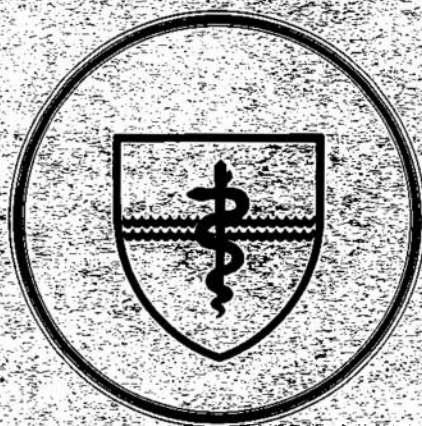


**NAVAL SUBMARINE MEDICAL
RESEARCH LABORATORY
SUBMARINE BASE, GROTON, CONN.**



REPORT NUMBER 821

DENTAL CARIES AT THE UNITED STATES NAVAL ACADEMY (1971 Survey)

I. Prevalence, Incidence and Comparative Analyses

by

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and

W. R. Shiller, CDR, DC, USN (RET)

Naval Medical Research and Development Command
Research Work Unit MF51-524-012-0016-01

Released by

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Naval Submarine Medical Research Laboratory

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SUMMARY PAGE

THE PROBLEM

During the past decade the United States Navy has instituted a service-wide preventive dentistry program. One of the main features of this program is the use of stannous fluoride in three agents, a prophylactic paste, an aqueous solution and a dentifrice. Data are required periodically to test the level of dental health with regard to preventive dentistry effectiveness as well as to yield information useful in other aspects of oral health maintenance. The Naval Academy population is of prime importance in this regard.

FINDINGS

The prevalence and incidence of dental caries in the Naval Academy population is found to be remarkably low. Specifically, the incidence of caries is found to be about 50% less than was found in a study prior to the present preventive program.

APPLICATION

Continued emphasis on the Navy-wide preventive dentistry program is warranted.

