

THE INFLUENCE OF WAR AND POST-WAR CONDITIONS ON THE TEETH OF NORWEGIAN SCHOOL CHILDREN¹

II. CARIES IN THE PERMANENT TEETH OF CHILDREN AGED 7-8 AND 12-13 YEARS

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INTRODUCTION

CHANGES in the amount of caries in the permanent teeth of Norwegian school children during the school years 1940-1941 to 1948-1949 and 1951-1952 and 1952-1953 are described in this second report on the findings from an extensive, nationwide investigation conducted by the Pedodontic Department of the Norwegian State Dental School with the cooperation of the dentists in twenty-two school dental clinics in widely separated sections of Norway. This investigation was planned at the outbreak of World War II as a result of reports from several European countries, including Norway, that a marked reduction in dental caries among school

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The statistical treatment of the primary data has been carried out at the Milbank Memorial Fund, New York. I am very much indebted to the President, Dr. F. G. Boudreau, for the great interest he took in these studies in 1948 leading to a fellowship for my stay at the Milbank Fund in 1949-1950 and in 1955-1956 and for making the staff and all facilities available for analysis of these data and for the opportunity to publish the report in the *Quarterly*.

I want to express my sincere thanks to Miss Dorothy G. Wiehl, who has been responsible for the statistical treatment, for her interest and constant help. I am also indebted to her for reading the manuscript. I am very grateful to Mr. Louis Rubal for his painstaking work and many interesting and valuable suggestions. Thanks are also due to the other members of the staff for help in various ways.

Reprints of these reports are available through the Milbank Memorial Fund.

children occurred during World War I. It was hoped that, if a similar reduction in caries occurred under wartime conditions, the data collected would provide more evidence on the causes of the reduction.

In the first report, (Toverud, 1956) the population examined, the method of examination and the methods of tabulating the data are described in detail. A few items of primary interest are repeated here.

The children examined were from schools in cities, villages and rural districts in different parts of Norway, but it was not possible to obtain a random sampling of communities, partly because of the voluntary cooperation of dentists and partly because of conditions under the German Occupation. Furthermore, examinations were not done in every community in every school year; the same school grades were not included in every community; and, in a few communities, the grades examined varied from year to year. In order to minimize any effect on the findings of year-to-year variation in the composition of the population examined, data are presented for specific sex and age groups for selected groups of communities. Three basic community groups are used, namely, cities, villages and rural schools;³ but data for several communities are shown separately either because the dental status differed in some respect from that of the appropriate basic group or for some special reason.

Children in grades 1 and 2 and 6 and 7 were examined in nearly all communities in each year for which any examinations were available. Consequently, the population is most constant and most representative at ages 7 and 8 years and at ages 12 and 13 years. For children of these ages, caries rates during the period of study are examined in this report.

General consistency of the trends in dental status for the different groups of communities affords the best evidence, it is be-

³ The basic group of cities includes: Egersund, Fredrikstad, Larvik (ages 12 and 13 years only), Skudeneshavn, Tønsberg, and Tromsø. The village group includes: Aker, Baerum, Eidsvoll, Hedrum, Odda, Oppegaard, Ski, Stord, Strinda, and Tune. Rural districts combined are: Blaker, Fet, V. Gausdal and Meldal.

lieved, of their significance and validity. Statistical tests of significance are used sparingly since the sources of variation and error in the data are not limited to those associated with random sampling.

The previous report discussed the findings on changes during the study periods, 1940–1941 to 1948–1949 and 1951–1952 and 1952–1953, in eruption of the permanent teeth and also in retention and caries status of the deciduous predecessors, if any. In the following pages, and in a subsequent report, the changes observed in the amount of dental caries in the permanent dentition of the children examined will be described in detail. For specific sex-age groups in the different communities, annual rates for several measures of caries status will be presented. These measures include the following types of rates:

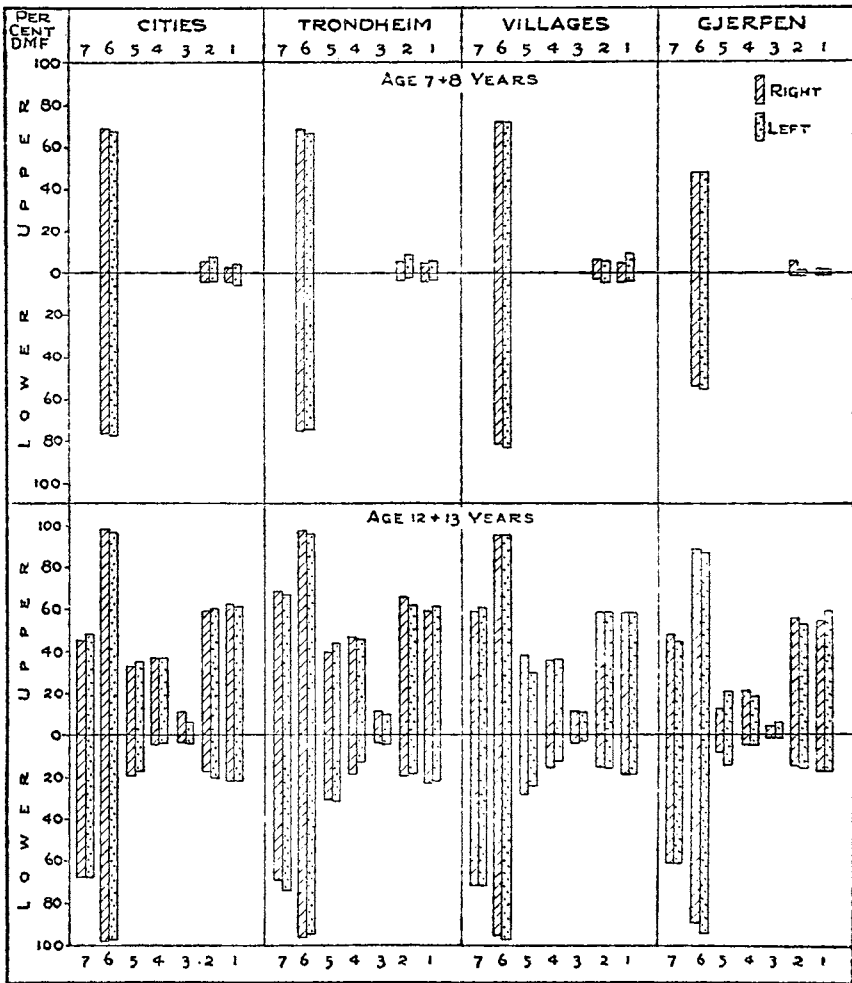
1. Per cent of children examined who had one or more permanent teeth decayed, missing, or filled (DMF), or, alternatively, the per cent caries free.
2. Average number of DMF teeth per child. This measure of individual susceptibility to caries is not as useful for young children who have a limited and variable number of erupted permanent teeth as for older children.
3. Per cent of total erupted permanent teeth found to be DMF on examination.
4. Per cent of the total number of each *specific* permanent tooth erupted that was DMF.
5. Percentage of DMF surfaces among the total surfaces for a *specific* erupted permanent tooth; usually extracted teeth are included with a constant number of carious surfaces estimated.
6. Percentage of DMF surfaces among the total surfaces of *all* erupted permanent teeth.

In the previous report, which described the dental examination, it was stated that after the first two years, namely 1940–1941 and 1941–1942, the dentists examined only the status of the dentition in the right half of the mouth. This was in accordance with earlier investigations which had indicated that it is really unnecessary to examine the whole dentition in order to obtain reliable prevalence rates for caries in population

groups. However, if the dentition on the right side was completely free of caries, the left side was examined in order to be sure that the child was really caries-free clinically.

A study of bilateral symmetry in the occurrence of caries in the permanent teeth was made for the year 1941-1942 to see whether the examination of only one-half of the dentition was justified in these studies of Norwegian school children.

Fig. 19. Percentages of specific teeth DMF on the right side of the mouth compared with percentages for corresponding teeth on the left side for boys examined in 1941-1942 in various communities. Specific teeth are numbered from 1 (central incisor) progressively to 7 (permanent second molar).



BILATERAL SYMMETRY IN THE OCCURRENCE OF CARIES IN THE PERMANENT TEETH

For the study of the reliability of the prevalence of caries in one-half of the dentition as an index of caries in the total dentition, the occurrence of caries in the specific permanent teeth on the right side has been compared with that on the left side.

Fig. 20. Percentages of specific teeth DMF on the right side of the mouth compared with percentages for corresponding teeth on the left side for girls examined in 1941-1942 in various communities. Specific teeth are numbered from 1 (central incisor) progressively to 7 (permanent second molar).

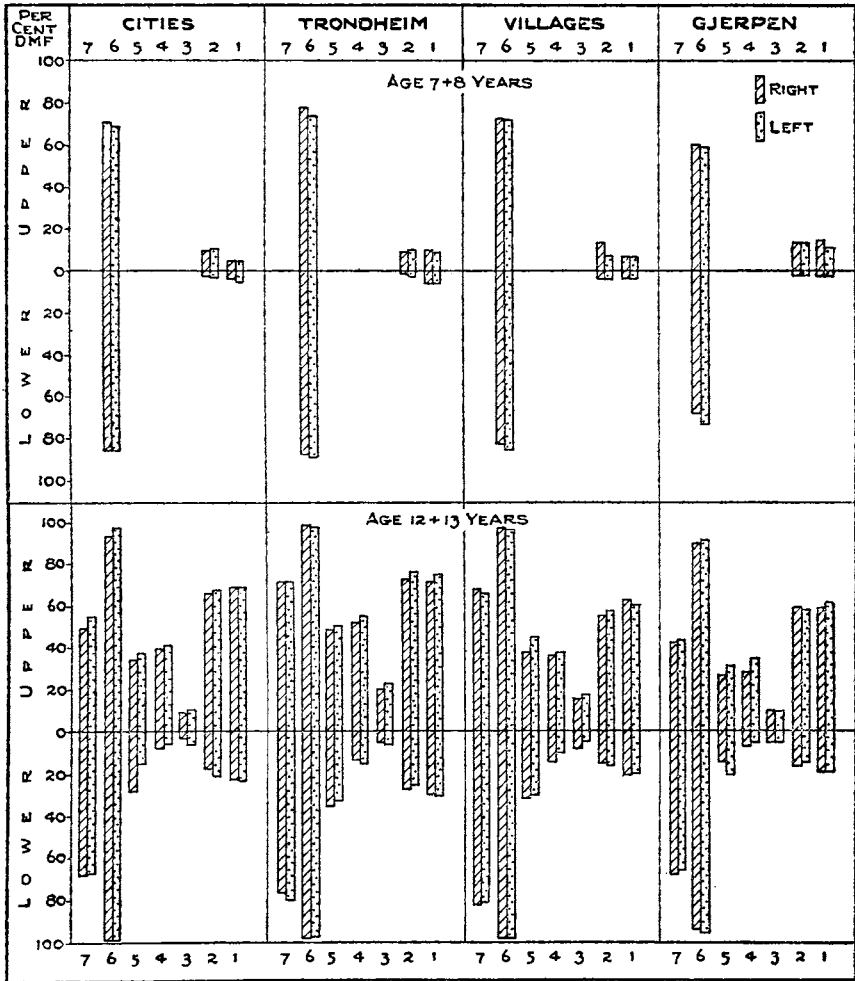


Table 16. Comparison of DMF rates for specific permanent teeth on the right side and on the left side in the lower jaw of 7+8 year old children and 12+13 year old children examined in 1941-1942.

AGE AT EXAMINATION AND SPECIFIC TOOTH IN LOWER JAW	BOYS				GIRLS			
	Number Having Tooth ¹	Per Cent of Teeth DMF		Number Having Tooth ¹	Per Cent of Teeth DMF			
		Right	Left		Right	Left		
CITIES								
<i>Age 7+8 Years</i>								
First Molar	296	77.4	77.7	338	86.1	86.1		
Central Incisor	294	4.4	4.8	340	3.5	4.7		
Lateral Incisor	217	4.1	3.7	263	2.3	2.7		
<i>Age 12+13 Years</i>								
First Molar	168	98.8	98.2	175	98.9	98.9		
Central Incisor	168	22.0	22.0	176	23.3	23.9		
Lateral Incisor	168	17.3	20.8	176	18.7	21.6		
Cuspid	156	3.2	3.8	174	2.9	6.3		
First Bicuspid	142	4.2	3.5	163	7.4	5.5		
Second Bicuspid	122	19.7	17.2	143	28.0	14.7 ^b		
Second Molar	116	68.1	68.1	144	68.1	66.7		
TRONDHEIM								
<i>Age 7+8 Years</i>								
First Molar	289	75.4	75.1	266	88.0	88.7		
Central Incisor	263	4.2	3.4	254	5.5	5.9		
Lateral Incisor	181	2.8	2.2	192	1.6	2.6		
<i>Age 12+13 Years</i>								
First Molar	283	97.2	95.4	298	98.7	98.0		
Central Incisor	283	23.0	22.3	297	30.3	30.6		
Lateral Incisor	283	20.1	19.1	298	26.8	25.5		
Cuspid	267	3.4	4.1	297	5.7	6.4		
First Bicuspid	236	18.6	13.1	284	14.1	17.6		
Second Bicuspid	197	30.5	31.5	240	35.4	32.9		
Second Molar	200	70.0	75.0	244	77.5	80.3		
VILLAGES								
<i>Age 7+8 Years</i>								
First Molar	351	80.6	82.9	388	83.0	85.8		
Central Incisor	356	4.2	3.9	383	3.4	3.7		
Lateral Incisor	253	2.4	4.0	303	4.0	4.0		
<i>Age 12+13 Years</i>								
First Molar	266	97.0	98.9	240	97.9	98.3		
Central Incisor	266	18.4	18.4	240	20.8	20.0		
Lateral Incisor	266	15.0	15.4	239	15.1	17.6		
Cuspid	255	3.5	3.1	239	8.4	4.6 ^b		
First Bicuspid	234	15.8	12.4	231	14.7	10.8		
Second Bicuspid	207	28.0	23.7	202	32.2	30.7		
Second Molar	196	72.4	72.4	193	82.4	81.9		

Table 16 (Continued)

AGE AT EXAMINATION AND SPECIFIC TOOTH IN LOWER JAW	Boys			GIRLS		
	Number Having Tooth ¹	Per Cent of Teeth DMF		Number Having Tooth ¹	Per Cent of Teeth DMF	
		Right	Left		Right	Left
GJERPEN						
<i>Age 7+8 Years</i>						
First Molar	111	54.1	55.0	85	68.2	74.1
Central Incisor	113	0.9	0.9	87	2.3	2.3
Lateral Incisor	81	1.2	1.2	66	1.5	1.5
<i>Age 12+13 Years</i>						
First Molar	138	89.9	94.9 ^a	151	94.7	96.0
Central Incisor	137	16.8	16.8	150	19.3	19.3
Lateral Incisor	138	14.5	15.9	151	17.2	14.6
Cuspid	130	0.8	0.8	147	4.8	4.8
First Bicuspid	125	4.8	4.8	142	7.0	5.6
Second Bicuspid	104	7.7	14.4	121	14.9	20.7
Second Molar	102	60.8	60.8	124	68.5	66.1

¹ Number of children with specified tooth erupted on both sides of lower jaw.

^a Difference between percentages significant at 0.05 level.

^b Difference between percentages significant at 0.01 level.

Rates for children aged 7 and 8 years and for those aged 12 and 13 years at last birthday are shown in Figures 19 and 20 for four community groups, namely, combined cities, Trondheim, combined villages, and Gjerpen. For the younger age group, rates have been used only for the incisors and first permanent molars. For each specific permanent tooth in the upper and in the lower jaw, the percentages DMF are shown in Figures 19 and 20; and in Table 16, the number of children examined, the DMF percentages for teeth in the lower jaw and the statistical significance of the difference between the DMF percentages for each tooth on the right and on the left side⁴ are shown.

⁴ Since the DMF percentages for a specified permanent tooth in the left and right sides of the dentition of the children examined in 1941-42, relate to teeth for the same children, the differences in rates for the antimeres were tested for significance by the χ^2 analysis appropriate for correlated percentages. Only children with both of the specified antimeres were considered so that each test becomes essentially a comparison of rates for two matched samples (See, Cochran, W. G.: *Biometrika*, December, 1950, 37, Parts 3 and 4.) Chi-square (with Yates' correction) was obtained from the following formula:

$$\chi^2_{(\text{cor.})} = \frac{(|b - c| - 1)^2}{b + c}$$

(Continued on page 134)

As can be seen from Figures 19 and 20, the bilateral symmetry in the DMF status of the several teeth is very close in most cases. In a few instances some discrepancies are noticed, particularly in those morphological groups where only a very few erupted or carious teeth are present. The bilateral symmetry for the permanent first and second molars is very close, and these teeth, in most instances, also show the highest caries rates. Furthermore, the charts demonstrate very clearly that there is no systematic difference in the pattern of bilateral symmetry as between boys and girls or as between the different community groups.

The conclusion may be drawn from this preliminary analysis of bilateral caries that the examination of only the right half of the dentition should provide a closely accurate picture of the total dental condition. These bilateral symmetry studies confirm the results of earlier ones mentioned in Part I, Brekhus (1931), and also the more recent studies by Calonius (1953), Welander (1955), and others.

A further discussion of bilateral symmetry of caries and related questions will be taken up later in a separate publication.

PER CENT OF CHILDREN WITH NO CARIES IN PERMANENT TEETH

The dental health status of children is usually expressed in rates of occurrence of dental caries among individuals in a population group rather than of non-occurrence or freedom from caries. However, since we are interested in the "health" of the individual and of the population, it should be logical to record the frequency of *healthy* dentitions instead of *diseased* dentitions. The main reason for not doing so is that very few indi-

b = number of children with the left antimere DMF, but not the right; and
c = number of children with the right antimere DMF, but not the left.

A significant difference at the level selected (0.05) would have rejected the null hypothesis of no difference in the caries experience of the specified teeth in the right and left sides of the dentitions of the groups of children studied. As shown in Table 16, significant differences occurred in only three instances for teeth in the lower jaw. In the upper jaw, four differences were significant (P.01-.05), as follows: ages 7 + 8 years, lateral incisors for girls in villages; ages 12 + 13 years, first molars for girls in cities and second bicuspids for boys and for girls in villages.

Table 17. Per cent of boys and girls aged 7+8 years with no carious permanent teeth.

