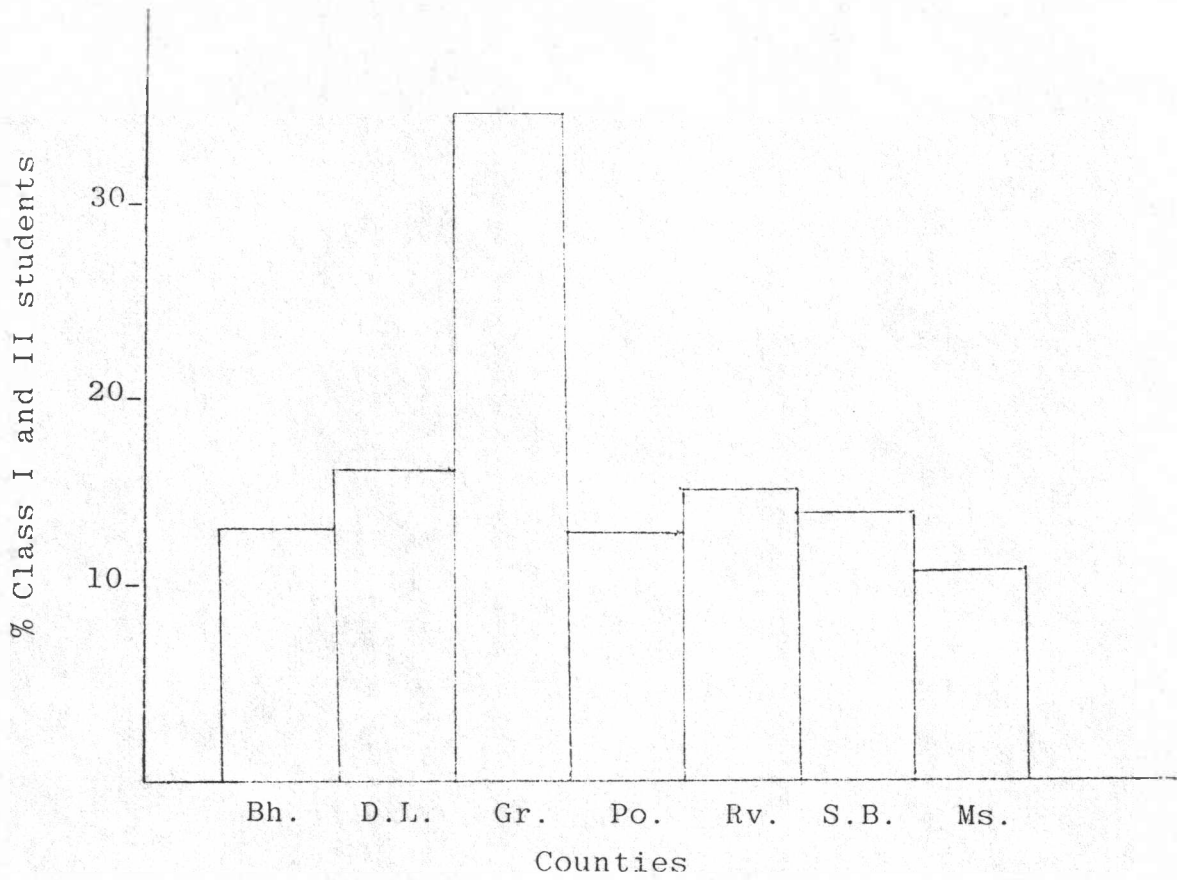


Fig. 1.

Percent Class I and II students in each county.  
 (Counties: Beaverhead=Bh., Deer Lodge=D.L.,  
 Granite=Gr., Powell=Po., Ravalli=Rv.,  
 Silver Bow=S.B., Missoula=Ms.)