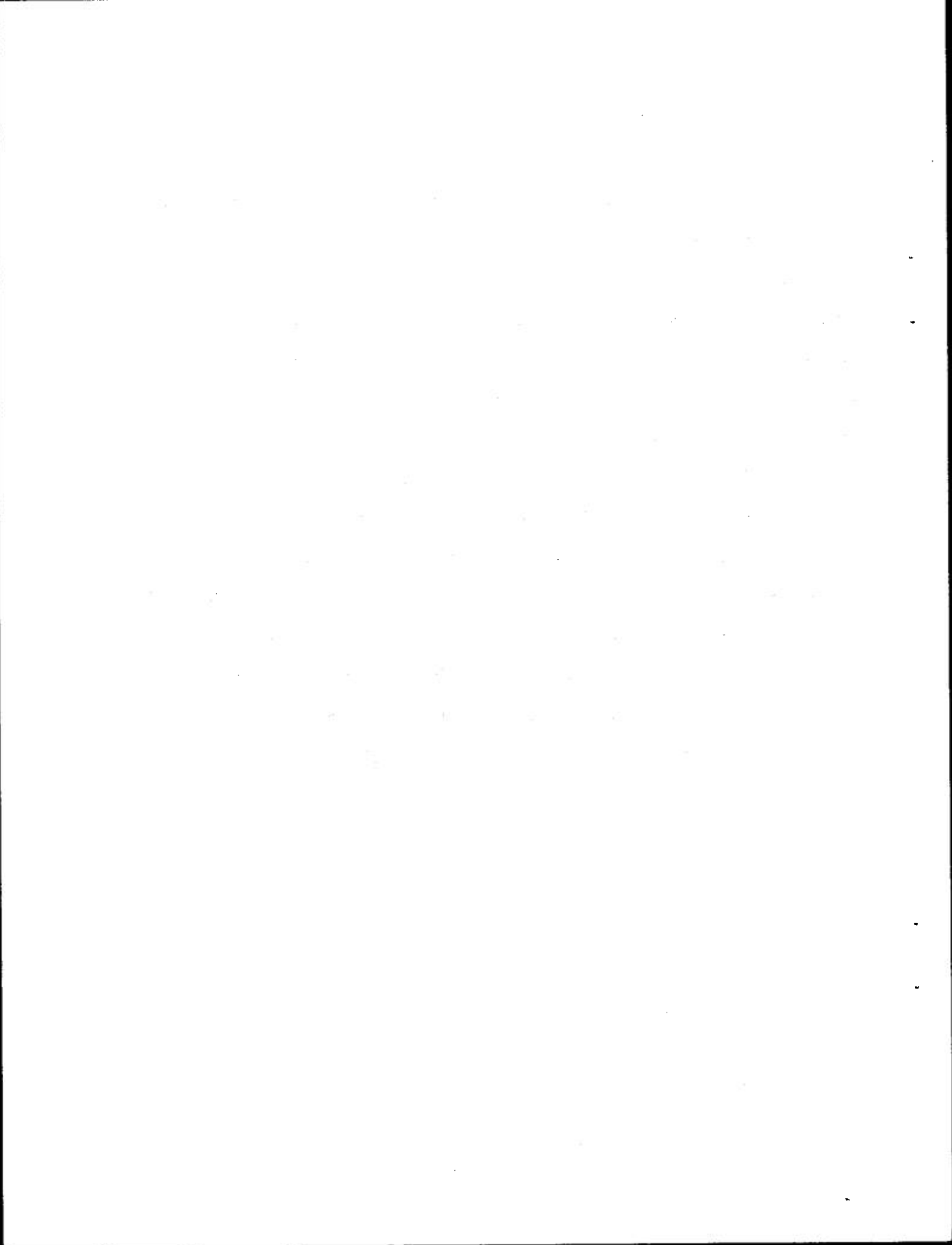
ADMINISTRATIVE INFORMATION

This investigation was conducted as part of Bureau of Medicine and Surgery Research Work Unit MF51.524.012-0016 - Longitudinal Study of Dental Diseases and Defects in Naval Submarine Personnel. This report has been designated as Submarine Medical Research Laboratory Report No. 821. It is Report No. 1 on this Work Unit.

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ABSTRACT

Two classes of the United States Naval Academy were surveyed with regard to their dental caries status. The data were in the form of treatment needs, teeth and teeth surface involvement, and x-ray discernible caries. Comparisons were made between the classes, within the classes at different times of Academy life, between the combined classes and a similar group prior to the Navy-wide preventive dentistry program, and between the classes and other present-day naval populations. A 50% reduction in dental caries experience from the preventive dentistry Academy population was demonstrated. Evidence is presented to indicate that the present Academy regimen results in lowered decay experience as the Academy years progress. The overall level of initial caries experience and of caries incidence in the Academy population appears to be less than in any other naval population used for comparison. It is concluded that the present Navy-wide preventive dentistry program warrants continued emphasis.



DENTAL CARIES AT THE UNITED STATES NAVAL ACADEMY (1971 Survey)

1. Prevalence, Incidence and Comparative Analyses

INTRODUCTION

The Navy's caries prevention program has been formally tested in only one series of studies^{1,2,3}. The Navy-wide implementation of this program has suggested to many the need for follow-up evaluation of its effectiveness. Such evaluations in the general Navy population are extremely difficult, if not impossible, for several reasons; the chief ones being lack of control groups, population differences, and changes in examination and treatment programs. The problem of adequate control groups is obvious in view of the universal application of the preventive dentistry program. Perhaps less obvious are the dangers of using historical controls for cohort analyses.

The United States Naval Academy might be the one place where these population, examination, and treatment changes are minimal. It therefore suggests itself as an attractive possibility in a continuing cohort analysis of the Navy caries prevention program.

A study of the effectiveness of medicated dentifrices was conducted by Kyes, Overton and McKean⁴ at the Naval Academy, 1957-1959. That study affords the only pre-caries prevention program data with which present disease levels may be compared.

Stanmeyer and Raphael⁵ reported a 92% reduction in "new lesions" incidence after two and one-half years of an intensive caries prevention program at the Naval Academy. Their conclusions were based on comparisons

between their data and those reported by Kyes, et al.⁴ The figures cited were 2.14 "lesions" per man year as reported by Kyes compared to .17 "lesions" per man year after the caries prevention program. It was unclear, however, how the data were collected and treated in Stanmeyer's study.

It was therefore considered desirable to attempt a careful assessment of the dental status and caries incidence of the present Academy population. Such a study is expected to yield information concerning the usefulness of the Academy as a caries test population; to give some information concerning the caries prevention program effectiveness and to give a valuable description of the population with regard to dental care needs.

MATERIALS AND METHODS

The subjects were members of the Academy classes graduating in 1971 and 1972. At the time of analysis there were 888 subjects in the 1971 Academy sample and 932 in the 1972 sample. Smaller samples consisting of 220 members of the 1971 class and 226 of the 1972 class were drawn by selecting every fourth man from the alphabetical class rolls. The more detailed analyses were performed on these sub-samples.

The preventive dentistry program was generally comparable for the two classes. The standard two agent application of stannous fluoride was given twice during the freshman year and annually thereafter. The fluoride dentifrice was most probably used by almost all of the subjects since non-fluoride dentifrices are not even sold at the Academy.