SCHOOL YEAR	NUMBER OF CHILDREN EXAMINED		NUMBER OF CHILDREN WITH NO DMF TEETH		PER CENT WITH NO ¹ DMF TEETH	
	Boys	Girls	Boys	Girls	Boys	Girls
CITIES						
1940-41	255	235	32	20	11.4	7.0
1941-42	306	346	51	35	17.9	8.6
1942-43	315	336	60	42	19.1	13.2
1943-44	327	315	88	58	26.9	17.5
1944-45	290	286	83	61	28.6	20.7
1945-46	355	274	116	64	30.3	25.6
1946-47	404	324	126	83	30.9	24.6
1947-48	411	397	105	78	24.9	18.5
1948-49	377	366	109	74	27.7	19.7
TRONDHEIM ²						
1940-41	220	195	40	17	14.6	7.5
1941-42	299	271	61	25	19.7	9.3
1942-43	266	257	66	27	25.8	10.5
1943-44	165	143	39	31	24.1	25.1
1944-45	117	145	34	38	27.2	26.9
1945-46	155	155	72	61	43.1	35.8
1946-47	209	223	39	23	20.4	11.1
VILLAGES						
1940-41	371	358	59	39	15.0	9.6
1941-42	364	392	61	49	16.6	11.9
1942-43	428	404	126	69	28.6	16.4
1943-44	394	339	111	69	28.6	20.9
1944-45	263	284	83	80	32.2	27.7
1945-46	388	376	162	145	42.1	39.5
1946-47	256	252	109	76	42.2	30.5
1947-48	320	319	115	92	36.2	27.3
1948-49	311	314	99	56	31.5	18.9
GJERPEN						
1940-41	103	95	33	25	34.5	27.2
1941-42	114	87	50	23	44.6	27.0
1942-43	117	89	65	34	57.4	40.8
1943-44	100	85	71	48	73.0	53.5
1944-45	104	100	77	69	73.8	67.5
1945-46	120	121	103	91	86.1	74.7
1946-47	141	137	115	97	80.9	71.3
1947-48	131	122	101	78	77.6	65.0
1948-49	121	120	95	81	79.0	67.8

¹ Adjusted to an equal number of children for each half-year of age and weighted for each half-year according to distribution of average number of erupted permanent teeth based on first three years.

² No examination in 1948-1949; and 7 year-old children only in 1947-1948.

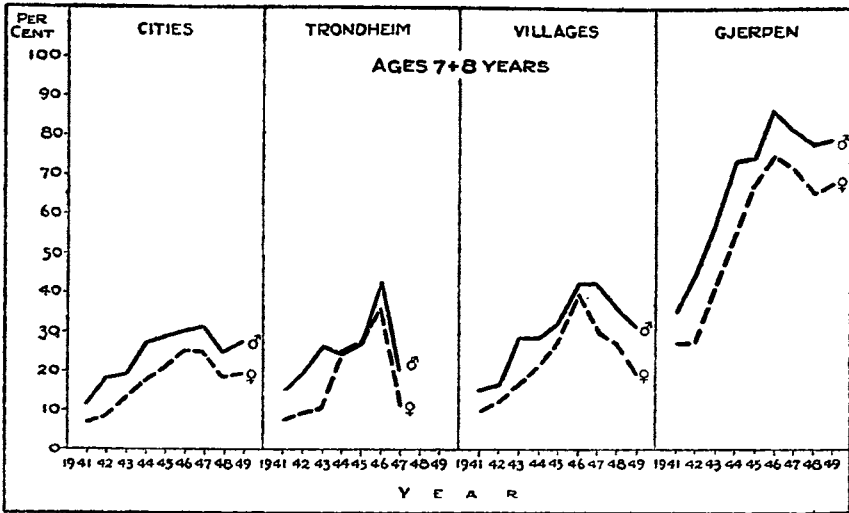


Fig. 21. Per cent of boys and of girls aged 7+8 years with caries-free permanent dentition in various communities during the period 1940-1941 to 1948-1949.

viduals in most countries of the Western world are free from dental caries. The child, starting with caries-free teeth, usually very early will acquire some caries, so that by the teen-age period not far from 100 per cent of children show evidence of past or present caries. Such high rates make impressive propaganda for prevention of this disease. Even if the percentage of diseased teeth among all permanent teeth is not nearly so high, certain groups of teeth, such as the molars, may have caries at almost the same high level. From a therapeutic point of view it is, of course, of great value to know the number or per cent of diseased teeth or diseased surfaces. In this publication, therefore, the usual DMF rates will be used to express dental health for the permanent dentition.

Before the rates for caries experienced by the children during the study period are examined, it is of interest to note the increase during the period in the percentages of children with caries-free permanent dentition. For boys and girls aged 7 and 8 years, the percentages with no caries in any erupted permanent tooth are shown in Table 17 and Figure 21. As will be seen, not more than from 7 to 15 per cent of the children in

combined cities, Trondheim, and villages had caries-free permanent teeth in 1940–1941. These rates increased considerably—about three to four times—up to 1945–1946, and then decreased. In Gjerpen the initial per cents as well as the later maximum per cents, also in 1945–1946, were much higher, 27–35 and 75–86 per cent, respectively for girls and for boys. In all four community groups, more boys than girls had caries-free dentition. In no instances are the figures for 1948–1949 as low as those for 1940–1941.

AVERAGE NUMBER OF DMF PERMANENT TEETH PER CHILD,
1940–1941 TO 1948–1949

The average numbers of DMF permanent teeth per child in the years 1941–1949, in four community groups—cities, Trondheim, villages, and Gjerpen—are shown in Figure 22 and Table 18 for age groups 7 + 8 years and 12 + 13 years.⁵

7 + 8 Year-Old Children. As will be seen from Figure 22, the initial average number of carious teeth per person, for children 7 + 8 years old, is about the same for cities, Trondheim, and villages, ranging from 3.2 to 4.0 DMF teeth. The averages decrease steadily each year until 1946 and then rise again. The values for Gjerpen are lower, and the reduction greater, but the shape of the curves is similar. The reduction for Gjerpen amounts to 2.3–2.4 and for the other groups 1.1 to 1.9 teeth per child. The percentage reduction varies from 75 to 85 per cent in Gjerpen and from 32 to 50 in the three other communities.

12 + 13 Year-Old Children. For the age group 12 + 13 years, the curves for cities and villages are practically identical throughout. In 1941, the first year, the average for boys is 11 DMF teeth and for girls 12.4 to 12.8. Here, too, we find a drop

⁵ Ages 7 and 8 years and ages 12 and 13 years have been combined in many of the charts and tables for the various DMF rates in order to reduce erratic annual variations by using larger numbers of children. In most instances, the DMF rates have not been adjusted for single years of age within the combined age groups. Rates adjusted for age by single years and by half-years were computed for many population groups but the results differed so little from the unadjusted rates that the latter have been used.

Table 18. Average number of permanent teeth DMF per child, by sex and age groups 7+8 and 12+13 years, for children in cities, Trondheim, villages and Gjerpen, 1940-1941 to 1948-1949.

AGE AND SCHOOL YEAR	Boys				GIRLS			
	Cities	Trondheim	Villages	Gjerpen	Cities	Trondheim	Villages	Gjerpen
AVERAGE NUMBER OF PERMANENT TEETH DMF PER CHILD ¹								
<i>Age 7+8 Years</i>								
1940-41	3.2	3.3	3.2	2.7	3.8	4.0	3.7	3.1
1941-42	3.1	3.0	3.2	2.1	3.4	3.6	3.4	2.9
1942-43	2.9	2.9	2.5	1.5	3.3	3.3	3.1	2.1
1943-44	2.5	2.6	2.4	0.9	2.7	2.8	2.9	1.2
1944-45	2.5	2.4	2.3	0.7	2.6	2.5	2.4	0.9
1945-46	2.2	1.7	1.9	0.4	2.4	2.1	2.1	0.8
1946-47	2.2	2.8	1.9	0.6	2.5	3.6	2.4	0.9
1947-48	2.5	—	2.2	0.7	2.8	—	2.3	1.2
1948-49	2.3	a	2.2	0.6	2.7	a	3.0	1.1
<i>Age 12+13 Years</i>								
1940-41	11.0	12.0	11.0	10.2	12.4	12.6	12.8	10.6
1941-42	10.7	11.8	11.1	9.0	11.6	13.7	12.0	10.3
1942-43	9.7	11.3	10.0	8.2	11.0	13.0	11.2	8.9
1943-44	9.0	9.7	9.2	7.2	10.5	12.3	10.4	6.7
1944-45	7.9	8.7	8.5	6.3	10.0	10.8	9.5	6.9
1945-46	7.9	8.6	7.7	4.5	9.4	10.1	8.9	5.7
1946-47	7.1	9.8	7.7	3.9	8.8	12.2	9.1	4.8
1947-48	7.3	11.1	7.7	3.7	9.2	°	8.6	4.6
1948-49	7.8	a	7.7	3.8	8.8	a	8.8	3.7
NUMBER OF CHILDREN								
<i>Age 7+8 Years</i>								
1940-41	255	220	371	103	235	195	358	95
1941-42	306	299	364	114	346	271	392	87
1942-43	315	266	428	117	336	257	404	89
1943-44	327	165	394	100	315	143	339	85
1944-45	290	117	263	104	286	145	284	100
1945-46	355	155	388	120	274	155	376	121
1946-47	404	209	256	141	324	223	252	137
1947-48	411	b	320	131	397	b	319	122
1948-49	377	—	311	121	366	—	314	120
<i>Age 12+13 Years</i>								
1940-41	206	303	296	146	180	307	262	157
1941-42	168	283	266	138	176	298	240	151
1942-43	230	240	275	135	195	250	267	148
1943-44	304	146	333	135	330	167	300	132
1944-45	320	155	360	131	332	174	298	135
1945-46	270	211	400	130	292	235	379	112
1946-47	271	187	249	133	271	195	221	109
1947-48	276	110	296	132	311	°	280	94
1948-49	285	—	299	109	277	—	264	95

¹ Average number for whole mouth; average values for teeth on right side are multiplied by two.

a No examinations in 1948-1949.

b Seven-year olds only in 1947-1948.

° Thirteen-year old girls only in 1947-1948.

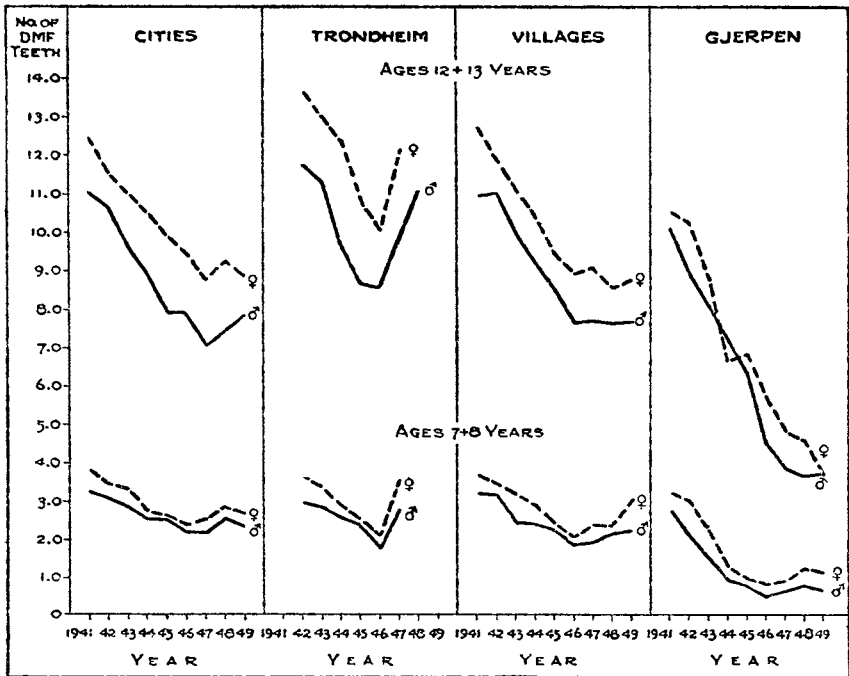


Fig. 22. Average number of permanent teeth DMF per child at ages 7 + 8 and 12 + 13 years in various communities, 1940-1941 to 1948-1949.

in the curves, the lowest level being reached in 1947 for cities, and 1946 to 1948 for villages. In Trondheim, values are somewhat higher, reached a low in 1946, and the upturn, after 1946, is sharper. Gjerpen shows definitely lower values in this age group, as at the younger ages, and the curves drop steadily until 1949. From 1940-1941 to the lowest value, the reduction in the average number of carious teeth per child in cities and in villages amounts to 3.3-4.2, with a percentage reduction of 30-36. In Gjerpen the corresponding figures are 6.5-6.9 teeth and 64-65 per cent.

Figure 23 shows the average number of DMF teeth per child for each of the ages 7, 8, 12, and 13 years separately in the same four community groups. Curves for single years of age are somewhat irregular but there is no essential difference in the trends from those shown in Fig. 22. The increase with age in the average number of DMF teeth is demonstrated in Fig.

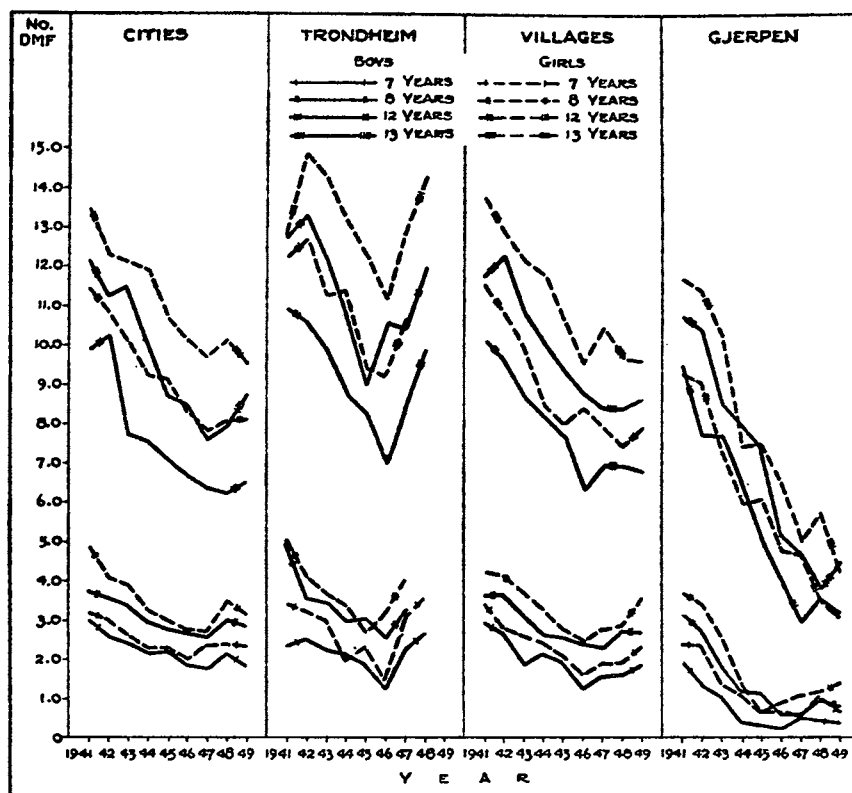


Fig. 23. Average number of permanent teeth DMF per child at ages 7, 8, 12 and 13 years in various communities, 1940-1941 to 1948-1949.

23. This reflects both an increase in the number of teeth erupted and in the number of teeth affected by caries.

DMF TEETH AS PERCENTAGES OF TOTAL ERUPTED PERMANENT TEETH

The percentages of the erupted permanent teeth that were found to be decayed, missing, or filled for boys and girls examined each year from 1940-1941 to 1948-1949 describe changes in the development of caries during the period better than the average numbers of DMF teeth since the time of eruption of permanent teeth was not constant throughout these years. The percentages of the total erupted permanent teeth that were DMF are shown in Table 19 for boys and for girls at ages

Table 19. Per cent of total permanent teeth DMF for boys and girls at ages 7+8 years and 12+13 years in cities, Trondheim, villages, Gjerpen and rural districts, 1940-1941 to 1948-1949.

AGE AND SCHOOL YEAR	Boys					GIRLS				
	Cities	Trond-heim ¹	Vil-lages	Gjerpen	Rural Dis-tricts	Cities	Trond-heim ¹	Vil-lages	Gjerpen	Rural Dis-tricts
PER CENT OF TOTAL PERMANENT TEETH DMF										
<i>Age 7+8 Years</i>										
1940-41	34.5	36.5	33.4	27.7	36.4	34.9 ^a	40.7	34.8	28.5	36.3
1941-42	30.3	32.9	31.8	20.3	30.5	31.7	35.0	32.0	26.9	32.0
1942-43	29.1	31.0	25.1	15.3	29.4	30.0	33.8	29.0	19.9	29.2
1943-44	25.3	27.8	25.2	8.5	22.5	25.6	26.6	27.9	11.6	23.0
1944-45	25.1	25.3	24.1	7.8	17.8	25.6	24.7	24.0	8.7	18.3
1945-46	23.9	18.8	19.8	4.6	16.5	22.6	20.5	20.0	7.4	14.8
1946-47	23.9	29.7	20.6	6.4	19.5	24.8	35.2	23.4	8.5	19.6
1947-48	27.6	^a	23.3	7.8	22.1	27.5	^a	23.4	11.1	24.7
1948-49	24.6	—	23.8	6.4	23.7	25.3	—	28.3	10.0	24.3
<i>Age 12+13 Years</i>										
1940-41	42.2	45.5	42.5	39.6	43.2	46.4	46.4	48.2	40.2	49.4
1941-42	41.5	45.9	42.8	34.7	46.4	43.2	51.2	45.4	39.0	49.9
1942-43	38.5	43.9	38.6	32.4	39.4	41.7	49.0	42.2	33.5	43.3
1943-44	35.4	38.0	36.8	28.8	36.7	39.9	46.7	39.5	24.9	37.3
1944-45	31.8	33.6	34.0	25.2	31.8	38.1	41.0	36.4	26.0	34.2
1945-46	31.3	33.7	30.7	18.7	28.6	35.7	38.7	34.2	21.7	29.1
1946-47	28.6	38.5	30.9	15.8	26.6	33.7	46.6	35.1	18.4	28.1
1947-48	28.9	44.5	31.1	14.6	30.7	35.2	^b	33.1	18.3	29.5
1948-49	31.1	—	31.9	15.3	25.9	33.9	—	34.4	14.6	28.2
NUMBER OF ERUPTED PERMANENT TEETH										
<i>Age 7+8 Years</i>										
1940-41	1,200	1,007	1,791	506	338	1,283	958	1,900	519	422
1941-42	1,552	1,362	1,823	582	223	1,864	1,411	2,103	476	278
1942-43	1,548	1,233	2,093	570	228	1,848	1,262	2,182	478	319
1943-44	1,623	766	1,887	505	355	1,659	762	1,760	439	549
1944-45	1,440	549	1,233	489	432	1,457	736	1,417	520	568
1945-46	1,617	714	1,816	566	577	1,446	785	1,937	632	561
1946-47	1,842	987	1,198	652	478	1,639	1,128	1,278	718	450
1947-48	1,899	—	1,481	625	389	2,051	—	1,588	659	389
1948-49	1,766	—	1,454	596	414	1,940	—	1,671	643	452
<i>Age 12+13 Years</i>										
1940-41	2,697	3,991	3,828	1,871	969	2,411	4,156	3,465	2,063	731
1941-42	2,158	3,627	3,442	1,782	757	2,356	3,986	3,165	1,987	751
1942-43	2,889	3,086	3,549	1,699	574	2,573	3,314	3,537	1,959	1,054
1943-44	3,860	1,868	4,180	1,690	1,013	4,363	2,204	3,962	1,763	1,255
1944-45	3,993	1,995	4,530	1,640	1,107	4,341	2,289	3,882	1,781	1,242
1945-46	3,413	2,676	5,017	1,581	1,129	3,851	3,058	4,948	1,464	1,274
1946-47	3,342	2,388	3,107	1,641	890	3,527	2,554	2,870	1,427	1,047
1947-48	3,502	1,375	3,655	1,653	798	4,088	^b	3,627	1,182	920
1948-49	3,597	—	3,624	1,343	868	3,613	—	3,377	1,200	1,088

¹ No examinations in 1948-1949.^a Seven year-olds only examined in 1947-1948.^b Thirteen year-old girls only examined in 1947-1948.