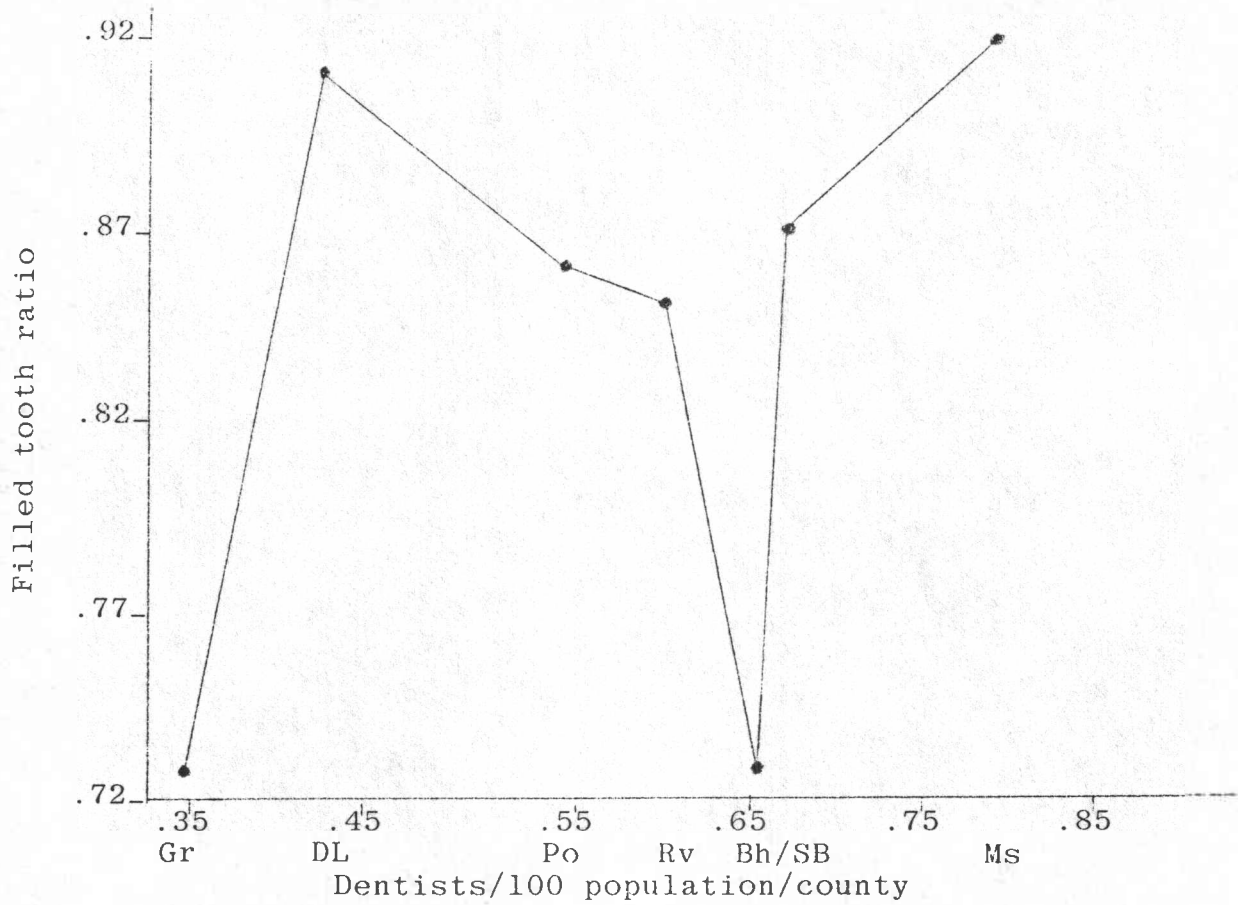


Fig. 2.

Comparison between the filled tooth ratio and the dental manpower per county  
 (Counties: Beaverhead=Bh., Deer Lodge=D.L., Granite=Gr., Powell=Po., Ravalli=Rv., Silver Bow=S.B., Missoula=Ms.)