A regular Type 2 Navy examination was performed on each man by a member of the dental staff initially during the pre-entrance summer (examination 1), during the winter of the freshman year (examination 2), during the winter of the sophomore year (examination 3), and during the fall of the senior year (examination 4). The total time period covered was 36 months divided

into two 18-month periods by the sophomore year exam (exam 3). An exact one-year period was present between the freshman and sophomore years (exams 2 and 3).

No attempt was made to calibrate the examiners; however, the senior dental officer reviewed each case.

All of the required dental work found at any examination was completed before the time of the next examination.

The examination results were recorded in the appropriate positions on the Standard Form 603. In addition, the treatment needs and treatments rendered were recorded in positions on the local dental jacket to correspond to each examination time. The required work was categorized as being the result of a new lesion or the result of a failed restoration. The restoration failures included mechanical ones as well as recurrent caries.

DMF (Decayed, Missing, Filled) and DMFS (Decayed, Missing, Filled, Surfaces) scores were computed for each examination time by adding the number of decayed, missing and filled teeth or surfaces present excluding the third molars. Minor enamel caries were not included and any DMF or DMFS increment in reality resulted in operative work being performed. There were, therefore, no reversals in the DMF/DMFS scores.

The posterior bite-wing x-rays taken at each examination were read by one of the investigators (W.R.S.) in a manner previously described.⁶ A decayed, missing, filled interproximal posterior (DMFS-IP) score was computed from the x-ray interpretations. Enamel lesions were included in this survey; therefore, reversals were present.

All data were punched on IBM cards and were subjected to both parametric and enumerative analyses to enable interpretation. Wherever parametric comparisons were made, the t test for non-paired data was used. In those comparisons employing historical controls, the level of significance was set at 99% ($P < .01$) and in those comparisons between or within classes of the present study the significance level was set at 95% ($P < .05$). Non-parametric analyses of differences between rates were performed by computing the ratio of the rate differences to the combined estimated population rate standard error for the two samples.

$$Z = \frac{P_1 - P_2}{\left(\frac{P_0 Q_0}{N_1} + \frac{P_0 Q_0}{N_2} \right)^{1/2}}$$

RESULTS

The general epidemiological characteristics of dental caries of the Naval Academy sub-samples are given in Tables 1 and 2. In Table 1 the cumulative progression of caries experience is reported as the mean DMF teeth scores, the DMFS scores, and the DMFS-IP scores. Variability is expressed as plus or minus one standard error of the mean throughout this paper. A rather uniform progression rate is noted in all of these scores. This is further evidenced in the increment scores in Table 2. It is noted that in the 1971 year group there is a decreased increment the second 18-month period over the first. This difference is statistically significant only in the case of the DMFS-IP evaluations ($P < .01$). It is noted that the numbers of subjects are less in the DMFS-IP than in the other analyses. A small number of men did not have x-ray records suitable for DMFS-IP analyses. Comparisons between the 1971 and 1972 year groups revealed no significant differences in the DMF/DMFS increments. There was, however, a significant difference in the DMFS-IP increments for both the one year and the first 18 months data ($P < .01$). One

is impressed by the fact that the mean increments actually result from very few incidences of newly-involved teeth or surfaces. The actual enumerations of these incidences are given in Tables 3 and 4. Similarly, the DMFS-IP increments were, numerically, rather rare. For example, in the 1971 year group, 23% of the subjects had increments of interproximal involvement contrasted to only 7% of the 1972 year group. The difference between these rates is highly significant ($P < .01$). These latter data were not presented in tabular form.

One of the purposes of this study was to attempt some comparisons with other caries surveys in comparable populations. These comparisons are given in Table 5. The first and foremost noteworthy finding is the very low initial caries scores in the present study compared to any other reported in this table. These differences are highly significant. By way of explanation, the data from the former studies were modified somewhat for these comparisons. Where logically feasible, groups within a study were combined and combined mean scores with their standard errors were computed. For example, no significant differences were found among the groups in the study by Kyes et al; all groups were therefore combined. Similarly, the two three-agent stannous fluoride groups were combined in the study by Scola and Ostrom. It is interesting to note the similarity in the caries increments of the present study and that of the New London studies. The .25 DMF and 1.13 DMFS one-year increments of the present study do not differ significantly from the .48 DMF and the 1.59 DMFS increments of the most disparate New London study. When it is remembered that both of these populations are cross-sectional representatives of the United States of comparable age and that they were both afforded the advantage of similar three-agent fluoride treatment, the similarity

in caries experiences takes on the appearance of good corroborative evidence. Before one becomes too absolute in this thought pattern however, he must be reminded that these studies were conducted in quite different manners and at different times. A comparison of the present study increment with either of the yearly increments in Kyes's study reveals about a 50% decrease in the caries increments. Again this is about the level of reduction reported in the New London studies.