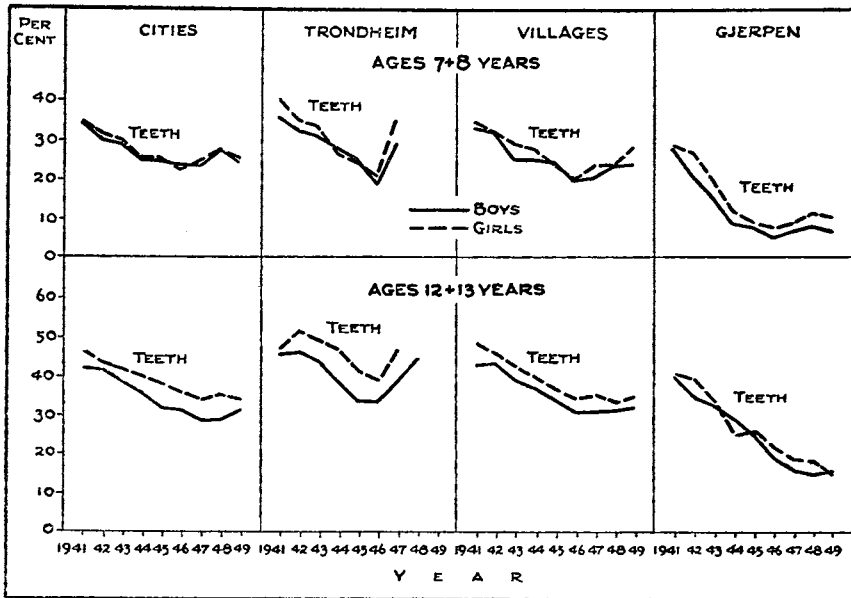


Fig. 24. Per cent of total permanent teeth DMF at ages 7 + 8 years and 12 + 13 years in various communities, 1940-1941 to 1948-1949.

7 and 8 years combined and at ages 12 and 13 years combined for each of the community groups. Trends in the DMF rates are depicted in Fig. 24.

Ages 7 + 8 Years. At ages 7 and 8 years, the percentages for DMF teeth are highest in the first year 1940-1941 and decrease to the lowest percentage in 1945-1946 in the combined cities, Trondheim, combined villages, Gjerpen, and in the combined rural districts.⁶ After 1946, there is an increase in the DMF

⁶ Variation among annual DMF rates for specific sex-age groups in each of the groups of communities and in the communities shown separately is significant at the .01 level or less by the χ^2 test of significance for variation among a series of percentages, and the differences between minimum and maximum DMF rates are highly significant. This estimate of the probability that the observed variation could occur from chance alone depends on an assumption that data for each year are for independent, randomly selected individuals in the given populations, a condition which does not fully apply to these data for several reasons: (1) the number of teeth on which the DMF per cent is based is not a completely independent number of observations since one tooth is not "independent" of all other teeth in the same mouth in the usual statistical sense; (2) the populations examined are not distributed equally each year among the various schools and communities in the combined community groups and in a single community are not distributed equally each year among different schools; so that there is a possibility of some selective variation as a result of differences in the populations examined or differences in

(Continued on page 143)

rates. These changes are consistent for both boys and girls.

Although the trends in DMF rates are similar for the different community groups, the amount of the reduction from 1941 to 1946 varies. In the cities, for boys the DMF rate decreased from 34.5 to 23.9 per cent, a reduction of 31 per cent; in villages, the rates were 33.4 and 19.8 per cent, a reduction of 41 per cent. In Trondheim, the DMF rate for boys decreased 49 per cent, and in Gjerpen the DMF rate for boys was only 4.6 in 1945-1946 giving a percentage reduction of 83. For the combined rural districts, the DMF percentages for boys decreased from 36.4 in 1941 to 16.5 in 1946, a decrease of 54 per cent.

As may be seen in Fig. 24, DMF rates for girls show approximately the same reduction as the DMF rates for boys in each of the community groups.

Ages 12 + 13 Years. At ages 12 and 13 years, the percentages of the total permanent teeth that were DMF showed a downward trend in all the community groups, but there was very little or no decrease in rates until 1942-1943 and the minimum rates did not occur in the same year in the different communities. However, most of the reduction in DMF rates occurred from 1941-1942 to 1945-1946, and, in the following three years, changes in DMF rates were very small in the various community groups, with the exception of Trondheim.

The DMF rates at ages 12 + 13 years were almost the same in cities as in villages throughout the period 1941 to 1949 both among boys and among girls. Among boys, the DMF rate for diagnostic standards of the examining dentists; and (3) rates for successive years for children aged 7 + 8 years, or 12 + 13 years, are not based on independent populations since most of the children 7 or 12 years of age in one school year are included at ages 8 or 13 in the next year. When the third factor of correlation between successive ages in successive years is eliminated by computing annual rates for single years of age, the variation among annual rates for the different communities is significant at the .01 level or less; but the effect of the other two factors cannot so easily be eliminated. Since the usual statistical measures of variation in rates that might be expected as a result of simple random sampling are not appropriate to these data the results of such tests are not given. Patterns of change are of principal interest, as previously stated, and the validity of specific trends in dental caries in these communities is based chiefly on consistency of these patterns. Some fairly large irregularities in rates from year to year for a community group may result from a combination of several types of sampling and error variation; and, on the other hand, small changes from year to year may have real significance if part of a consistent pattern.

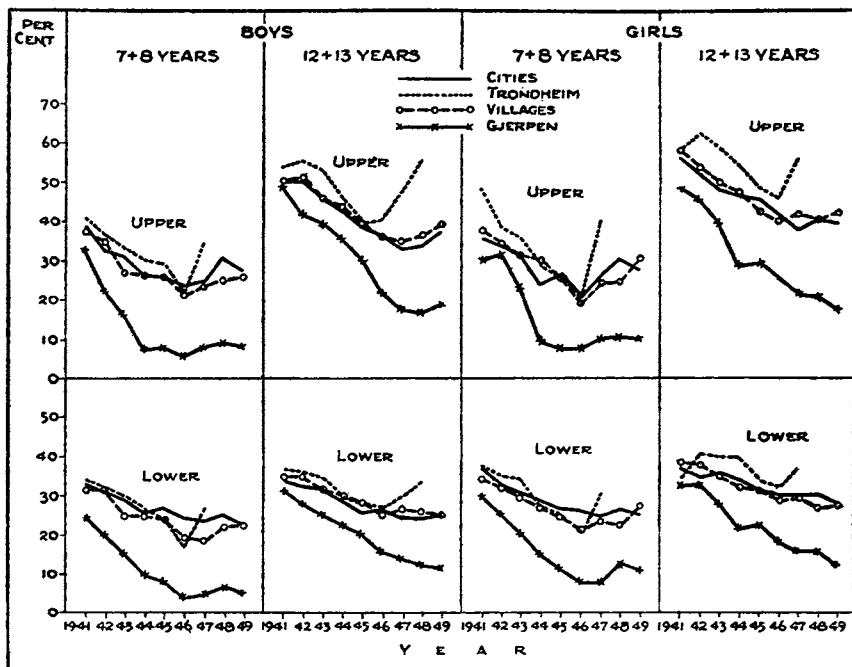


Fig. 25. For total permanent teeth in the upper jaw and for those in the lower jaw, the per cent DMF at ages 7+8 years and at ages 12+13 years in various communities, 1940-1941 to 1948-1949.

permanent teeth was 42 per cent in 1940-1941 in cities and in villages. The percentage in cities decreased to 28.6 in 1946-47 and in villages to 30.7 in 1945-1946, reductions of 32 and 28 per cent, respectively. Among girls, the reduction in the DMF rates was 27 per cent in cities and 31 per cent in villages from initial rates of 46 and 48 per cent DMF teeth.

In Trondheim, the maximum DMF rates were recorded in 1941-1942, 45.9 and 51.2 for boys and girls, respectively. The decrease in rates amounted to 27 per cent for boys and 24 per cent for girls in 1945-1946, and in this City there was a definite rise in the DMF rates in the school year 1946-1947.⁷

The greatest reduction in the percentage of DMF teeth is found for Gjerpen. From rates of 40 per cent in 1940-1941 for both boys and girls, the rates decreased to 15 per cent, a reduc-

⁷Examinations were done in a reduced number of schools in Trondheim in 1947-1948. For the children examined, the DMF rates showed a further increase over the preceding year. No children were examined in 1948-1949.

Table 20. Per cent of total permanent teeth DMF in the upper and lower jaws separately for 7+8 and 12+13-year old children in cities, Trondheim, villages and Gjerpen, 1940-1941 to 1948-1949.

AGE AND SCHOOL YEAR	UPPER JAW				LOWER JAW			
	Cities	Trondheim ²	Villages	Gjerpen	Cities	Trondheim ²	Villages	Gjerpen
BOYS—PER CENT OF TEETH DMF								
<i>Ages 7+8 Years¹</i>								
1940-41	38.7	40.9	37.4	33.0	33.2	33.8	31.6	24.5
1941-42	32.7	36.6	34.5	22.0	30.6	31.3	31.3	19.9
1942-43	31.2	33.0	26.9	16.2	29.0	29.9	24.8	15.0
1943-44	26.4	30.2	26.5	7.5	25.7	26.7	25.0	9.7
1944-45	25.9	29.6	26.2	8.1	26.6	23.6	23.7	8.1
1945-46	23.8	22.0	21.4	5.8	24.4	16.4	19.1	3.8
1946-47	25.0	34.8	23.5	8.2	23.7	26.8	18.4	4.9
1947-48	30.9	—	25.0	9.1	25.3	—	22.0	6.9
1948-49	27.9	—	25.9	8.0	22.8	—	22.3	5.2
<i>Ages 12+13 Years</i>								
1940-41	50.5	54.3	50.4	48.3	34.2	36.7	34.8	31.1
1941-42	50.3	55.6	50.9	41.7	32.6	36.2	34.8	27.7
1942-43	45.8	53.0	45.8	39.8	31.4	34.7	31.7	25.1
1943-44	42.5	46.1	43.6	35.4	28.4	29.8	30.1	22.4
1944-45	38.3	39.2	39.7	30.5	25.4	28.2	28.3	20.1
1945-46	36.4	40.3	36.0	21.9	26.4	27.3	25.5	15.6
1946-47	32.8	47.4	35.0	17.6	24.6	29.8	26.9	14.0
1947-48	33.7	55.5	36.5	16.7	24.2	33.9	25.8	12.5
1948-49	37.5	—	39.1	19.2	24.9	—	25.0	11.5
GIRLS—PER CENT OF TEETH DMF								
<i>Ages 7+8 Years¹</i>								
1940-41	35.9	48.4	37.7	30.2	37.0	37.5	34.4	29.9
1941-42	33.7	38.5	34.3	31.9	32.5	35.0	31.9	25.2
1942-43	31.5	35.8	30.7	22.7	30.7	34.3	29.6	20.0
1943-44	24.1	28.7	30.0	9.5	28.8	27.1	27.2	14.2
1944-45	26.2	25.2	24.9	7.7	26.7	25.4	24.4	10.5
1945-46	20.6	20.8	19.2	7.4	26.2	20.9	21.3	7.9
1946-47	25.7	40.4	24.3	10.1	25.1	31.2	23.2	7.6
1947-48	30.3	—	24.4	10.3	26.5	—	22.5	12.6
1948-49	27.5	—	30.6	10.0	24.9	—	27.4	10.5
<i>Ages 12+13 Years</i>								
1940-41	56.1	58.0	57.8	48.4	36.8	34.7	38.8	32.3
1941-42	52.0	62.0	53.4	45.6	34.4	40.3	37.6	32.5
1942-43	48.1	58.6	49.8	39.8	35.4	39.5	34.7	27.4
1943-44	46.2	54.0	47.1	28.6	33.6	39.5	32.1	21.3
1944-45	45.5	48.5	42.1	29.7	30.8	33.6	30.8	22.4
1945-46	41.4	45.5	39.8	25.8	30.1	31.9	28.6	17.7
1946-47	38.1	56.2	41.4	21.4	29.5	37.2	28.9	15.6
1947-48	40.4	—	40.0	21.0	30.1	—	26.3	15.7
1948-49	39.8	—	42.1	17.5	28.2	—	27.0	11.8

¹ Only incisors and first molars included at ages 7+8 years.² No examinations in 1948-1949; in 1947-1948, 8 year-old children and 12 year-old girls not examined.

tion of 63 per cent. The minimum rates occurred in 1947 to 1949.

For the combined rural districts, the percentage reduction from 1940-1941 rates was 40 for boys and 43 for girls, and minimum rates were recorded in 1946-1947.

DMF Rates for Upper and Lower Jaws. The percentages of the total erupted permanent teeth in the upper and lower jaw separately that were decayed, missing or filled are shown for boys and girls aged 7 + 8 years and 12 + 13 years in each community group in Fig. 25 and Table 20. For both jaws, the DMF rates decreased considerably in the period 1940-1941 to 1948-1949. At ages 7 + 8 years, the lowest DMF rates for the upper teeth are in 1945-1946 for both boys and girls in combined cities, Trondheim, combined villages and in Gjerpen, and there is a tendency for the rates to increase in 1946-1947. For teeth in the lower jaw, the minimum DMF rates are in 1945-1946 or 1946-1947 and there are very small differences between these two years for each sex in all community groups except Trondheim where rates were higher in 1946-1947. At ages 12 + 13 years, the lowest rates were recorded from 1945-1946 to 1948-1949. For teeth in the upper jaw, there is a slight increase in DMF rates in 1947-1948 or 1948-1949 except among girls in Gjerpen. Rates for the lower jaw continued downward or leveled off after 1945-1946 except in Trondheim.

Differences between the caries rates for the upper and lower jaw are small for girls and somewhat larger for boys aged 7 + 8 years of age. At these ages only the incisors and first molars have been considered. The lower first molar has a higher caries rate than the upper but the lower incisors have lower caries rates than the upper. These differences are nearly counterbalanced at ages 7 + 8 years. Differences in caries rates for individual teeth are discussed in the next section.

In the 12 + 13 year-old groups, rather large differences in the DMF rates for the two jaws are apparent. In the cities, Trondheim, and in villages, rates for the lower jaw in 1940-1941 range from 34 to 37 per cent for boys and 35 to 39 per cent for

girls compared with rates for the upper jaw of 50 to 54 per cent for boys, 56 to 58 per cent for girls. The values for Gjerpen are lower but the same relationship is present. The maximum reduction in Gjerpen was about 64 per cent both in the upper and in the lower jaw. In cities and villages, the maximum reduction in DMF rates for the upper jaw was 28 to 35 per cent and for the lower jaw was slightly less for corresponding community and sex groups.

The magnitude of the difference between the upper and lower jaw at ages 12 + 13 years is explained by an increase in the excess of caries in upper incisors as compared to caries in lower incisors as age advances whereas the difference between upper and lower first molars is eliminated since nearly all first molars are carious by age 12 + 13 years.

DMF RATES FOR SPECIFIC TEETH IN THE UPPER AND LOWER JAWS

For specific permanent teeth erupted, the percentages DMF are shown in Table 21a and b for boys and girls aged 7 + 8 in each of the community groups. Corresponding percentages are given in Tables 22a and b for ages 12 + 13. Figure 26 illustrates changes in the DMF status of each tooth during the period 1941 to 1949 for boys and girls aged 7 + 8 years and 12 + 13 years in the villages, and is representative of findings in the cities. This chart demonstrates clearly the relative caries rates for the specific permanent teeth in these age groups. The order of susceptibility of the various teeth is the same as that usually found. For every morphological type of tooth, in boys and in girls, each curve declines from the levels of 1941 or 1942. At ages 7 + 8 years, the lowest values are found in 1945 or 1946; after these years the rates rise except those for the lower incisors. At ages 12 + 13 years, the school years with the lowest values are not identical for the different teeth and vary from 1946 to 1949. The teeth with the shortest post-eruptive age—the second molars and the upper cuspids—usually follow the pattern of the 7 + 8 year old group, whereas the teeth with the

Table 21a. Per cent DMF for specific teeth at ages 7+8 years in cities, Trondheim, villages, Gjerpen and rural districts, 1940-1941 to 1948-1949, and 1951-1952 and 1952-1953 in Gjerpen.