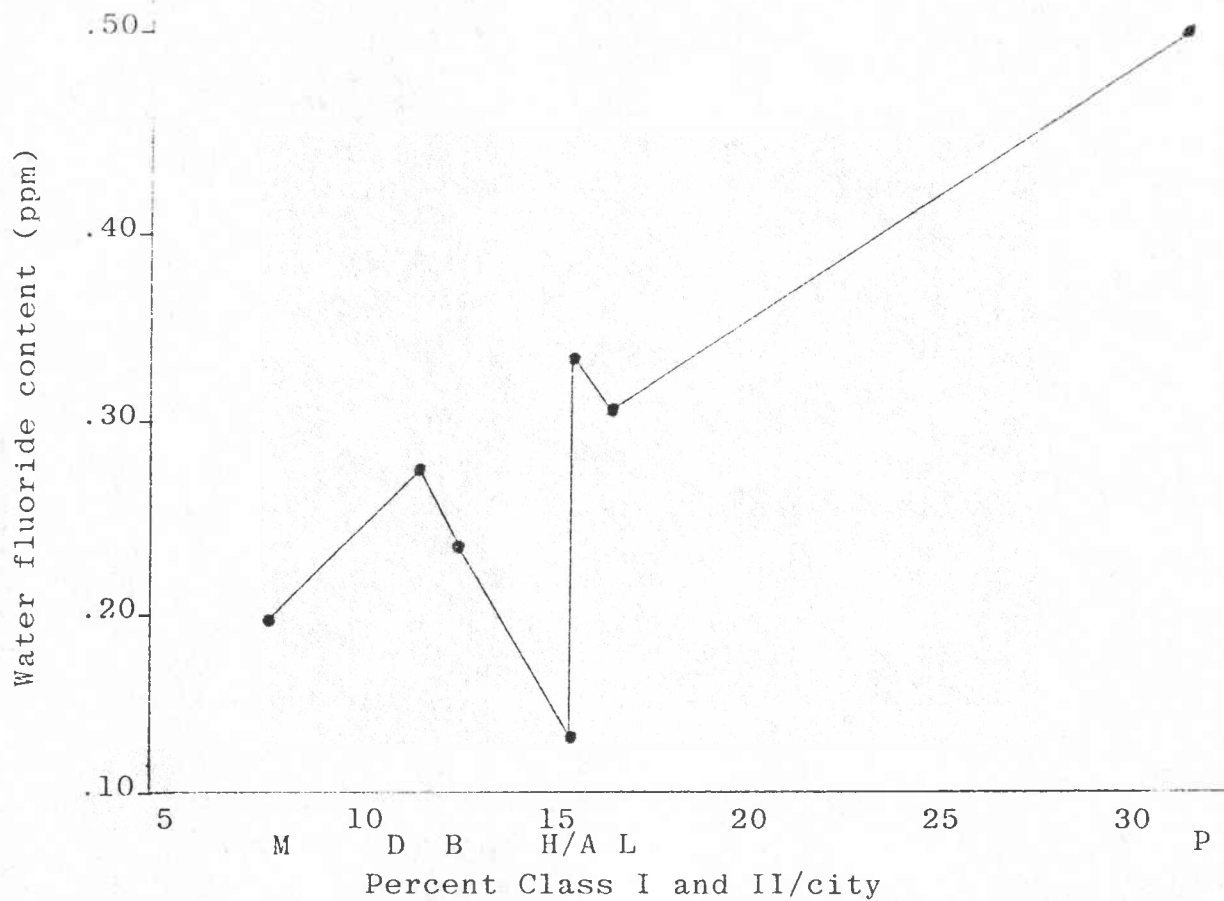


Fig. 3.

Comparison between water fluoride content and percent Class I and II students per city  
 (Cities: Missoula=M., Deer Lodge=D., Butte=B., Hamilton=H., Anaconda=A., Lima=L., Philipsburg=P.)