The results already presented might adequately describe the caries status for a dental epidemiologist. The clinician or dental care program manager, however, bases his thinking on lesions and restorations not on surface or tooth involvement. For this reason data concerning operative dentistry requirements were tabulated and are given for the total 1971 and 1972 classes (Table 6) and for the study samples (Table 7). It is to be noted that there were significantly more unrestored lesions initially in the 1972 class than in the 1971 class. The mean number of lesions per man was remarkably similar for the two classes at the freshman winter examination. Strangely, however, the 1972 class showed a much reduced new lesion and replacement rate at the sophomore winter examination. The latter values represent a one-year increment of lesions or replacements per man. The differences noted between classes at the sophomore examination were highly significant in the case of the total population (Table 6, $P < .01$) but were not statistically significant in the case of the study samples (Table 7, $P > .05$). It should be noted that the smaller number in the study samples decrease the significance level of the observed mean differences.

Table 8 gives the increments for treatment needs for the total Classes. Contrary to the corresponding DMF/DMFS data from the smaller sub-samples the differences between the first and second 18-month periods are statistically significant, both for new lesions and for replacement needs ($P < .01$). These findings indicate some effect of the Academy regimen on this important aspect of dental care.

As in the case of the epidemiological data, the treatment needs data are presented in tabulated form in Tables 9, 10, 11, 12, 13, 14, and 15. The two-way spreads employed enable one to determine the incidence of subjects in each possible combination category concerning the two treatment need types. For example, in Table 9, 41 subjects had no new lesions but had one replacement restoration required and 18 subjects had one new lesion requiring restoration and a one replacement restoration required.

The importance of comparisons with like populations is every bit as great in the case of dental care requirements as in the case of DMF/DMFS scores. Table 16 represents a comparison of the present study with a study aboard the USS NEW JERSEY.⁷ In the NEW JERSEY study, a sample of 300 men was used for detailed analyses from a total population of 978 men. The mean values refer to the number of lesions or restorations per man year. It is evident that there is a marked difference in the operative dentistry needs. Statistical comparisons are possible only in the new lesion category and the significance is high ($P < .001$). Actually it is apparent that such large mean differences are significant in all categories.

The total class samples at the Naval Academy were also analyzed to determine the actual number of men contributing to the work load. It was found that in the 1971 class, 48% of the men had no new lesions during the entire study period and 34% required no restorative work at all. Similarly in the 1972 class, 48% had no new lesions and 40% required no restorations in an 18-month period.

DISCUSSION AND CONCLUSIONS

The main stated objective in this study was to attempt an evaluation of the effectiveness of the standard Navy preventive dentistry program. Comparisons of the present findings with those of former studies, therefore, became of prime concern.

The most striking difference between the present data and any of those formerly reported is in the initial caries experience levels. At first thought the natural question would be concerning the relative dependability of the present study DMF/DMFS measurements, since the initial values of the Kyes Annapolis study were comparable to those of the New London studies. Probably the first fact that should be pointed out is the stated differences between the examination criteria of the Kyes study and the present one. In the former "the smallest discernible etching and decalcifications" were included as lesions. The present DMFS scores did not include such lesions. This could account for some of the differences.

Further evidence that the present groups may have been initially comparable to those of the New London study and indirectly to those of Kyes may be found in the x-ray analyses performed by the same individual.

It is not felt advisable, however, to dismiss the observed initial DMF/DMFS differences so lightly. Bite-wing x-rays were analyzed in the present study in a manner identical to that done in the New London study population⁶ and in a group of 1231 young enlisted personnel.⁸ If the averaged mean score of DMFS (IP) in Table 1 is employed as values in the regression formula obtained for the DMFS -DMFS(IP) relationship in the New London Study⁶ ($\hat{y} = 1.66x + 11.26$), the expected DMFS score would be 23.96 which is very close to the observed 21.35 of the present study. One could argue these

opinions at length, but the observed low initial DMF/DMFS scores are intriguing enough to warrant study in depth.

A companion question must be raised concerning the comparability of any increment scores from such a low caries population to a population such as that of the Kyes study. It has long been felt that subjects should be stratified on the basis of DMF scores when doing caries increment comparisons. Actually an unreported analysis of the New London data revealed a product moment correlation coefficient between the initial score and the caries increment of $-.07$. A similar analysis of the Shiller and Scola enlisted study⁸ revealed an r value of $+.05$. In both cases it is evidenced that no correlation exists in this young adult age group between initial DMF and the increment.