AGE AND SCHOOL YEAR	BOYS—7+8 YEARS						GIRLS—7+8 YEARS					
	Central Incisor		Lateral Incisor		First Molar		Central Incisor		Lateral Incisor		First Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
CITIES												
1940-41	5.0	2.9	6.5	2.4	75.0	84.1	7.7	9.9	9.9	5.2	75.6	90.5
1941-42	3.0	4.4	5.0	3.9	67.6	77.6	5.4	3.5	9.4	2.2	70.1	85.7
1942-43	4.0	2.3	9.4	1.8	61.5	74.3	4.9	2.1	7.1	1.1	67.9	82.9
1943-44	2.4	0.9	3.3	1.3	54.3	68.2	2.3	1.0	0	0.4	55.3	78.7
1944-45	0.4	0.4	1.9	0.5	56.4	70.8	1.8	0.7	4.0	0	57.0	73.3
1945-46	0.4	0.3	1.1	0.5	47.7	63.3	1.3	0.4	1.6	0.5	47.0	71.6
1946-47	2.0	1.3	3.7	0.4	49.1	61.0	1.6	0.6	6.8	0	54.7	67.9
1947-48	3.5	0.7	8.1	0.8	59.9	66.8	4.7	1.3	9.4	0.3	62.5	71.6
1948-49	0.7	0.5	3.2	0.8	58.0	60.7	3.8	0.6	4.1	0.7	61.4	68.5
TRONDHEIM ¹												
1940-41	8.3	5.4	17.9	4.7	71.2	78.4	15.7	9.0	23.5	5.3	81.8	87.1
1941-42	4.9	4.1	5.0	2.7	67.7	74.0	9.3	5.4	8.0	1.5	76.6	88.1
1942-43	5.6	5.2	9.5	6.0	62.0	68.8	6.4	3.7	5.8	1.2	70.6	86.3
1943-44	2.4	1.3	0	1.0	62.4	69.0	2.4	2.8	7.2	0.9	63.7	73.2
1944-45	3.7	1.8	2.7	1.4	57.7	59.1	0.9	0.7	1.4	0	56.6	69.5
1945-46	0.9	0	7.7	0	41.3	42.9	3.8	0.7	6.7	0	41.8	57.7
1946-47	2.6	1.9	9.4	0.7	68.0	70.1	10.4	3.2	14.3	3.7	79.5	79.2
VILLAGES												
1940-41	5.7	3.3	6.4	2.6	73.3	81.9	7.2	6.8	10.6	4.7	77.8	86.9
1941-42	5.3	4.2	5.7	2.3	71.9	79.9	6.5	3.4	11.6	3.8	72.8	83.1
1942-43	2.7	2.2	5.5	1.3	55.6	64.0	6.0	2.5	4.6	1.6	67.3	79.1
1943-44	2.6	1.3	4.8	1.5	54.4	64.5	6.9	0.9	8.3	0.7	62.0	74.8
1944-45	1.1	1.2	2.4	0.6	53.2	61.7	2.7	0	3.1	0	54.1	66.5
1945-46	2.4	1.4	4.6	1.3	41.6	47.2	2.5	0.8	4.3	1.1	41.3	56.9
1946-47	4.0	0.8	8.8	0.6	44.1	48.2	4.2	0.4	7.7	0	49.6	64.3
1947-48	4.2	0.6	6.2	0	48.7	58.9	4.6	0.6	6.7	0	50.3	62.7
1948-49	3.8	0.3	3.8	0	51.9	59.4	4.2	1.0	6.8	0.8	67.6	75.8
GJERPEN												
1940-41	8.5	5.9	13.2	2.7	61.2	60.0	12.2	8.7	14.8	5.1	56.2	72.0
1941-42	1.1	0.9	4.4	1.1	48.1	54.1	13.3	2.3	12.5	1.4	59.5	68.2
1942-43	3.6	0.9	2.4	0	30.2	39.3	5.4	0	9.1	0	44.7	55.7
1943-44	1.2	1.0	0	1.4	16.5	24.2	0	2.4	0	0	22.8	36.9
1944-45	2.6	0	0	0	14.9	20.6	1.2	1.0	0	0	16.8	27.6
1945-46	0	0	0	0	11.8	10.0	0	0	0	0	17.9	21.8
1946-47	3.9	0	10.0	0	10.9	12.9	1.8	0.7	4.4	0.9	20.1	19.9
1947-48	1.9	0	2.2	1.1	17.5	18.4	2.9	1.7	2.8	1.0	21.6	32.8
1948-49	2.1	0	2.0	0	15.4	14.4	2.0	0.9	4.8	0	19.8	28.3
1951-52	1.7	0	2.1	0	29.2	25.9	8.0	0	10.8	0	32.5	38.9
1952-53	2.6	0	6.8	0.7	31.4	33.7	6.0	1.6	8.3	1.3	41.7	49.2
RURAL DISTRICTS												
1940-41	11.1	9.1	23.1	4.1	77.8	79.7	10.6	8.8	11.1	6.4	74.7	88.8
1941-42	5.4	0	11.1	0	69.0	83.3	0	2.0	7.4	0	80.4	88.0
1942-43	2.6	2.2	0	0	71.7	71.1	1.8	0	7.4	0	66.7	81.7
1943-44	0	0	4.2	0	54.2	54.2	1.1	0	2.0	0	60.6	58.1
1944-45	0	0	0	0	38.1	52.3	1.1	0	2.0	0	44.0	49.1
1945-46	0	0	1.9	0	35.8	48.6	0	0	0	0	30.9	45.4
1946-47	0	0	4.9	0	43.8	56.2	1.4	0	4.8	0	38.8	61.2
1947-48	3.3	0	6.7	0	53.2	53.9	0	0	0	0	55.8	67.5
1948-49	0	0	0	0	60.3	63.3	0	0	0	0	59.1	65.2

¹ No examinations in Trondheim in 1948-1949; and 8 year-olds not examined in 1947-1948.

Table 21b. Number of specific permanent teeth erupted at ages 7+8 years in cities, Trondheim, villages, Gjerpen and rural districts, 1940-1941 to 1948-1949, and 1951-1952 and 1952-1953 in Gjerpen.

AGE AND SCHOOL YEAR	BOYS—7+8 YEARS						GIRLS—7+8 YEARS					
	Central Incisor		Lateral Incisor		First Molar		Central Incisor		Lateral Incisor		First Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
CITIES												
1940-41	180	241	77	170	236	246	209	232	111	192	221	232
1941-42	233	298	119	233	293	299	297	341	160	275	338	343
1942-43	251	306	106	217	301	311	288	328	182	272	333	334
1943-44	253	317	120	237	317	321	266	312	151	238	304	310
1944-45	227	281	107	199	273	284	227	285	125	213	270	281
1945-46	253	338	90	216	333	343	238	270	123	207	264	271
1946-47	295	391	109	247	377	390	255	317	147	240	309	321
1947-48	310	401	123	258	389	391	321	392	191	298	379	391
1948-49	281	367	124	250	355	361	317	359	193	292	355	362
TRONDHEIM ¹												
1940-41	144	203	67	129	205	213	140	189	68	131	187	194
1941-42	203	267	80	187	288	296	215	257	125	197	265	268
1942-43	197	248	84	168	255	260	188	245	103	173	248	255
1943-44	123	159	54	103	157	158	123	141	69	112	135	138
1944-45	82	112	37	74	111	115	117	142	69	106	143	141
1945-46	111	152	39	96	150	154	131	152	60	116	146	149
1946-47	153	206	64	138	197	201	183	221	105	161	210	221
VILLAGES												
1940-41	283	361	110	272	345	359	307	352	161	296	343	352
1941-42	302	357	141	261	345	354	340	385	215	318	372	390
1942-43	335	417	164	299	405	419	351	397	217	320	391	398
1943-44	302	380	147	262	373	383	291	334	169	268	326	333
1944-45	188	251	84	171	250	253	226	271	128	208	268	278
1945-46	286	368	130	235	377	381	316	365	187	281	363	369
1946-47	199	252	80	165	245	247	212	245	117	193	246	244
1947-48	236	308	113	209	298	304	259	317	149	234	300	303
1948-49	239	298	104	203	293	298	284	310	161	256	306	310
GJERPEN												
1940-41	82	102	38	75	98	100	82	92	54	79	89	93
1941-42	94	113	45	88	106	111	75	87	48	70	84	85
1942-43	84	114	41	83	116	117	74	88	44	69	85	88
1943-44	81	97	48	73	97	99	74	82	37	66	79	84
1944-45	76	99	33	59	101	102	81	96	46	72	95	98
1945-46	91	115	33	77	119	120	100	120	68	92	117	119
1946-47	103	137	40	91	138	139	114	135	68	109	134	136
1947-48	103	129	46	92	126	125	105	120	71	100	116	122
1948-49	97	120	49	89	117	118	100	117	63	96	116	120
1951-52	121	164	47	113	154	162	138	168	83	131	166	167
1952-53	153	201	88	144	204	202	166	193	108	154	192	193
RURAL DISTRICTS												
1940-41	54	66	26	49	63	64	66	80	36	63	79	80
1941-42	37	41	18	36	42	42	42	51	27	37	51	50
1942-43	38	45	16	33	46	45	56	61	27	48	60	60
1943-44	49	71	24	50	72	72	87	102	51	78	104	105
1944-45	68	84	39	61	84	86	88	108	49	80	109	110
1945-46	95	110	52	84	106	107	92	108	43	84	110	108
1946-47	82	93	41	71	89	89	71	88	42	66	85	85
1947-48	61	79	30	59	77	76	61	76	29	62	77	77
1948-49	67	84	34	59	78	79	75	88	36	67	88	89

¹ No examinations in 1948-1949 in Trondheim; and 8 year-old children not examined in 1947-

Table 22a. For 12+13 year old boys in cities, Trondheim, villages, Gjerpen and rural districts, the percentages of specific permanent teeth that were decayed, missing or filled in each year from 1940-1941 to 1948-1949.

SCHOOL YEAR	BOYS—PER CENT OF TEETH DMF													
	Central Incisor		Lateral Incisor		Cuspid		First Bicuspid		Second Bicuspid		First Molar		Second Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
CITIES														
1940-41	57.8	26.7	59.3	23.8	14.3	6.0	37.2	7.8	39.8	18.2	94.7	97.1	41.2	58.5
1941-42	62.5	22.0	57.8	17.3	11.3	3.1	36.5	3.9	31.4	18.7	98.2	98.8	43.5	66.9
1942-43	50.9	22.3	55.6	19.1	7.7	3.6	25.6	5.4	26.8	14.1	96.1	96.9	46.4	55.9
1943-44	47.4	16.8	49.5	14.1	3.6	0.7	23.9	3.3	22.9	10.0	96.7	98.4	43.3	53.0
1944-45	40.6	12.2	40.3	8.4	1.5	0.3	25.2	2.5	20.2	8.6	95.0	96.9	32.4	47.8
1945-46	34.8	12.2	35.8	7.0	1.4	0.8	20.6	3.3	16.0	7.6	96.3	97.4	38.6	54.8
1946-47	29.5	7.4	31.4	3.7	1.4	0.8	10.7	2.9	8.9	7.9	95.6	95.9	46.3	53.9
1947-48	31.5	6.2	32.1	4.3	3.5	1.1	16.9	0.8	13.1	5.7	90.6	92.8	43.0	57.1
1948-49	40.0	5.3	38.0	3.5	3.6	0	18.7	5.1	19.5	12.1	88.7	90.1	45.0	59.4
TRONDHEIM ¹														
1941-42	59.6	23.0	65.3	20.1	10.5	3.3	45.4	17.1	37.7	28.4	97.5	97.2	65.1	66.4
1942-43	63.3	25.9	65.2	19.2	10.9	5.2	39.9	13.0	31.1	19.0	97.1	97.9	53.7	60.8
1943-44	56.2	25.3	57.3	15.8	6.6	0	27.3	4.8	23.3	10.6	95.2	98.6	47.3	48.7
1944-45	39.1	23.9	47.4	11.0	4.1	0.7	23.6	5.8	17.3	12.5	96.1	96.8	35.4	43.7
1945-46	33.2	17.1	43.3	5.7	4.9	0.5	23.5	6.2	24.9	13.2	96.7	94.8	47.6	55.9
1946-47	45.5	11.2	45.5	7.5	7.6	1.1	31.8	4.8	34.1	17.2	96.8	97.3	69.4	72.9
1947-48	47.3	11.8	58.7	11.9	11.2	4.8	42.0	5.4	46.3	28.9	99.1	92.7	84.6	88.9
VILLAGES														
1940-41	58.8	21.3	56.4	17.2	9.7	2.8	33.1	11.9	34.0	27.2	95.9	98.0	59.9	69.0
1941-42	58.3	18.4	58.0	15.0	12.0	3.5	36.2	16.0	36.0	26.9	94.7	97.0	55.0	71.6
1942-43	57.1	19.3	53.3	16.0	5.8	0.8	26.6	10.2	22.4	19.9	95.6	97.5	50.0	58.2
1943-44	49.1	17.8	50.2	15.9	3.1	1.3	20.4	4.1	23.3	13.8	96.4	97.6	54.0	60.1
1944-45	42.8	14.7	42.0	10.6	1.7	0.6	18.4	5.8	19.4	11.7	96.4	97.2	48.7	56.9

1945-46	36.5	9.8	38.2	6.8	2.3	0.5	13.8	3.7	13.0	7.3	95.8	96.5	42.1	51.3
1946-47	33.7	6.8	32.9	3.6	2.5	0.8	14.5	4.5	11.7	10.8	93.6	97.2	49.7	68.3
1947-48	37.5	5.4	37.4	4.1	4.4	1.1	16.1	8.2	19.8	14.8	89.8	93.6	41.9	56.0
1948-49	41.5	4.7	42.0	4.0	8.1	1.1	16.9	7.5	25.0	16.8	83.6	86.9	45.3	56.7
GJERPEN														
1940-41	64.4	20.7	64.8	16.4	7.2	2.1	24.3	3.6	23.5	17.3	91.8	95.9	52.1	68.3
1941-42	55.1	16.8	56.2	14.5	4.3	0.8	21.6	4.8	12.6	7.0	89.1	89.9	44.4	60.0
1942-43	54.8	16.3	49.3	11.1	3.8	0	23.7	4.9	14.9	6.9	86.7	88.1	31.3	45.5
1943-44	54.8	17.9	43.9	12.6	2.8	0.8	10.9	3.4	10.9	1.9	89.6	88.9	15.6	23.5
1944-45	46.6	13.2	37.0	9.2	1.9	1.6	8.1	1.8	9.9	0	79.4	84.0	14.6	23.3
1945-46	28.7	5.4	21.9	2.3	0	0	3.4	0.9	4.8	2.2	68.5	75.4	8.5	15.8
1946-47	17.4	4.5	17.7	3.0	3.1	0	5.0	0	2.7	4.0	57.9	60.9	7.7	23.0
1947-48	24.2	1.5	23.3	0.8	0	0	1.6	1.7	1.9	2.0	50.0	56.1	3.9	24.0
1948-49	29.4	0.9	24.8	0.9	0	0	7.1	3.2	6.3	5.3	44.0	49.5	11.9	17.9
1951-52	37.8	2.2	35.8	3.9	2.2	0	4.2	1.2	4.3	4.0	52.8	60.6	12.9	26.7
1952-53	39.3	3.5	37.4	4.0	0	0	7.0	0	7.4	1.7	64.2	72.3	12.5	26.0
RURAL DISTRICTS														
1940-41	64.9	23.0	57.5	17.6	15.4	2.7	33.8	10.3	33.3	21.1	95.9	97.3	60.7	68.3
1941-42	70.7	25.9	63.2	17.2	13.0	3.4	40.4	14.5	44.2	28.6	94.8	96.6	61.9	74.0
1942-43	54.5	22.7	52.4	13.6	5.4	0	36.4	5.0	29.3	17.9	100.0	100.0	47.1	60.0
1943-44	45.7	23.5	40.3	16.0	3.1	2.7	21.9	4.2	23.6	6.9	97.5	100.0	57.4	58.7
1944-45	43.7	17.2	39.0	9.2	2.8	2.4	8.8	1.3	18.2	2.9	98.9	96.6	39.7	52.2
1945-46	39.3	15.7	33.3	6.7	2.7	0	6.0	2.5	12.3	2.9	95.5	93.3	34.9	40.3
1946-47	28.6	7.1	27.1	1.4	5.2	1.4	6.3	1.5	10.0	7.5	91.4	95.7	42.6	40.7
1947-48	17.7	3.2	27.9	3.2	7.5	1.6	18.3	3.8	24.5	15.9	91.9	93.5	50.0	65.5
1948-49	22.4	3.0	24.2	3.0	3.5	0	10.8	1.6	8.6	5.6	88.1	92.5	30.6	63.2

¹ No examinations in Trondheim in 1948-1949; 1940-1941 omitted, values of doubtful accuracy.

Table 22b. For 12+13 year old girls in cities, Trondheim, villages, Gjerpen and rural districts, the percentages of specific permanent teeth that were decayed, missing or filled in each year from 1940-1941 to 1948-1949.