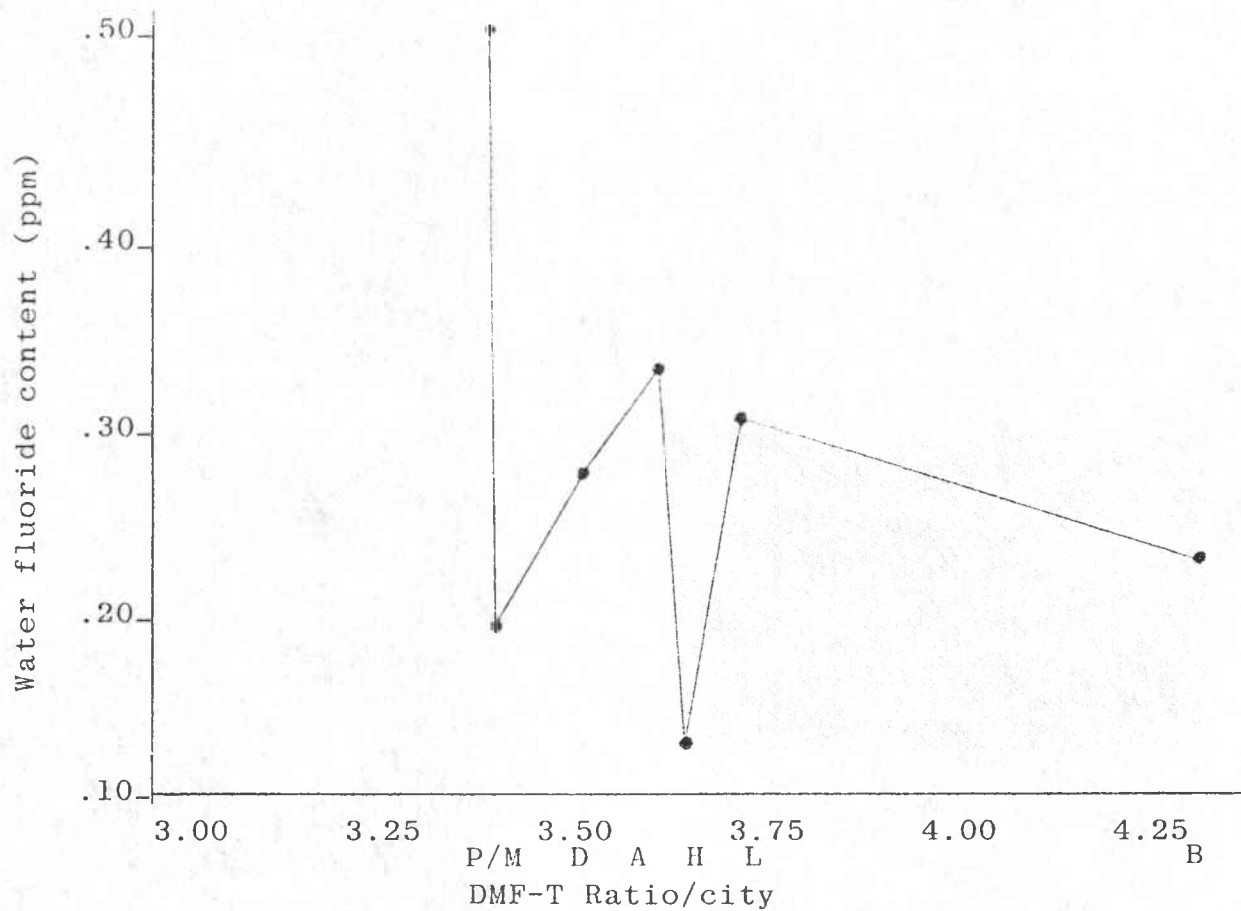


Fig. 4.

Comparison between water fluoride content  
and DMF-T ratio per city  
(Cities: Missoula=M., Deer Lodge=D., Butte=B.,  
Hamilton=H., Anaconda=A., Lima=L., Philipsburg=P.)



## DISCUSSION

Since the results of the study are from the Dental Research and Demonstration Project's first year of enactment, these are baseline results which cannot be compared to results from previous years of the project. Next year, and in subsequent years, these figures will be used as a basis of comparison to see how successful the project has been in improving the dental health of the students involved. But the different aspects of the project can be viewed against each other to discuss major influences on the results.

For the most part, the seven counties proved to be quite close in overall dental health. Granite County was significantly higher than the rest of the counties in percent Class I and II students. This may be due to the small sample size of Granite County schools. Other factors which contribute to Granite's seemingly poor dental health could be that it has the lowest (0.37) dental manpower figure of any of the counties tested. This idea is backed up by Granite's significantly low filled tooth ratio (0.73), which indicates a decreased amount of dental care. Also, Granite has the second lowest mean family income (1979), next to Ravalli, of

the seven counties; therefore, economic factors could play some role in the counties results (22).

On the other hand, Missoula County has the lowest percent Class I and II students of the counties studied. These results may be more reliable due to the larger population of elementary school children screened in Missoula County. Missoula County also has the highest filled tooth ratio, indicating a high degree of dental care. In correspondence with these results is the fact that Missoula County has the highest population of dentists per 1000 people, in addition to the highest mean family income at \$22,622 (17, 22).

In the statistics on the seven cities, each a representative of a different county, versus water fluoride content, the results do not seem very conclusive. Philipsburg, which had the highest concentration of fluoride at 0.50 ppm, had the lowest DMF-T along with Missoula, but conversely had the highest Class I and II percent. It appears that in Philipsburg, which is in Granite County, the fluoride level is not as large a factor in dental health as other influences including those listed earlier for Granite County. The different fluoride levels comparisons may not be too conclusive since they are all way below the optimum water fluoride concentration of 1 ppm.

Although there is no previous data from these counties to compare to, the Flathead study results could

be used. In 1979, Flathead County results showed: Class I, 3%; Class II, 13%; and Class III, 85%. My totaled results again showed: Class I, 2.8%; Class II, 10.3%; and Class III, 86.9%. Therefore, there is a 2.9% rise in children indicating no apparent dental care is needed. Even though dental decay was dramatically decreased in the 9 yr of the Flathead program, it was even lower in the counties in this study. This would, of course, be due to a number of variables including fluoride levels, increased dental education of the public, more healthy and nutritious diets, the state of the economy, and dental manpower.

Before concluding, I would like to list just a few of the positive aspects and benefits derived from this project which would indicate its worthiness and necessitate not only its survival but also expansion and initiation of other projects similar to this one.

1. allows use of primary preventive measures to a fuller degree in reducing dental disease.
2. allows monitoring and adjustment of the supply of dental health personnel to meet community needs
3. increases community knowledge and use of dental health services
4. allows appraisal of the quantity of dental services provided to the communities
5. helps move dental care from the schools into households to develop parental interest
6. increases general knowledge of oral health care thereby decreasing apathy, a major barrier in achieving better oral health

7. offers the benefits of fluoride, especially important in our areas of low water fluoride content, thus making certain no child is denied the benefits of fluoride
8. helps educators and health officials improve techniques of implementing and continuing successful programs
9. helps implement health care policies in our own state by showing areas of greatest need.

Projects similar to the DRDP which deal with the dynamics of transferring preventive health care techniques to the public are at least as important as programs developing new dental techniques. I agree with the International Conference on Research in the Biology of Periodontal Disease when they emphasized that the improvement of dental health relates less to the technical advances than to an understanding of the social, educational, and economic context of the individuals who must adopt the procedures (19).

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