We are now brought to the point of considering the amount of caries incidence reduction in our present Academy population compared with that of the Kyes study. In Table 5 it appears that there is about a 50% reduction in the present caries increments compared with either of the Kyes one-year data. This is about the level reported in the New London study.

At this point it is well to point out the differences between carious lesion incidence and DMFS score increments. If one were to consider the .51 new lesions of the 1971 class one-year period (Table 6) as being comparable to the average one year DMFS score of 2.14 of Kyes's study, one could report a 76% reduction in caries. This, however, would be patently dishonest since the two values represent vastly different measurements.

As was stated in the result section, there is much to recommend the use of lesion and restoration counts in a caries study, particularly when work load considerations are paramount. Comparisons of the present study with the Kyes

study are not possible since only recurrent carious lesions were reported in the former and these were not made a separate category in the present study. Some comparisons were possible, however, with the NEW JERSEY study reported by Farrell.⁷ Situations in the NEW JERSEY^{study} were somewhat similar to those at the Academy in that all dental needs were corrected initially and the standard three-agent fluoride applications were used. Conditions differed in that the prior dental work for the NEW JERSEY was performed Navy-wide while much of that at the Academy was performed by the staff at Annapolis. Personnel differences and environmental differences also were present. Even with these differing conditions in mind, however, the treatment needs of the two population groups (Table 16) are truly remarkably different; both from a practical and a statistical point of view. Many explanations may be suggested; more complete operative procedures at the Academy, more intensive preventive care at the Academy, a more arduous environment in the NEW JERSEY, different diets and different populations particularly with regard to age. Unfortunately a most useful comparison of mechanical versus recurrent caries failure can not be made because the basic data were not segregated with this in mind.

With regard to the information contained in the present study itself, several interesting facts are apparent. One is the amazing conformity of DMF/DMFS scores of the two classes for the possible comparison periods. This certainly points to some degree of reproducibility in the examiners. The fact that some differences were noted in the treatment needs between the two classes initially corroborates a fact well-known to the Academy staff. Some members of the 1972 class were inadvertently admitted without meeting current dental standards. Conjecture must suffice to explain the reverse relationship between

the classes for the one-year period at the sophomore examination. An appealing conjecture is that a greater share of the operative work in the mouths of the 1972 class was performed by the Academy staff compared to that of the 1971 class. It could be maintained that the more ideally performed restorative work of the 1972 class resulted in less repair work than in the 1971 class. It must be emphasized that this is pure conjecture. Again, recurrent caries figures would be most helpful in identifying the reasons for these lessened care needs.

Comparisons between the first 18 months and the second 18 months of Academy life reveal some lessening of the DMF/DMFS increments in the second period. The fact that these reductions are not statistically significant should not lead to their being ignored completely, particularly when one examines the significant reduction in the case of the DMFS (IP) scores. These scores include small enamel lesions and consequently diagnostic reversals are present. The significant reductions in the DMFS(IP) in the second 18 months over the first could be construed as evidence of the arresting action of fluorides on these small non-restored lesions.

The highly significant difference between the DMFS(IP) increments between the two classes is difficult to explain. It should be noted that the Academy classes are treated as a group and that class differences are present. The opinion was uniformly expressed by the Academy staff that the 1972 class was a better class, dentally, than was the 1971 class. This unexplained difference in the interproximal increments should lead to further investigations.

An Academy effect can also be seen in the increments of operative dentistry needs. The second 18 months increments are significantly reduced from the first.

In the case of new lesions this amounts to a 41% reduction and in the combined requirements a 49% reduction. Actually it must be pointed out that many factors could be responsible for this finding, but the preventive dentistry program certainly should be considered as one of those factors.

In conclusion, certain beliefs can be advanced rather safely.

1. A demonstrable caries reduction of about 50% exists in the present Academy population when compared with a like population before the present preventive program. (Kyes study, Table 5)
2. A beneficial effect of the Academy regimen is demonstrated by an approximately 50% reduction in treatment needs during the latter part of the Academy years. (Table 8)
3. The Academy regimen is associated with a reduction of the interproximal caries increment to the extent of about 75%. The possibility exists that this fact may represent the enamel caries arrestment action of fluorides. (Table 2; Class of 1971)
4. A final caveat must be inserted lest one attached unwarranted importance to the findings obtained from historical control comparisons. At best, such findings should be used as indicators; not as proof of cause-effect relationships.