SCHOOL YEAR	GIRLS—PER CENT OF TEETH DMF													
	Central Incisor		Lateral Incisor		Cuspid		First Bicuspид		Second Bicuspид		First Molar		Second Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	CITIES													
1940-41	70.6	27.2	67.2	20.0	18.6	6.1	45.5	12.7	35.7	24.5	97.8	97.8	52.7	71.2
1941-42	68.8	23.3	66.1	18.8	8.6	2.9	39.2	7.1	34.1	26.1	93.8	98.9	49.0	65.6
1942-43	61.0	27.7	57.3	19.5	2.7	3.6	31.8	7.0	32.2	22.4	96.9	98.5	51.0	71.4
1943-44	59.6	23.0	56.2	16.7	4.3	3.7	29.3	6.0	24.5	14.4	96.7	98.5	48.1	73.8
1944-45	57.2	19.6	55.0	13.6	3.1	2.1	26.4	2.2	21.7	10.3	97.3	97.3	50.8	71.5
1945-46	47.6	18.5	47.8	9.9	3.4	1.0	23.4	3.6	19.4	10.1	96.2	99.0	47.5	70.0
1946-47	35.9	14.0	42.7	11.1	3.0	0.4	17.0	4.6	18.3	13.1	94.8	98.5	51.6	66.1
1947-48	39.9	11.6	39.5	7.7	8.0	1.9	22.7	5.7	22.5	17.6	94.5	96.8	52.4	69.6
1948-49	43.3	5.8	39.3	4.3	7.4	2.6	21.1	4.2	22.5	16.2	92.4	94.6	46.9	71.5
	TRONDHEIM ¹													
1941-42	71.5	30.3	73.2	26.8	19.0	5.7	52.1	14.2	46.8	33.3	98.3	98.7	69.9	76.1
1942-43	67.6	35.3	68.1	27.7	17.9	6.9	48.0	12.2	39.3	23.6	97.6	99.6	65.3	72.3
1943-44	62.9	35.9	69.3	29.5	9.9	7.2	35.0	9.7	34.4	21.0	97.6	99.4	66.9	73.2
1944-45	58.6	28.2	55.9	17.3	7.9	4.8	33.3	7.9	30.7	17.4	98.9	98.3	47.2	61.1
1945-46	51.5	25.1	53.0	15.3	5.0	0.9	27.4	6.8	22.3	15.3	98.3	98.3	54.4	60.3
1946-47	59.0	21.5	57.5	16.5	19.4	5.7	42.2	9.1	37.1	22.1	98.5	97.9	78.1	89.3
1947-48 ²														
	VILLAGES													
1940-41	66.3	20.6	61.4	16.0	19.8	6.9	41.3	14.9	43.8	38.3	97.3	98.1	72.0	82.8
1941-42	62.5	20.8	55.1	15.0	15.5	8.4	36.1	14.5	35.6	31.6	97.9	97.9	67.2	81.3
1942-43	61.8	22.5	57.0	13.9	10.8	4.6	27.0	9.3	31.5	21.6	97.8	97.0	58.3	77.9
1943-44	56.7	19.3	55.7	12.0	7.4	2.4	20.5	6.5	27.9	16.4	96.7	99.0	61.6	71.0
1944-45	49.0	19.1	48.8	10.8	4.1	1.4	18.8	5.0	19.4	16.3	97.3	99.0	52.7	64.8

	46.4	15.3	48.8	10.0	2.4	1.9	18.2	3.0	17.2	10.1	95.8	98.4	43.9	62.0
1945-46	46.4	15.3	48.8	10.0	2.4	1.9	18.2	3.0	17.2	10.1	95.8	98.4	43.9	62.0
1946-47	48.0	10.4	44.7	5.9	4.6	0.5	18.4	5.2	18.7	15.1	96.4	98.2	54.4	73.0
1947-48	41.8	4.3	42.2	4.3	5.5	0.7	18.7	4.1	22.0	14.2	90.6	94.2	55.2	66.4
1948-49	47.3	2.7	46.1	1.5	8.5	1.1	21.9	6.4	25.7	18.4	91.3	92.8	46.4	71.0
	GJERPEN													
1940-41	66.2	16.6	55.2	14.6	10.9	6.4	26.8	7.8	27.5	16.8	92.4	94.9	54.8	73.6
1941-42	58.9	19.9	59.3	17.2	9.1	4.8	27.9	7.0	26.1	15.7	90.1	94.7	39.7	69.3
1942-43	55.4	16.9	51.0	14.9	6.0	3.4	25.5	5.7	18.9	9.5	87.8	91.9	25.0	47.4
1943-44	43.9	13.6	38.5	13.0	3.3	2.3	9.2	0.8	9.8	5.2	78.0	87.1	10.3	24.2
1944-45	44.4	15.7	41.2	11.9	4.0	1.5	8.4	2.3	7.4	5.2	79.3	91.1	14.7	26.3
1945-46	38.4	9.0	29.1	5.4	3.0	0.9	4.6	0.9	8.1	2.0	75.0	86.6	12.8	15.5
1946-47	32.1	5.5	19.6	0.9	2.1	0	2.8	1.9	3.3	2.2	74.3	82.6	5.1	13.1
1947-48	38.3	2.1	20.0	0	2.5	0	2.3	1.2	5.4	5.6	57.4	76.6	8.5	21.1
1948-49	32.6	2.1	22.8	1.1	1.2	0	4.6	0	5.9	2.6	38.9	55.8	6.7	20.5
1951-52	35.6	4.0	33.8	3.4	2.3	0	9.7	1.4	3.2	7.0	58.4	73.2	26.5	40.6
1952-53	41.3	4.3	35.6	2.9	3.5	1.4	13.0	2.3	7.3	11.2	71.0	85.5	27.1	45.3
	RURAL DISTRICTS													
1940-41	68.5	18.5	61.1	16.7	22.2	5.6	47.2	11.1	57.1	35.6	100.0	94.4	71.7	84.6
1941-42	71.4	32.1	57.1	23.2	11.5	7.3	53.6	17.0	52.8	38.0	98.2	100.0	57.8	76.5
1942-43	53.2	25.3	49.4	22.8	13.2	5.2	40.8	11.8	36.1	20.6	100.0	100.0	59.1	66.2
1943-44	48.5	19.6	44.1	14.4	9.2	2.1	24.2	6.6	20.5	11.8	95.9	96.9	58.1	65.4
1944-45	43.3	16.5	39.8	13.4	7.1	2.1	19.1	2.3	22.2	14.5	92.8	95.9	40.8	63.2
1945-46	33.3	8.8	33.0	7.8	4.7	1.0	10.4	2.4	19.0	5.6	91.2	96.1	32.4	47.5
1946-47	25.3	2.4	24.7	2.4	4.4	0	13.0	4.3	13.2	10.0	86.7	96.4	41.0	59.4
1947-48	31.9	2.8	35.2	2.8	6.3	0	17.9	2.9	17.2	6.8	87.5	88.9	43.5	71.4
1948-49	31.0	2.4	34.5	2.4	1.4	0	20.3	1.2	17.2	9.3	77.4	86.9	47.5	61.6

* No examinations in Trondheim in 1948-1949; 1940-1941 omitted, values of doubtful accuracy.
 † Only 9 girls age 12 years in 1947-1948.

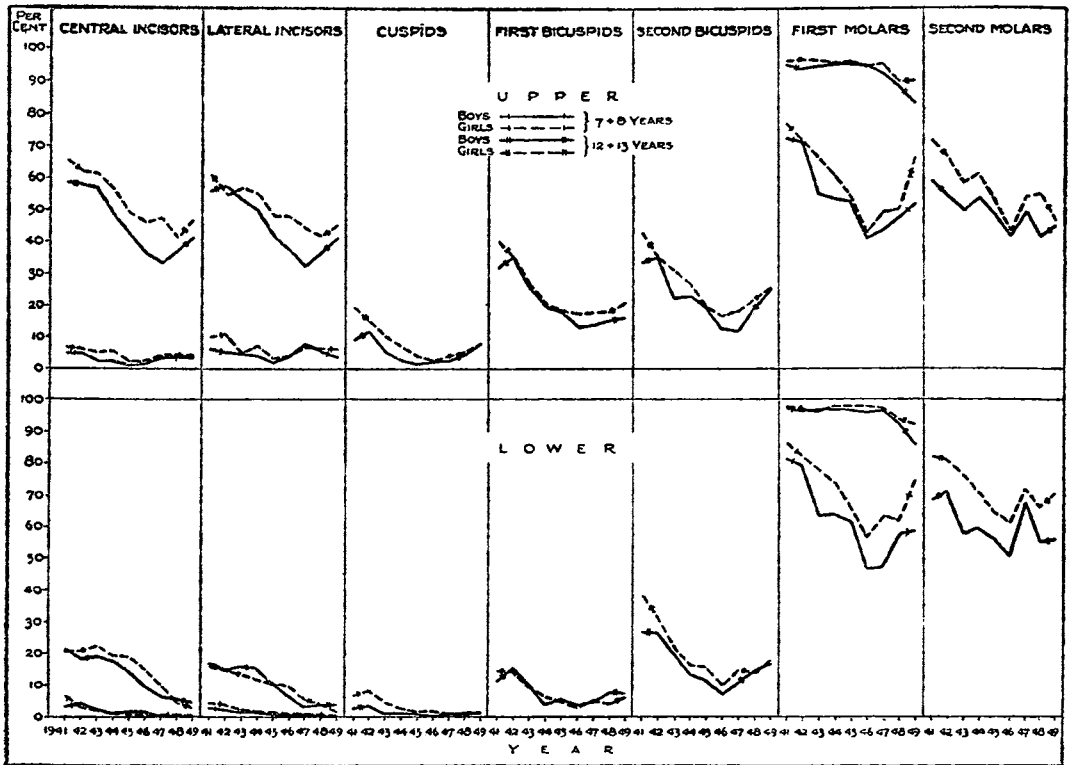


Fig. 26. Percentages of specific permanent teeth DMF at ages 7 + 8 years and 12 + 13 years for boys and girls in villages, 1940-1941 to 1948-1949.

longest post-eruptive age, or the lowest caries rates, usually reach the lowest value late. The first molars are an example of the teeth with long post-eruptive age, and the lower incisors and lower cuspids are representative of the low-caries teeth.

Except for the molars, the mandibular tooth has a lower DMF rate than the corresponding upper tooth; this is in agreement with common findings. Rates for the different bicuspid also vary according to the usual pattern; the first and second upper bicuspid have almost identical DMF rates, whereas in the lower jaw, rates are much lower for the first than for the second bicuspid.

Percentage Reduction in DMF Rates for Specific Teeth. Differences in the maximum percentage reduction from levels in the school year 1940-1941 for DMF rates of corresponding

Table 23. Maximum percentage reduction in the percentages of total and specific permanent teeth DMF in the school-years 1940-1941 to 1948-1949, for 7+8 and 12+13 year-old boys and girls in cities, villages, Gjerpen and rural districts.

(Base year=1940-1941.)

AGE AND SPECIFIC TOOTH	CITIES		VILLAGES		GJERPEN		RURAL DISTRICTS	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
MAXIMUM PERCENTAGE REDUCTION IN DMF RATES								
<i>Age 7+8 Years</i>								
Total Teeth ¹	30.7	35.2	40.7	42.5	83.4	74.0	54.7	59.2
Total Upper ²	38.5	42.6	42.8	49.1	82.4	75.5	63.9	64.1
Total Lower ²	31.3	32.7	41.8	38.1	84.5	74.6	47.6	55.7
<i>First Molar</i>								
Upper	36.4	37.8	43.2	46.9	82.2	70.1	54.0	58.6
Lower	27.8	25.0	42.4	34.5	83.3	72.4	39.0	48.9
<i>Age 12+13 Years</i>								
Total Teeth	32.2	27.4	27.8	31.3	63.1	63.7	40.0	43.1
Total Upper	35.1	32.1	30.6	31.1	65.4	63.8	46.9	49.7
Total Lower	29.2	23.4	28.2	32.2	63.0	63.5	35.0	39.1
<i>Central Incisor</i>								
Upper	49.0	49.2	42.7	37.0	73.0	51.5	72.7	63.1
Lower	80.1	78.7	77.9	86.9	95.7	87.3	87.0	87.0
<i>Lateral Incisor</i>								
Upper	47.0	41.5	41.7	31.3	72.7	64.5	57.9	59.6
Lower	85.3	78.5	79.1	90.6	95.1	100.0	92.0	85.6
<i>Cuspid</i>								
Upper	90.2	83.9	82.5	87.9	100.0	89.0	82.5	93.7
Lower	100.0	93.4	82.1	92.8	100.0	100.0	100.0	100.0
<i>First Bicuspid</i>								
Upper	71.2	62.6	58.3	55.9	93.4	91.4	82.2	78.0
Lower	89.7	82.7	68.9	79.9	100.0	100.0	87.4	89.2
<i>Second Bicuspid</i>								
Upper	77.6	48.7	65.6	60.7	91.9	88.0	74.2	76.9
Lower	68.7	58.8	73.2	73.6	100.0	88.1	86.3	84.3
<i>First Molar</i>								
Upper	6.3	5.5	12.8	6.9	52.1	57.9	8.1	22.6
Lower	7.2	3.3	11.3	5.4	48.4	41.2	4.9	7.9
<i>Second Molar</i>								
Upper	21.4	11.0	30.1	39.0	92.5	90.7	49.6	54.8
Lower	18.3	7.9	25.7	25.1	76.9	82.2	41.0	43.9

¹ Includes all permanent teeth.
² Incisors and first molars only.

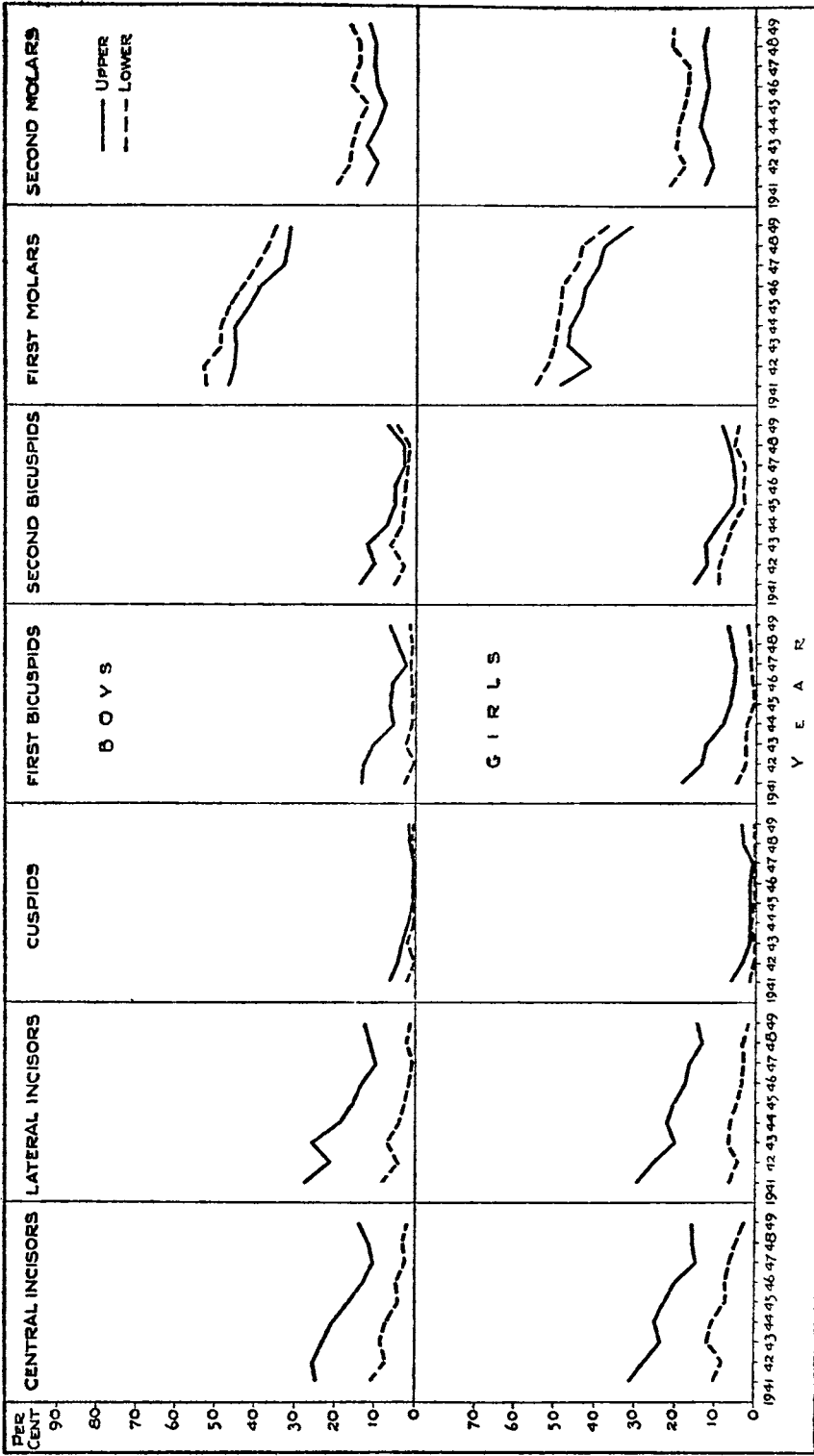


Fig. 27. Percentages of total surfaces DMF in specific teeth at ages 7 + 8 years and 12 + 13 years for boys and girls in cities, 1940-1941 to 1948-1949.

teeth in the upper and lower jaws may be obtained from Table 23. For the ages 7 + 8 years, first molars only have been considered because of the very low caries rates for incisors. In cities, villages, and rural districts, the upper first molars show a greater reduction than the lower ones. In Gjerpen, where the percentage reduction was greatest (70 and 82 per cent for upper first molars and 72 and 83 per cent for lower ones among girls and boys, respectively) there was no real difference between upper and lower molars.

In the 12 + 13 year age group for cities, villages, rural districts, and Gjerpen, the maximum percentage reduction in the DMF rate is higher for the mandibular incisors, cuspid, and bicuspid than for the corresponding maxillary tooth with the exception that boys in villages and in Gjerpen had the same reduction for upper and lower cuspids and in cities had a higher reduction for upper than lower second bicuspid and girls in Gjerpen had the same reduction for upper and lower second bicuspid. For the first and second molars, the reverse is true, and the reduction in the DMF rate is usually much greater for the maxillary than for the mandibular tooth. In general, the tooth with the lowest susceptibility to caries shows the largest percentage reduction.