Table 1

Naval Academy Dental Caries Parameters

	Class	N	Initial	Freshman Winter	Sophomore Winter	Senior Fall
DMF	71	220	10.08 \pm .314	10.22 \pm .316	10.47 \pm .318	10.73 \pm .321
	72	226	9.61 \pm .326	9.78 \pm .330	10.03 \pm .329	
DMFS	71	220	21.86 \pm .949	22.23 \pm .955	23.39 \pm .992	24.49 \pm 1.051
	72	226	20.86 \pm .937	21.42 \pm .960	22.50 \pm .975	
DMFS (IP)	71	214	7.98 \pm .470	8.21 \pm .476	8.53 \pm .483	8.78 \pm .494
	72	204	7.30 \pm .455	7.47 \pm .462	7.50 \pm .462	

Table 2

Naval Academy Dental Caries Increments

	Class	N	First 18 months	Second 18 Months	One-year period	Total for three years
DMF	71	220	.38 \pm .060	.27 \pm .055	.24 \pm .048	.65 \pm .084
	72	226	.41 \pm .054		.25 \pm .044	
DMFS	71	220	1.53 \pm .239	1.10 \pm .176	1.16 \pm .224	2.63 \pm .303
	72	226	1.61 \pm .212		1.10 \pm .191	
DMFS (IP)	71	214	.55 \pm .064	.16 \pm .070	.34 \pm .051	.70 \pm .090
	72	204	.20 \pm .049		.04 \pm .034	

Table 3 - Enumeration of Caries Increment (DMFT)

Increment	1971 Class N=220				1972 Class N=226			
	First 18 months	Second 18 months	One Year	Total	First 18 months	Second 18 months	One Year	Total
0	169	186	189	148	167		189	
1	35	21	19	39	36		24	
2	7	7	6	15	16		8	
3	3	2	2	6	4		3	
4	5	2	4	7	3		2	
5	0	1	0	2	0		0	
6	1	1	0	2	0		0	
7	0	0	0	1	0		0	

Table 4 - Enumeration of Caries Increment (DMFS)

Increment	1971 Class N=220				1972 Class N=226			
	First 18 months	Second 18 months	One Year	Total	First 18 months	Second 18 months	One Year	Total
0	135	154	157	106	128		159	
1	26	20	23	28	25		22	
2	24	16	21	27	24		14	
3	9	3	0	9	15		9	
4	6	8	2	6	14		7	
5	4	9	3	9	5		4	
6	1	2	2	3	4		3	
7	4	2	2	4	1		1	
8	3	2	3	7	2		1	
9	1	0	1	4	2		1	
10	1	0	1	2	1		1	
> 10	6	4	5	15	5		4	

Table 5

Comparative Caries Data

	N	Initial caries level	First year increment	Second year increment	Two year increment
Kyes, et al *	728		.64 ± .044	.57 ± .037	1.21 ± .063
DMF	728	34.84 ± .665	1.93 ± .091	2.34 ± .080	4.28 ± .124
DMFS	728				
Present study	446	9.84 ± .227	.25 ± .033		
DMF	446	21.35 ± .667	1.13 ± .147		
DMFS	446				
Scola & Ostrom **	160	14.97 ± .346	.48 ± .106		.46 ± .116
DMF	160	36.01 ± 1.07	1.59 ± .254		2.26 ± .280
DMFS	160				
Scola ***	307	14.65 ± .345	.29 ± .058		
DMF	307	38.55 ± 1.227	1.26 ± .117		
DMFS	307				
Scola ****	231	14.22 ± .367			.35 ± .063
DMF	231	36.28 ± 1.353			1.90 ± .167
DMFS	231				

* Groups combined

** 1968 Study - Three Agent Stannous Fluoride Groups combined

*** One-Year self-preparation study all fluoride groups combined

**** Two-year self-preparation study all fluoride groups combined.

Table 6

Operative Dentistry Requirements
Total Class Populations

	Class	N	Initial	Freshman Winter	Sophomore Winter	Senior Fall
New lesions	71	888	.43 \pm .040	.34 \pm .031	.51 \pm .037	.50 \pm .032
	72	932	.77 \pm .045	.33 \pm .028	.40 \pm .028	
Replacements	71	888	.34 \pm .032	.25 \pm .025	.28 \pm .023	.21 \pm .020
	72	932	.26 \pm .029	.25 \pm .025	.19 \pm .019	
Combined	71	888	.78 \pm .062	.58 \pm .046	.78 \pm .047	.70 \pm .041
	72	932	1.03 \pm .060	.58 \pm .042	.59 \pm .038	