DMF Surfaces for Specific Teeth. Differences in caries rates for specific teeth in the upper and lower jaw and the relative changes in caries rates for corresponding teeth during the period 1941 to 1949 are demonstrated more clearly by rates for tooth surfaces affected by caries. For each tooth, the total number of surfaces is the base population (number of erupted teeth times number of surfaces of the specific tooth) and the percentage of these surfaces that were affected by caries is computed. For incisors and cuspids, four surfaces are counted; and for bicuspid and molars, five surfaces. Roots present are counted as having all surfaces carious; and any extracted tooth or artificial crown is counted as having three carious surfaces. Rates for carious surfaces in specific teeth of 13 year-old boys and girls are plotted in Fig. 27 for children in the cities and in

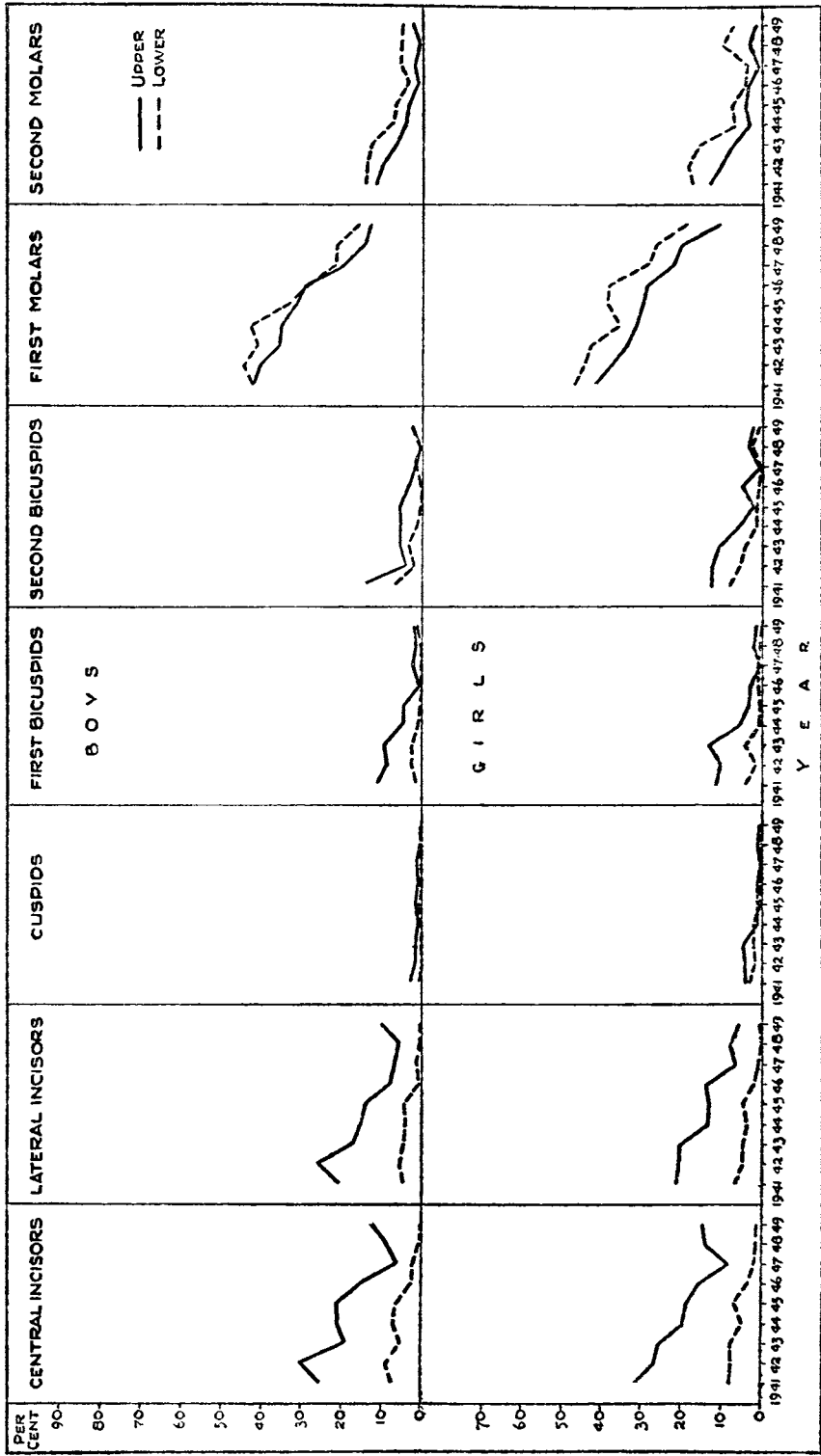


Fig. 28. Percentages of total surfaces DMF in specific teeth at ages 7 + 8 and 12 + 13 years for boys and girls in Gjerpen, 1940-1941 to 1948-1949.

Fig. 28 for children in Gjerpen, and are shown in Table 24a and Table 24b.

For corresponding teeth in the upper and lower jaws, the same relative caries status based on surfaces affected is shown in Figs. 27 and 28 as was noted for percentages of teeth DMF. The incisors, cuspid, and bicuspid in the upper jaw have higher percentages of surfaces carious than the corresponding tooth in the lower jaw, but the reverse condition is found for first and second molars. DMF surface rates for the lower molars exceed those for the upper molars less relatively than the surface rates for other teeth in the upper jaw exceed those for the corresponding tooth in the lower jaw.

It is clearly evident in Figs. 27 and 28 that the percentage of DMF surfaces in individual teeth was greatly reduced during and after World War II. With a few exceptions, the decrease in rates for surfaces was already apparent at the examinations in 1941–1942 and continued for a varying number of years. For the first molars, and also for the lower incisors, rates were still decreasing at the end of the period, 1948–1949, both in cities and in Gjerpen. The upper central incisors in both community groups, and upper cuspid and bicuspid in cities show an upturn in rates in 1947 or 1948. In Gjerpen, the curves are nearly horizontal in the latter part of the period for upper and lower cuspids and bicuspid.

Permanent First Molars DMF and Extracted. A comparison between the percentage of permanent first molars DMF and the percentage extracted (M) is demonstrated in Table 26 and Fig. 31 for cities, Trondheim, villages, and Gjerpen. As is seen, the extraction rate is higher in the lower than in the upper jaw in all districts. A very pronounced decrease in extraction of upper and of lower teeth took place from the start to the end of the period. In Gjerpen, for instance, the rate in 1940–1941 was from 38 to 47 per cent and in 1948–1949 it was zero for boys and for girls. The DMF rates were lower in this district than in any of the others, and the rate of extractions is also the least except for a few annual rates in the early part

Table 24a. For 13 year-old boys,¹ the percentage of surfaces carious in specific permanent teeth in cities, villages and Gjerpen, 1940-1941 to 1948-1949.

SCHOOL YEAR	PER CENT OF SURFACES DMF ² FOR SPECIFIED TOOTH													
	Central Incisor		Lateral Incisor		Cuspid		First Bicuspoid		Second Bicuspoid		First Molar		Second Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	CITIES													
1940-41	24.5	10.9	27.7	8.5	6.6	2.5	13.2	3.3	14.3	6.0	46.8	52.0	12.5	20.0
1941-42	25.4	7.3	21.5	4.2	4.8	0.8	12.9	0	11.3	3.3	45.2	52.6	9.8	16.8
1942-43	23.1	8.7	26.3	7.2	3.4	2.3	10.5	2.6	12.3	6.7	44.7	48.5	12.5	16.0
1943-44	20.5	7.1	19.1	4.2	1.9	0.3	5.8	1.0	7.2	3.9	45.3	48.4	9.4	14.4
1944-45	16.6	4.1	15.6	2.6	0.5	0	6.5	0.8	5.7	3.5	41.7	46.6	7.9	12.1
1945-46	13.0	4.6	13.4	1.9	0.6	0.1	6.0	0.8	5.4	2.7	38.6	42.7	8.8	14.8
1946-47	10.4	2.5	9.9	0.8	0.6	0.3	2.2	1.1	3.0	2.2	32.8	39.2	10.5	14.1
1947-48	11.5	3.0	11.2	2.0	1.3	0.6	4.4	0.1	3.5	1.9	31.8	36.7	10.2	14.1
1948-49	14.3	1.9	12.9	1.2	1.8	0	6.5	1.4	7.8	4.4	31.6	34.6	11.8	16.4
	VILLAGES													
1940-41	24.2	9.2	21.9	6.5	3.1	0.8	10.8	4.2	13.1	11.4	47.5	53.3	14.9	19.7
1941-42	25.9	7.6	24.8	5.0	4.7	1.4	14.6	5.8	19.0	10.1	47.2	50.6	13.9	19.0
1942-43	24.7	7.6	20.8	4.5	1.9	0.2	10.1	3.4	9.5	7.3	48.0	51.9	13.6	16.8
1943-44	21.0	7.6	18.8	5.3	1.2	0.5	6.4	1.2	8.3	3.7	47.2	47.9	11.3	15.7
1944-45	16.4	6.4	14.6	3.4	0.4	0	5.7	1.4	6.2	3.4	45.2	46.4	12.0	16.1
1945-46	16.1	5.2	14.9	3.0	0.5	0.1	5.6	1.1	5.2	2.2	41.6	43.6	10.3	13.0
1946-47	12.2	2.3	12.5	0.8	1.5	0.8	3.7	0.5	3.5	3.1	34.9	39.8	12.2	17.0
1947-48	15.0	1.7	11.9	1.0	1.9	0.5	4.2	2.0	5.8	4.0	38.0	39.3	12.3	15.6
1948-49	14.4	3.4	13.9	2.4	2.5	0.5	5.5	1.6	8.4	5.1	32.6	34.3	11.0	14.5
	GJERPEN													
1940-41	25.6	7.4	20.7	4.9	2.7	0.6	10.9	1.7	14.4	7.0	42.0	42.2	11.7	14.4
1941-42	30.6	9.1	26.2	5.6	1.3	0	8.6	2.9	4.1	2.1	40.6	44.8	10.2	14.3
1942-43	19.1	5.3	17.0	4.3	1.6	0	9.7	2.5	5.6	3.5	35.8	41.1	6.6	12.8
1943-44	21.0	7.2	15.3	4.0	0.8	0	5.1	0.7	5.5	1.1	35.4	42.9	4.3	7.2
1944-45	21.2	6.3	14.1	4.5	1.6	0.7	4.7	0.6	5.9	0	31.7	33.3	3.5	6.6
1945-46	15.3	2.5	7.9	0.8	0	0	0.7	0.4	3.3	0	29.5	28.8	1.0	3.6
1946-47	6.3	2.4	6.9	1.4	1.2	0	2.9	0	2.2	1.9	19.2	21.7	2.3	5.7
1947-48	9.0	0	5.8	0	0	0	1.6	0	0.4	0.4	14.3	21.5	0.5	5.4
1948-49	12.8	0	10.2	0	0	0	2.2	1.8	2.9	3.2	13.1	15.9	2.9	5.1
1951-52	14.7	0.9	11.9	1.3	1.4	0	2.7	1.1	1.6	2.3	14.5	22.5	3.0	5.4
1952-53	13.5	2.0	13.4	2.0	0	0	2.8	0	3.8	1.1	22.5	27.2	2.8	5.7

¹ Numbers of boys examined are shown in Table 26. Not all teeth are erupted at age 13 years, especially the second molars.
² Three carious surfaces counted for an extracted tooth.

Table 24b. For 13 year-old girls¹ in cities, villages and Gjerpen, the percentages of total surfaces carious in the specific permanent teeth, in 1940-1941 to 1948-1949.

SCHOOL YEAR	PER CENT OF SURFACES DMF ² FOR SPECIFIED TOOTH													
	Central Incisor		Lateral Incisor		Cuspid		First Bicuspid		Second Bicuspid		First Molar		Second Molar	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	CITIES													
1940-41	31.7	10.3	29.4	6.7	6.6	1.7	18.9	4.7	14.1	9.1	49.1	55.3	12.8	21.5
1941-42	27.7	8.0	25.8	4.4	3.1	0.3	13.5	2.9	12.6	9.0	41.8	52.3	10.7	17.6
1942-43	23.9	12.1	20.1	6.9	1.2	0.8	12.1	2.4	12.9	7.5	47.5	50.5	11.8	20.0
1943-44	25.1	10.8	22.3	6.7	1.4	1.2	8.2	2.3	9.8	6.0	46.4	49.8	14.1	19.2
1944-45	22.8	7.3	20.7	4.5	1.1	0.5	6.5	0.8	5.9	3.1	43.6	48.9	12.8	17.9
1945-46	20.2	7.5	17.9	3.7	1.4	0.4	5.9	0.4	5.3	3.1	42.7	48.4	10.8	15.6
1946-47	14.4	6.3	16.7	3.2	1.0	0.2	5.0	1.4	5.8	2.8	39.6	44.9	12.4	16.5
1947-48	15.4	4.7	13.4	3.4	3.4	0.7	5.8	1.8	6.7	5.5	38.2	43.9	13.1	20.7
1948-49	15.9	2.5	14.9	1.7	3.6	0.7	7.1	1.8	8.3	4.5	31.3	36.6	12.0	20.6
	VILLAGES													
1940-41	27.3	7.4	25.2	5.9	8.3	2.1	16.2	5.0	19.1	14.1	45.4	51.2	19.5	27.3
1941-42	28.5	8.6	22.2	5.5	5.7	3.1	13.5	5.8	14.2	12.2	48.0	53.3	16.7	22.4
1942-43	24.7	8.7	23.5	4.7	4.2	1.3	11.0	3.6	12.4	8.3	48.1	51.6	15.8	20.7
1943-44	24.9	8.4	22.5	4.5	3.5	0.7	7.2	2.3	12.3	6.0	49.3	53.6	14.6	19.7
1944-45	20.7	8.2	19.0	4.2	1.4	0.5	6.7	1.7	6.8	5.6	48.4	50.1	13.2	16.3
1945-46	16.9	7.0	16.7	3.9	0.7	0.9	5.2	0.8	5.6	2.4	45.7	46.9	9.9	13.2
1946-47	20.4	5.6	19.8	3.2	1.1	0.2	6.9	2.0	4.4	4.9	44.3	50.5	13.1	20.0
1947-48	16.3	1.7	13.5	1.6	2.1	0.2	6.9	1.1	8.5	4.6	35.2	40.4	15.6	18.9
1948-49	16.1	1.1	15.2	0.5	3.2	0.2	7.5	1.9	11.2	7.5	33.0	38.3	12.4	20.0
	GJERPEN													
1940-41	31.9	8.1	21.3	6.6	4.2	3.0	11.4	4.1	12.8	8.1	42.4	47.0	13.4	17.7
1941-42	26.6	7.4	20.5	4.8	4.5	1.9	10.3	1.6	12.9	6.0	37.9	44.9	10.5	18.9
1942-43	25.9	7.6	20.7	4.9	4.8	2.5	13.8	4.2	11.2	4.8	33.9	42.9	7.7	15.6
1943-44	19.7	4.9	13.5	3.8	1.3	1.6	5.9	1.0	6.2	1.5	31.5	35.7	3.4	7.0
1944-45	18.8	6.9	13.2	4.9	1.5	0.7	3.3	0.6	2.9	1.9	30.3	38.9	4.5	7.7
1945-46	15.8	3.4	14.0	1.7	1.3	0.4	3.1	1.0	5.3	1.1	29.0	38.3	3.8	4.2
1946-47	8.2	1.9	6.4	0.5	0.5	0	0	1.2	0.4	0.9	22.3	28.5	1.0	3.8
1947-48	14.2	1.1	8.1	0	1.2	0	2.3	0.5	3.9	2.6	20.5	26.8	3.4	10.0
1948-49	14.4	1.1	5.7	0.5	0.6	0	1.3	0	2.5	1.0	10.6	18.7	1.7	7.0
1951-52	13.3	1.1	10.2	0.8	0.8	0	2.2	0.6	0.3	3.7	19.7	26.7	6.2	9.5
1952-53	12.9	2.5	9.1	1.4	0.8	0.4	5.0	0.6	2.3	3.1	21.1	35.7	7.7	10.9

¹ Numbers of girls examined each year are shown in Table 26. Not all teeth are erupted at age 13 years, especially second molars.
² Three carious surfaces counted for each extracted tooth.

of the period. The highest percentage of extractions is found in Trondheim. Cities and villages had very similar extraction rates throughout the period.

The big difference in extraction rates among the various districts may depend not only on the difference in degree of destruction of the molar, but also on the attitude of the dentist towards extraction of the permanent first molar when it *can* be saved.

The pronounced decrease in the per cent of first molars extracted during the period is, of course, a consequence of less carious destruction; but it may also partly be caused by the dentist being able to give more time to preserving this molar as a result of the decrease in caries rates for all teeth.

SEX DIFFERENCES IN CARIES RATES

Comparison of the various measures of caries in the teeth of boys and of girls of the same chronological age and in the same year of examination has shown that the girls nearly always had a higher DMF rate than the boys. The difference may increase with advancing age, and usually is greater for teeth in the lower jaw than for those in the upper jaw. For the age group 7 + 8 years, the sexes do not differ very much when the caries rate is expressed as the number of DMF teeth per 100 total erupted permanent teeth (Table 19). However, when the caries rate is expressed as the number of DMF teeth per child (Table 18), the sex difference is very evident. In this age group, the sex difference is also clearly apparent in the DMF percentages for first permanent molars which contribute a very large portion of the total rate (Table 21a).

At ages 12 + 13 years, a definite sex difference is evident whether the rate is expressed as an average number of DMF teeth per child or as a percentage of total teeth DMF. The caries rate in all districts is higher for girls than for boys and, except in Gjerpen, is higher in every year of observation.

The difference between caries rates for boys and girls is not the same for each individual tooth, as may be seen in Fig. 26.

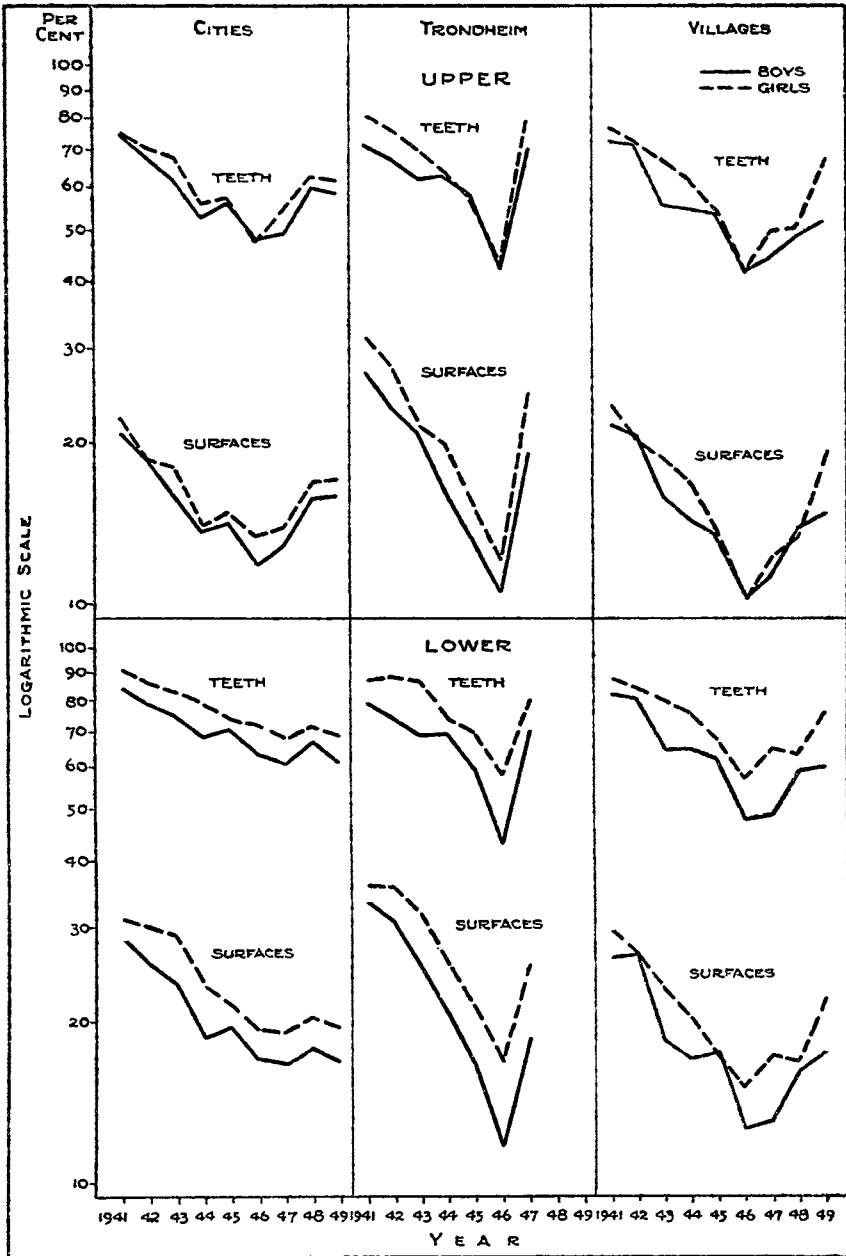


Fig. 29. For permanent first molars, the percentage of teeth DMF and percentages of surfaces DMF for boys and for girls aged 7 + 8 years in cities, in Trondheim and in villages, 1940-1941 to 1948-1949.