Table 7

Operative Dentistry Requirements
Study Samples

	Class	N	Initial	Freshman Winter	Sophomore Winter	Senior Fall
New lesions	71	220	.43 \pm .077	.29 \pm .049	.41 \pm .060	.54 \pm .093
	72	226	.69 \pm .084	.35 \pm .056	.34 \pm .052	
Replacements	71	220	.44 \pm .083	.19 \pm .039	.25 \pm .040	.22 \pm .048
	72	226	.19 \pm .049	.27 \pm .044	.16 \pm .027	

Table 8

Increments of Operative Dentistry Requirements

	Class	N	First 18 months	Second 18 months	One year period
New lesions	71	888	.85 \pm .052	.50 \pm .032	.51 \pm .037
	72	932	.73 \pm .042		.40 \pm .028
Replacements	71	888	.53 \pm .039	.21 \pm .020	.28 \pm .023
	72	932	.44 \pm .035		.19 \pm .019
Combined	71	888	1.36 \pm .074	.70 \pm .041	.78 \pm .047
	72	932	1.17 \pm .062		.59 \pm .038

Table 9

OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1971-1st Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
0	666	41	17	9	2			1			736
1	29	18	9	1	1						8
2	16	8	6	1	3		3	1			38
3	8	5	3				1				17
4	6	4	3			1					14
5	1	7	3	1	1					1	14
6		1	3	1							5
7		1	1		1			1			4
8		1		1							2
9											0
	726	86	45	14	8	1	4	3		1	888
Total Replacemt											

Table 10

OPERATIVE DENTISTRY REQUIREMENTS

Year Group 1971-2nd Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
New Lesions	0	657	52	14	3	2	1	1	1		731
	1	60	20	4	2						86
	2	20	8	8	1						37
	3	8	5	2		1					16
	4	6	3		1						10
	5				1					1	2
	6		1	1	1						3
	7	1				1					2
	8		1								1
	9										0
		752	90	29	9	5	2	-	-	-	888
Total Replacemt											

Table 11

OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1971-3rd Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
0	554	65	17	9	1			1			647
1	108	20	10	2	1	1					142
2	31	11	3								45
3	18	4	2	3							27
4	8	2	1								11
5	4	3	1	2							10
6	1		1								2
7	1	1									2
8	1										1
9			1								1
	726	106	36	16	2	1	0	1	0	0	888
Total Replacemt											

Table 12

OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1971-4th Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
0	564	51	16	1							632
1	110	27	4		2						143
2	53	11	2	2					1		69
3	14	8	2	1							25
4	5	8									13
5	4		1								5
6		1									1
7											0
8											0
9											0
	750	106	25	4	2	0	0	0	1	0	888
Total Replacemt											

Table 13
OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1972 - 1st Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
0	581	27	7	2				1			618
1	96	16	7		1	1					121
2	68	12	5	3	2			1	1	1	92
3	28	7	1	2	3	3					45
4	18	2	1	3	1	2					27
5	10	2	1	2							15
6	5	2									7
7	3	1	1								5
8	1			1							2
9											0
	810	69	23	13	7	6		2	1	1	932
Total Replacemt											

Table 14
OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1972-2nd Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
0	690	44	22	2		1	1	2			762
1	59	14	12	4			1				90
2	30	7	2	1		1					41
3	16	3	4		3						26
4	2	4	4								10
5											0
6	1		1								2
7		1									1
8											0
9											0
	798	73	45	7	3	2	2	2	0	0	932

Total Replacemt

Table 15

OPERATIVE DENTISTRY REQUIREMENTS
Year Group 1972-3rd Exam

	Replacement Restorations										Total New Lesions
	0	1	2	3	4	5	6	7	8	9	
New Lesions	0	645	55	11	1						712
	1	89	20	2	2	1		1			115
	2	51	11	7	3	1	1				74
	3	17	2	1		1					21
	4	3		1							4
	5	3	1			1					5
	6		1								1
	7										0
	8										0
	9										0
	808	90	22	6	4	-	-	0	0	0	932

Total Replacemt

Table 16

One Year Operative Treatment Need Comparisons

	N	Mean new lesion requirements	Rate %	Mean replacements required	Rate %	Mean total operative requirements	Rate %
Present study (Class 1971)	220	.41 \pm .060	24%	.25 \pm .040	18%	.66 \pm .082	35%
	888	.51 \pm .037	27%	.28 \pm .023	18%	.78 \pm .047	37%
USS NEW JERSEY study	300	1.71 \pm .087		.79		2.50	93%
	978						74%*

*This rate is computed from the number requiring any dental treatment - not only operative treatment - and is computed by dividing the number of men having lesions or requiring restorations by the total number in the group.