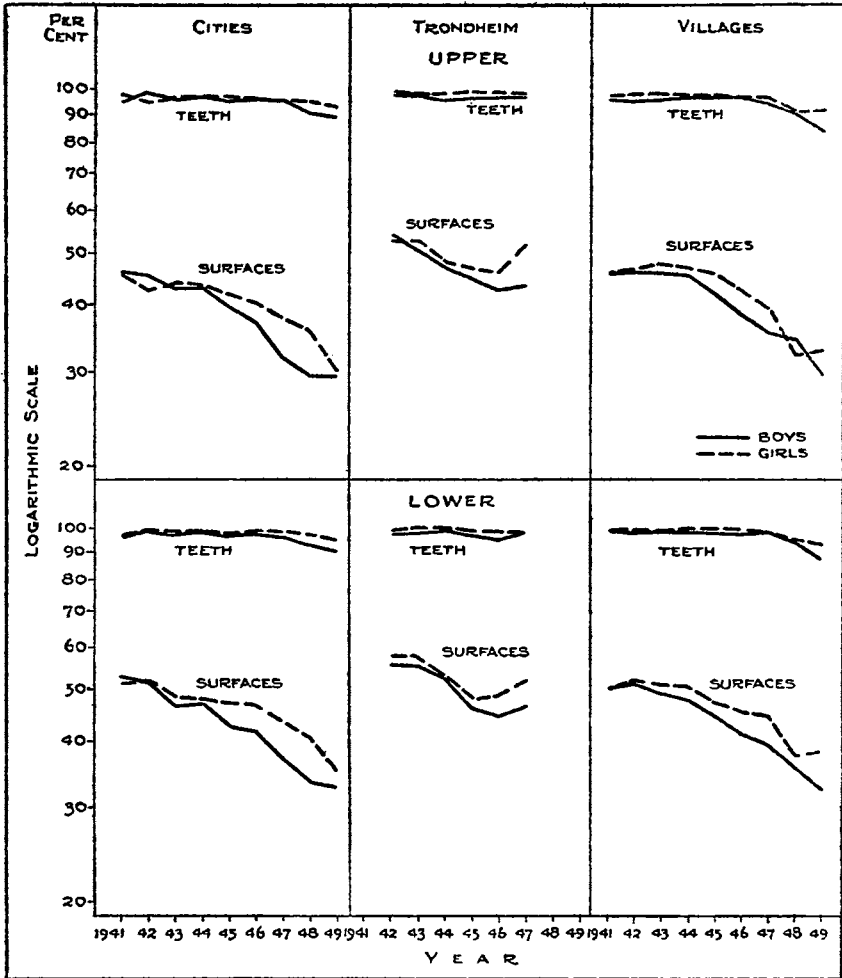


Fig. 30. For permanent first molars, the percentage of teeth DMF and percentage of surfaces DMF for boys and for girls aged 12 + 13 years in cities, in Trondheim and in villages, 1940-1941 to 1948-1949.

The largest differences are found for the upper incisors and second molars at ages 12 + 13 years, and for the first molars at ages 7 + 8 years. For the incisors, the sex difference is much greater at ages 12 + 13 years than at 7 + 8 years whereas the reverse situation holds for the first molars. In the older age group, there are only slight but persistent sex differences in the caries rates for first molars.

As pointed out above, the sex difference is not the same for

Table 25. Percentage of surfaces DMF¹ for permanent first molars of boys and girls aged 7+8 years and 12+13 years in cities, Trondheim and villages, 1940-1941 to 1948-1949.

SCHOOL YEAR	PER CENT OF SURFACES DMF FOR SPECIFIED MOLAR							
	7+8 Years ²				12+13 Years ³			
	Boys		Girls		Boys		Girls	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	CITIES							
1940-41	20.9	28.6	22.4	31.1	45.8	53.0	45.6	51.3
1941-42	18.7	25.2	18.6	30.0	45.0	51.3	42.5	51.7
1942-43	16.0	23.2	18.0	29.0	42.8	46.5	43.9	48.6
1943-44	13.7	18.7	14.1	23.1	43.0	47.0	43.5	48.0
1944-45	14.2	19.6	14.8	21.4	39.3	43.1	41.6	47.2
1945-46	11.8	17.0	13.4	19.3	37.0	41.5	40.0	46.8
1946-47	12.9	16.6	13.9	19.1	31.7	37.1	37.7	43.7
1947-48	15.8	18.0	17.0	20.5	29.3	33.5	35.8	41.0
1948-49	15.9	16.9	17.1	19.5	29.3	33.0	30.0	35.0
	TRONDHEIM ⁴							
1940-41 ⁵	27.2	33.2	31.6	36.1				
1941-42	23.1	30.8	27.3	35.6	53.6	55.7	52.6	57.7
1942-43	20.6	25.3	21.5	31.8	50.3	55.1	52.6	57.5
1943-44	16.1	20.5	19.7	25.5	46.3	52.1	47.8	52.2
1944-45	13.2	16.3	15.0	21.1	44.3	45.9	46.4	47.6
1945-46	10.5	11.6	12.1	16.8	42.2	44.2	45.7	48.7
1946-47	19.3	18.6	24.9	25.6	43.3	46.0	51.6	51.4
1947-48 ⁶					43.8	43.3		
	VILLAGES							
1940-41	21.7	26.1	23.6	29.4	45.5	50.0	45.6	49.8
1941-42	20.6	26.8	20.3	26.7	45.9	51.0	46.5	51.8
1942-43	15.7	18.3	18.7	22.8	45.8	48.7	47.6	50.6
1943-44	14.4	17.0	16.9	20.2	45.3	47.2	46.9	50.6
1944-45	13.5	17.5	13.7	17.1	42.0	44.2	45.5	47.0
1945-46	10.3	12.5	10.2	15.0	38.2	41.1	42.3	45.2
1946-47	11.5	12.9	12.3	17.2	35.4	39.3	39.2	44.4
1947-48	13.9	16.1	13.3	16.6	34.2	35.6	32.1	37.1
1948-49	14.9	17.5	19.3	22.0	29.5	32.2	32.7	38.1

¹ Three carious surfaces counted for each extracted tooth.² Number of erupted first molars shown in Table 21b.³ Number of children examined shown in Table 18.⁴ No examinations in 1948-1949.⁵ Values for 12+13 year old group omitted; erratic variations suggest doubtful accuracy.⁶ Eight-year old boys and girls, and 12 year-old girls not examined.

teeth in the upper and lower jaws. This is illustrated for first molars in Fig. 29 and Fig. 30 in which DMF rates have been plotted on a logarithmic scale so that an equal vertical distance between two points represents the same percentage difference. For the age group 7 + 8 years, (Fig. 29) the sex differences for upper first molars are very small, or absent, in most years, but for the lower molars, rates for DMF teeth for girls are consistently higher and the excess ranges from 4 to 15 per cent in cities and from 4 to 33 per cent in villages. The percentages for carious surfaces (Table 25) show approximately the same sex differences as the DMF rates for teeth. At ages 12 + 13 years (Fig. 30), nearly all first molars are carious in both upper and lower jaws of boys and of girls. The percentages of all surfaces affected with caries are higher for girls, but differences between the sexes are fairly equal for upper and lower first molars.

The sex difference is also demonstrated by the extraction rate for first molars, shown in Fig. 31 and Table 26 for 13-year old boys and girls. In cities, Trondheim, and villages, the percentages of first molars extracted are higher for girls than for boys for nearly every year 1941 to 1949, and the differences are larger for lower than for upper teeth. In Gjerpen, the differences by sex in extraction rates is less than in the other communities and rates for girls are not consistently higher.

Is the higher caries rate for girls due to a longer post-eruptive age of the teeth in girls of a specific chronological age than in boys of the same age, or is it due to a true sex factor?

In these studies, as in others, girls show an earlier eruption of the permanent teeth than boys. According to Hurme (1949), taking all 28 teeth together, the average difference in eruption time between the sexes is 0.45 years (5.3 months). This is in good agreement with the findings of Sloman (1941). Hurme states that the sex difference for specific teeth varies from 2.16 months (the maxillary first molar) to 11.16 months (the mandibular canine).

At ages 7 and 8 years, only the first molars and incisors, at

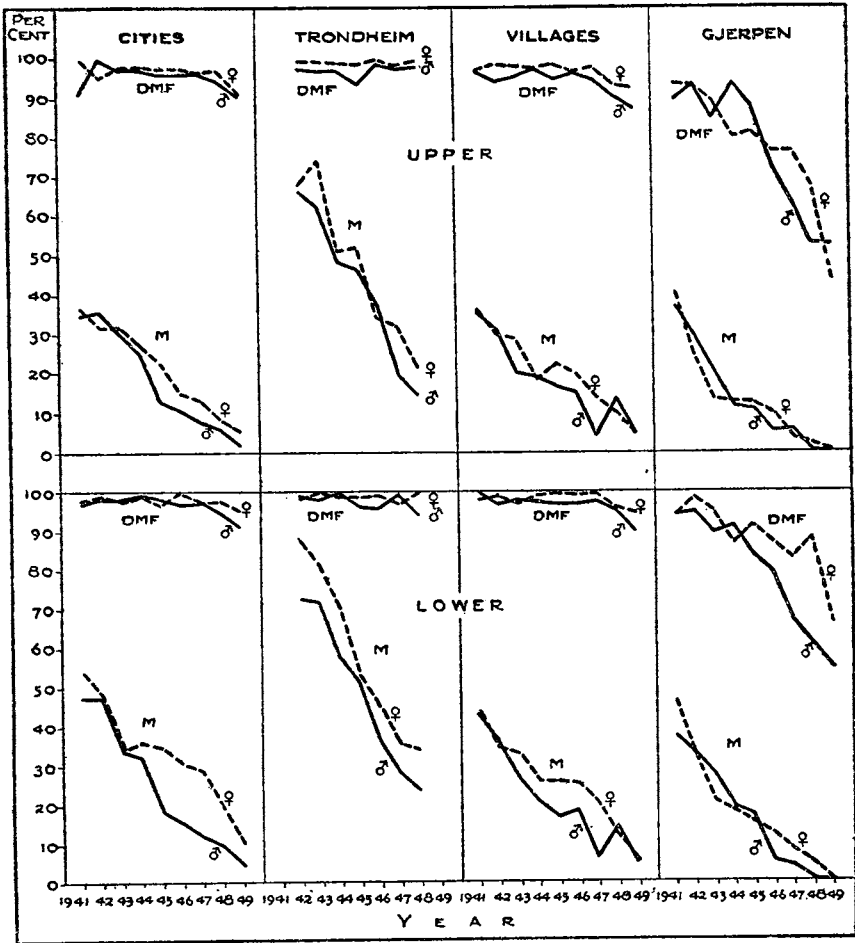


Fig. 31. Per cent of first permanent molars DMF and per cent extracted (M) at age 13 years for boys and for girls, 1940-1941 to 1948-1949.

most, normally are erupted. Using Hurme's figures, the difference in eruption time of these teeth would be 3.66 months, 3.64 for the lower teeth and 3.68 for the upper. With this large difference in post-eruptive age, we did not find in this age group that the percentage of erupted teeth DMF was consistently higher for girls than for boys, although the sex difference was clearly apparent when average numbers of DMF teeth per child were compared. Also, when only first molars are considered, a marked sex difference in caries rates was demonstrated for the lower jaw and a smaller and somewhat irregular difference

Table 26. For 13 year-old boys and girls, per cent of permanent first molars DMF and the per cent extracted (M) in cities, Trondheim, villages and Gjerpen, 1940-1941 to 1948-1949.

SCHOOL YEAR	NUMBER OF BOYS	Boys				NUMBER OF GIRLS	GIRLS			
		Upper First Molars		Lower First Molars			Upper First Molars		Lower First Molars	
		Per Cent of Teeth					Per Cent of Teeth			
		DMF	(M)	DMF	(M)		DMF	(M)	DMF	(M)
CITIES										
1940-41	103	91.3	35.0	97.1	47.6	90	100.0	36.7	97.8	54.5
1941-42	65	100.0	35.4	98.5	47.7	91	95.6	33.0	98.9	48.4
1942-43	118	97.5	30.5	98.3	33.9	91	97.8	31.9	97.8	34.1
1943-44	174	97.7	25.9	98.9	32.2	171	98.2	27.5	98.8	36.3
1944-45	164	96.3	12.8	98.2	18.9	191	97.4	23.0	96.9	34.6
1945-46	185	96.2	10.8	96.8	15.7	191	97.4	15.2	99.5	30.4
1946-47	149	96.6	8.1	97.3	12.1	139	96.4	13.7	97.1	28.8
1947-48	176	94.9	6.3	94.9	9.7	179	97.2	8.4	97.8	20.1
1948-49	171	91.2	1.8	91.2	4.7	151	91.4	5.3	94.7	10.6
TRONDHEIM ¹										
1941-42	120	97.5	66.7	99.2	72.5	141	99.3	68.1	98.6	87.9
1942-43	148	97.3	62.8	98.0	71.6	148	99.3	74.3	100.0	81.8
1943-44	74	97.3	48.6	100.0	58.1	92	98.9	51.1	98.9	70.7
1944-45	85	94.1	47.1	96.5	51.8	84	98.8	52.4	98.8	53.6
1945-46	96	99.0	37.5	95.8	36.5	110	100.0	34.5	99.1	45.5
1946-47	135	97.8	20.0	99.3	28.1	139	98.6	32.4	97.1	35.3
1947-48	67	98.5	14.9	94.0	23.9	79	100.0	21.5	100.0	34.2
VILLAGES										
1940-41	165	97.0	35.8	99.4	43.3	145	97.2	36.6	97.9	44.1
1941-42	145	94.5	31.0	96.6	35.9	137	98.5	29.9	98.5	34.3
1942-43	165	95.8	20.6	97.6	26.7	155	98.1	29.0	96.8	32.9
1943-44	193	97.9	19.2	97.4	20.7	178	97.8	18.5	98.9	25.8
1944-45	190	95.3	16.8	96.8	16.8	167	98.8	22.8	99.4	25.7
1945-46	228	96.9	15.4	96.9	18.4	188	97.3	20.2	98.9	25.0
1946-47	129	95.3	3.9	97.7	6.2	103	98.1	13.6	99.0	20.4
1947-48	150	90.6	14.1	95.3	14.8	143	93.7	10.6	95.8	12.0
1948-49	155	87.7	4.5	89.7	4.5	140	92.9	4.3	94.3	5.0
GJERPEN										
1940-41	82	90.2	37.8	93.9	37.8	83	94.0	41.0	94.0	47.0
1941-42	63	93.7	30.2	95.2	33.3	78	93.6	25.6	98.7	32.1
1942-43	76	85.5	21.1	89.5	27.6	82	89.0	13.4	95.1	20.7
1943-44	69	94.2	11.6	91.3	18.8	61	80.3	13.1	86.9	18.0
1944-45	72	88.9	11.1	83.3	16.7	72	81.9	12.5	91.7	15.3
1945-46	59	72.9	5.1	79.7	5.1	60	76.7	10.0	86.7	11.7
1946-47	72	63.9	5.6	66.7	4.2	52	76.9	3.8	82.7	7.7
1947-48	67	53.7	0	61.2	0	44	68.2	2.3	88.6	4.5
1948-49	49	53.1	0	55.1	0	47	44.7	0	66.0	0

¹ No examination in 1948-1949, and 1940-1941 values omitted because of doubtful accuracy.

for the upper jaw. Hurme's figures for the difference in eruption time for upper first molars is 2.16 months and for the lower is 3.24 months. This difference points in the same direction as our observed difference in the caries rate.

At ages 12 + 13 years, the DMF rates for all erupted permanent teeth were consistently higher for girls than for boys in the different communities. The sex differences are approximately equal for teeth in the upper and lower jaws, although according to Hurme, the average difference in eruption time for the lower teeth is 6.03 months and for the upper teeth is 4.65 months.

Among the many authors who have commented on the higher caries rate in girls as compared to boys of the same chronological age, Klein and Palmer (1938) should be mentioned. On the basis of their estimates of the "Post-eruptive Tooth Age" of 2,232 boys and 2,184 girls aged 6 to 16 years (Palmer, Klein and Kramer, 1938) they concluded that the greater post-eruptive tooth age of the girls, with a consequently longer period of risk of caries attack than the boys, is the cause of this difference. Thus, they conclude, susceptibility to attack by dental caries is no greater for girls than for boys. Finn (1952), reviewing the extensive literature on this subject, also attributes the higher caries rate in women, compared to that of men of the same chronological age, to the longer post-eruptive age of their teeth.

The present author has great difficulty in accepting this view. During the first post-eruptive years it would be natural to assume that a difference of 3 to 5 months in post-eruptive age would affect the caries picture quantitatively. However, the influence of this difference in eruption time would be expected to decrease year by year and be totally eliminated in adults. In the review by Finn mentioned above, the sex difference in caries rate was shown to have been demonstrated in numerous studies in population groups up to more than 60 years of age.