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2. The second part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

3. The third part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

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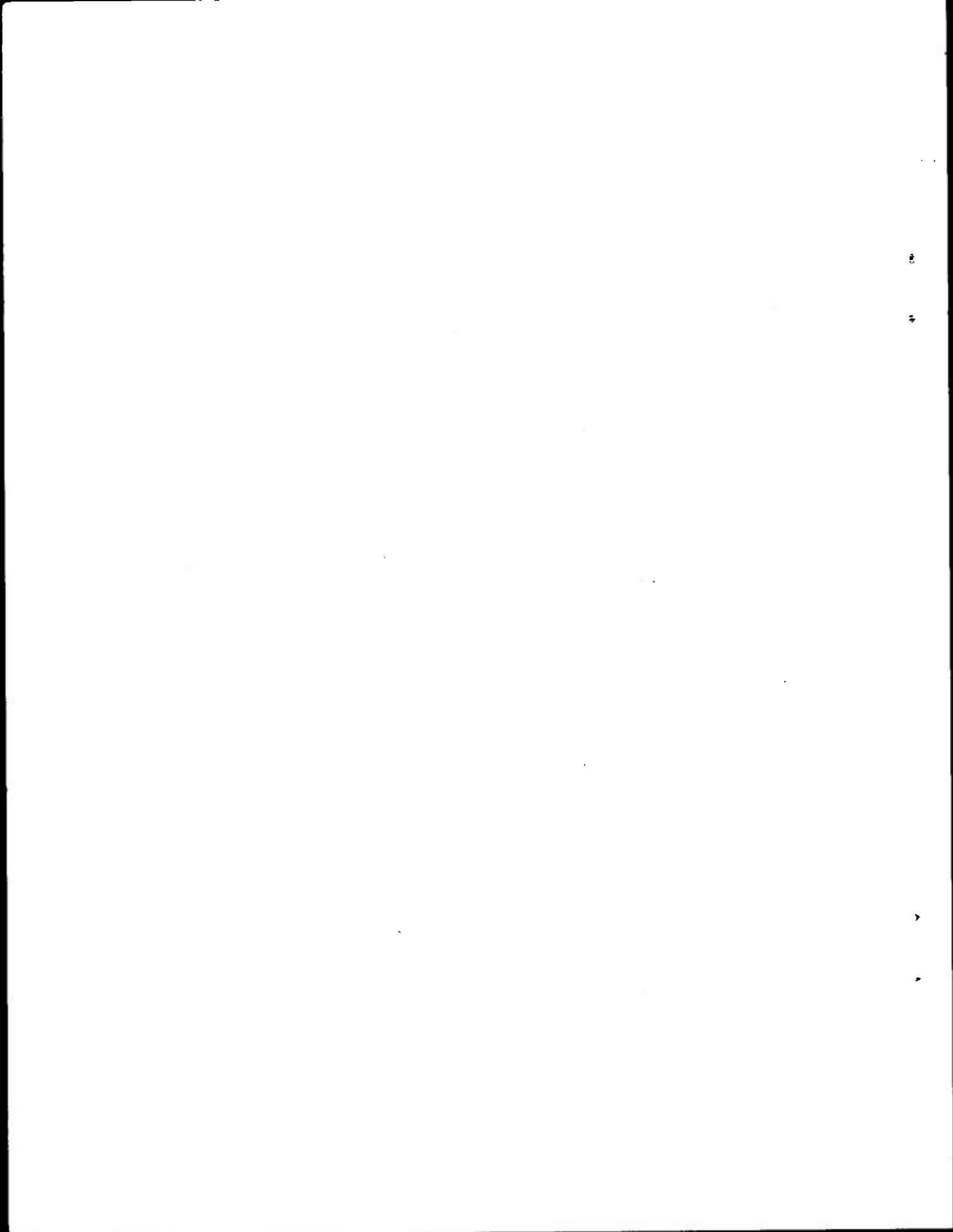
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13. ABSTRACT			
<p>Two classes of the United States Naval Academy were surveyed with regard to their dental caries status. The data were in the form of treatment needs, teeth and teeth surface involvement, and x-ray discernible caries. Comparisons were made between the classes, within the classes at different times of Academy life, between the combined classes and a similar group prior to the Navy-wide preventive dentistry program, and between the classes and other present day naval populations. A 50% reduction in dental caries experience from the preventive dentistry Academy population was demonstrated. Evidence is presented to indicate that the present Academy regimen results in lowered decay experience as the Academy years progress. The overall level of initial caries experience and of caries incidence in the Academy population appears to be less than in any other naval population used for comparison. It is concluded that the present Navy-wide preventive dentistry program warrants continued emphasis.</p>			

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