Sloman (1941) concludes from his extensive studies on the relationship of caries rates for boys and girls that the earlier

eruption of teeth in girls than in boys "can be but a small factor in the higher incidence of caries in young women as compared with young men." Hewat and Eastcott, in their studies on dental caries in New Zealand children, have similarly compared the caries experience of boys and girls aged 12 to 17 years. Besides basing their comparisons on grouping by chronological age they have also taken into account "post-eruptive tooth-surface years of mouth experience." Even by using this last method they have found a caries rate higher in girls than in boys, and hence concur in the conclusion reached by Sloman. The present author is of the same opinion.

Of special pertinence in these studies is the question of sex differences in caries rates—whatever the full explanation for these may be—in relation to a changing caries picture in a given population. Reductions in caries prevalence may vary by sex, by age, by school year, by community group, and also by type of tooth or surface involved. The changes (trends) over the period of the study were of primary importance here, and the possibility of a sex difference in changes in different school-year periods was considered. A preliminary study of this phase of the caries problem, for 8 and 13 year old children, respectively, and dealing only with the principal permanent teeth of interest here, was made in several of the community groups (cities, villages and Gjerpen). No consistent differences that would demonstrate a clearly defined sex differential rate of reduction in caries were found, and details of this investigation will not be given.

In the preliminary reports on this study (Toverud) the children were grouped not according to their chronological ages but according to the numbers of permanent teeth erupted. This was based on the following facts: (1) The caries risk is dependent upon the post eruptive age of the tooth. (2) The emergence of the permanent teeth in girls is earlier than in boys. (3) The emergence of permanent teeth in both sexes was found to be "retarded" during the war—and early post-war period—compared with the first war-year. The reason for

changing the basis for grouping to chronological age in the final report rather than the number of erupted teeth was mainly for the sake of better comparison with other studies.

COMPARISON OF CHANGES IN PREVALENCE OF DENTAL
CARIES IN DIFFERENT TYPES OF COMMUNITIES,
1940-1941 TO 1948-1949

One objective of these studies was to relate any changes in dental health status of the children that might occur during the war years to differences in living conditions of the populations in the various types of communities studied, especially to differences in the ease with which farm products could be obtained during the rationing period. We were particularly interested in comparing city children with rural children as it was natural to expect that the rationing of food would restrict the use of farm products more in cities than in rural areas.

In the foregoing discussion, data from four principal community groups, namely, cities, Trondheim, villages, and Gjerpen, have been considered and some differences for these groups have been suggested as well as the marked similarity in general trends for most of the period of study. For these communities and for combined rural districts and several separate communities previously omitted for special reasons, direct comparisons of different measures of dental caries will now be discussed in more detail.

Total DMF Rates in Different Communities. In Fig. 32, the percentages of total erupted permanent teeth that were decayed, missing or filled are compared for boys and for girls aged 7 + 8 years and 12 + 13 years in each of the four major community groups and in the rural districts. As is easily seen in Fig. 32, the DMF rates for each specific sex-age group are nearly the same at the beginning of the study in cities, villages, and rural districts. The initial values for Gjerpen are lower and those for Trondheim somewhat higher than rates for the other community groups.

At ages 7 + 8 years, in all districts the curves show a decline from the first year and reach the lowest level in 1945-1946.

After 1946, the curves all rise again. The final values in 1948-1949 in cities, villages, and rural districts are nearly the same for boys and quite similar for girls. In fact, the curves for cities and villages are practically identical throughout the period 1941-1949 except for 1946-1948 for boys and 1948 for girls. In the rural districts, the DMF rates for boys and for girls between 1944 and 1947 are definitely lower than those for boys and girls in cities, villages, and Trondheim. The curves for Trondheim are higher than those for any group except in 1945-1946; and rise more sharply after 1946 than the curves for other groups. Unfortunately, the population examined in Trondheim varied from year to year, which may account for some irregularities in rates, and examinations were stopped completely in 1948-1949. In Gjerpen, where the DMF rate at the beginning of the period was lower than in any other community group, the decrease in rates to 1946 was approximately equal to the decrease in rural

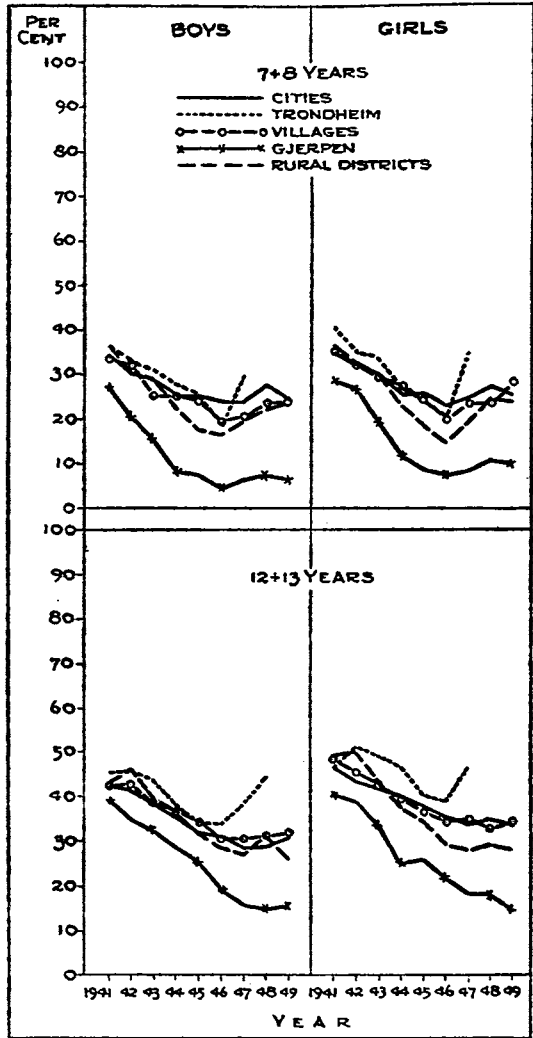


Fig. 32. Percentages of total permanent teeth DMF at ages 7+8 years and 12+13 years compared for various community groups, 1940-1941 to 1948-1949.

districts. In Gjerpen, where the DMF rate at the beginning of the period was lower than in any other community group, the decrease in rates to 1946 was approximately equal to the decrease in rural

districts. However, the increase after 1946 is less than in rural and other districts.

The *percentage* reduction in total DMF rates, shown in Table 23, is greatest in Gjerpen with 83 and 74 per cent for boys and girls aged 7 + 8 years, respectively. The reduction is next highest in rural districts, 55 and 59 per cent for boys and girls respectively; in third place are the villages with 41 and 43 per cent reduction; and the least reduction is shown for the cities, 31 and 35 per cent.

At the age 12 + 13 years, the curves for DMF rates in all five community groups have a marked downward trend after the first or second year. The year in which the minimum level is reached varies; but by 1946 or 1947 the curves are either at the lowest level or very close to it. Except in Trondheim, no definite increase in DMF rates after 1946 is shown for any of the community groups, and in Gjerpen the rates for girls continued to decrease up to 1949. In Trondheim, where the highest DMF rates are found at these ages as at the younger ages, the sharp drop in the curves up to 1946 is followed by a marked rise for both boys and girls. In cities and villages, rates for each sex were nearly identical throughout the study period. In rural districts, the initial rates for boys and girls are similar to those in cities and villages; the reduction is somewhat greater in the rural districts but the difference is more definite for girls than for boys. The curves for boys and girls at Gjerpen are much lower than the other curves for this age group as at the younger ages. In general, they parallel the curves for the rural districts during the first five or six years, but the downward trend continues in Gjerpen to 1948 for boys and to 1949 for girls.

The maximum reduction in the DMF rates for ages 12 + 13 years, expressed as the percentage change from 1940-1941 (Table 23), took place in Gjerpen with 63 and 64 per cent reduction for boys and girls, respectively. The next largest decrease occurred in the rural districts, 40 and 43 per cent; and in the cities and in villages the reduction is nearly equal, 32

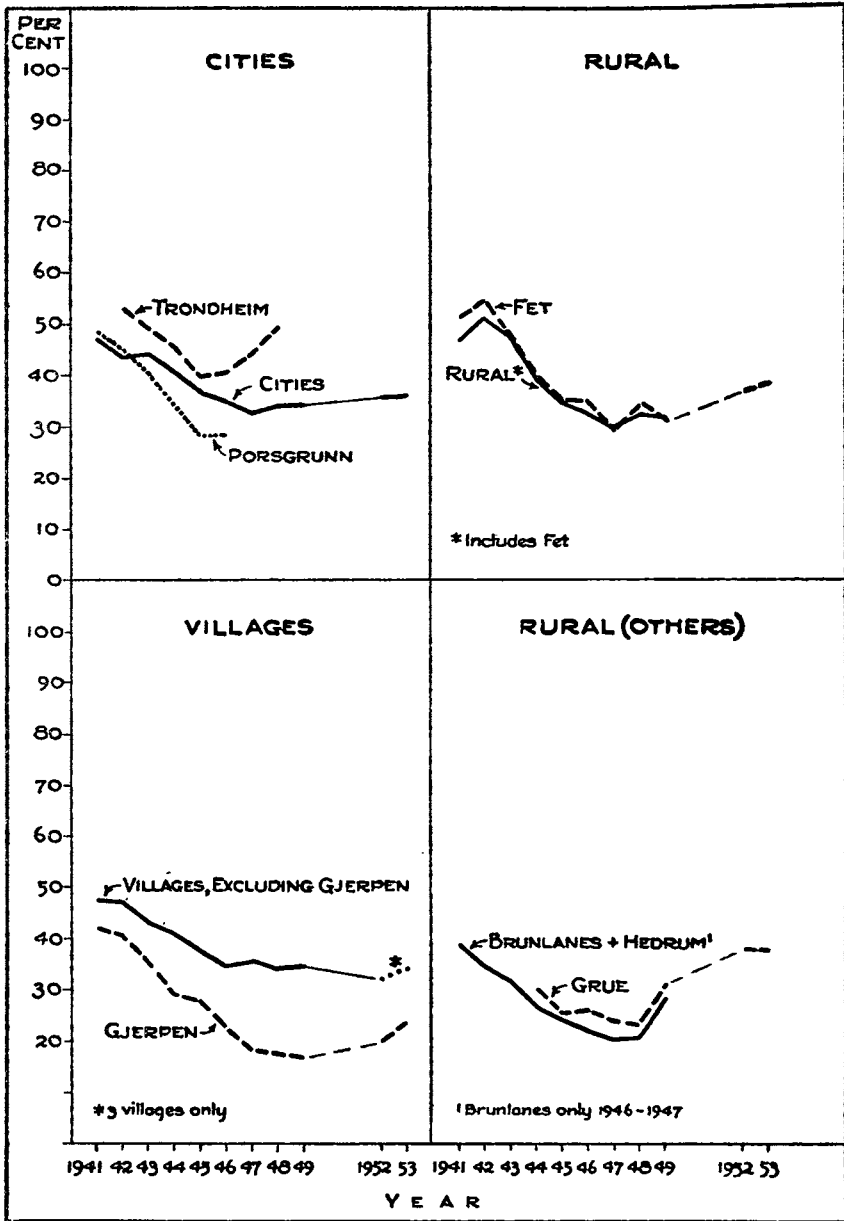


Fig. 33. Percentages of total permanent teeth DMF at age 13 years, combined sexes, in several individual communities and in the community groups.

and 28 per cent for boys and 27 and 31 per cent for girls. Thus, both at younger and older ages, Gjerpen shows the greatest

reduction and rural districts the next. At the younger ages, the reduction in cities was less than in villages but at the older ages, children in cities and villages showed about the same improvement in caries prevalence.

DMF Rates for Upper and Lower Teeth. The percentages of permanent teeth in the upper jaw and in the lower jaw affected by caries have been shown in Fig. 25 which also compares the

Table 27. For 13 year-old children (combined sexes), the percentages of total permanent teeth DMF in each community group, by school-year of examination.

SCHOOL YEAR	CITIES			VILLAGES		RURAL DISTRICTS			
	Cities (Main Group)	Trondheim ¹	Porsgrunn ²	Villages (Main Group)	Gjerpen	Rural (Main Group)	Fet ³	Brunlanes and Hedrum	Gruet ⁴
PER CENT OF TOTAL PERMANENT TEETH DMF									
1940-41	47.6	—	48.2	47.5	42.0	46.5	51.2	39.0	—
1941-42	43.6	52.8	45.0	47.1	40.5	51.2	54.4	34.5	—
1942-43	44.2	49.1	40.0	42.9	35.6	47.1	47.0	31.7	—
1943-44	40.9	45.2	34.4	41.0	29.0	39.7	39.1	26.8	30.9
1944-45	36.7	39.7	28.0	37.5	27.8	34.7	35.0	24.2	25.3
1945-46	35.0	40.5	28.2	34.4	22.4	32.7	34.9	21.8	26.1
1946-47	32.7	44.2	—	35.6	18.2	29.5	29.2	20.4 ^b	23.9
1947-48	34.1	49.8	—	34.0	17.6	32.5	34.4	20.8	23.3
1948-49	34.1	—	—	34.9	16.8	31.4	30.8	28.8	31.3
1951-52	35.4 ^a	—	—	31.8 ^a	19.8	—	37.0	—	38.0
1952-53	35.6 ^a	—	—	33.8 ^a	23.2	—	38.5	—	37.8
NUMBER OF ERUPTED PERMANENT TEETH									
1940-41	2,596	—	1,470	4,142	2,202	1,312	650	605	—
1941-42	2,118	3,493	818	3,771	1,908	864	564	701	—
1942-43	2,781	3,978	1,019	4,272	2,088	916	696	920	—
1943-44	4,613	2,209	1,198	4,926	1,722	1,064	470	838	1,293
1944-45	4,696	2,264	763	4,749	1,934	1,247	566	1,099	1,130
1945-46	4,971	2,760	916	5,482	1,543	1,329	825	1,204	1,138
1946-47	3,794	3,612	—	3,042	1,633	1,149	590	323 ^b	1,220
1947-48	4,710	1,932	—	3,877	1,443	965	416	510	1,077
1948-49	4,287	—	—	3,842	1,246	831	571	1,140	706
1951-52	4,278	—	—	1,834	1,930	—	584	—	1,219
1952-53	4,059	—	—	2,579	2,104	—	524	—	1,281

¹ No examinations in 1948-1949; 1940-1941 omitted, values of doubtful accuracy.

² No examinations after 1945-1946.

³ Fet included in main rural group.

⁴ No examinations in first three years of Study.

^a Values for "reduced" groups.

^b Brunlanes only.

DMF rates at ages 7+8 years and 12+13 years for cities, Trondheim, villages, and Gjerpen for the period 1941 to 1949. The curves for both the upper and lower jaw demonstrate nearly the same relative level for DMF rates in these four communities as the total DMF rates. However, there is a tendency for differences among the communities to be somewhat greater for the upper than for the lower jaw.

DMF Rates for Selected Communities. It was stated previously that not all of the individual communities for which some dental examinations were available could be included in the three main groups (cities, villages, and rural districts). Among the cities, Porsgrunn, in addition to Trondheim, has been dealt with separately because examinations were not continued after 1945-1946 and the trend in DMF rates differed somewhat from that for the main group of cities.

In Fig. 33, and Table 27, the per cent of permanent teeth DMF for 13 year-old boys and girls (combined sexes⁸) in Porsgrunn is compared with rates for the combined cities and Trondheim. For the first two years, the DMF rates for Porsgrunn are nearly the same as rates for cities, but in the following years the rates for Porsgrunn decrease more rapidly. The lowest point of the curve for Porsgrunn is reached in 1945, the same as for Trondheim, whereas the curve for cities reaches its low point in 1947.

Trends in caries rates for the incisors and first permanent molars in 13 year-old children in Porsgrunn are shown in Table 28 and illustrated in Fig. 34. For central and for lateral incisors in the upper and lower jaw, the percentages of teeth affected with caries and the percentages of tooth surfaces affected decrease very sharply from 1941 to 1945. In 1946, rates for central incisors continued downward but for lateral incisors the rates increase. For first molars, however, the percentage of teeth DMF does not show any clearly defined change from 1941 to 1946; but the percentage of tooth surfaces

⁸ Although caries rates for boys and for girls of the same age differ, trends during the Study were comparable and the two sexes have been combined in order to eliminate annual variations in rates due to small numbers.

affected with caries does decrease.⁹ Percentages of first molars extracted among these 13 year-old children also are shown in Fig. 34 and it is clearly evident that a pronounced decrease in extractions occurred during the period 1941 to 1946.

In the combined rural group,¹⁰ three rural communities—Brunlanes, Hedrum, and Grue—have not been included. In Grue, fairly large numbers of children were examined from 1944 to 1949 and also in 1952 and 1953 and this community, therefore, is studied separately. Brunlanes and Hedrum have been combined, since the dental status of the small groups from each community appeared to be comparable, but are

Table 28. PORSGRUNN: Per cent of teeth and of tooth surfaces¹ DMF for the specific permanent incisors and first molars, and the per cent of first molars extracted, for 13 year-old boys and girls combined, 1940-1941 to 1945-1946.

AGE AND SCHOOL YEAR	NUMBER OF CHILDREN	CENTRAL INCISORS		LATERAL INCISORS		FIRST MOLARS		
		Teeth DMF	Surfaces DMF	Teeth DMF	Surfaces DMF	Teeth		Surfaces DMF
						DMF	Extracted	
UPPER JAW								
<i>Age 13 Years</i>								
1940-41	108	70.4	28.9	67.6	26.6	95.4	40.7	48.1
1941-42	60	66.7	24.6	61.7	25.8	96.7	36.7	46.7
1942-43	74	68.9	30.1	64.4	23.6	95.9	29.7	47.6
1943-44	89	55.1	20.8	55.8	19.8	96.6	22.5	45.6
1944-45	56	46.4	16.1	36.4	12.3	96.4	12.5	43.9
1945-46	69	42.0	14.1	43.5	13.8	97.1	7.2	42.3
LOWER JAW								
1940-41		32.4	11.8	23.1	7.4	97.2	53.7	54.3
1941-42		23.3	8.8	18.3	5.4	96.7	55.0	51.3
1942-43		25.7	9.8	17.6	5.1	95.9	37.8	50.5
1943-44		15.7	5.6	11.2	3.4	96.6	37.1	48.1
1944-45		14.3	4.9	9.1	2.7	98.2	23.2	48.2
1945-46		8.7	3.3	10.3	2.9	94.2	8.7	41.4

¹ Three DMF surfaces per extracted tooth.

⁹ Changes in surfaces affected with caries will be discussed in detail for specific teeth and specific surfaces in a later report.

¹⁰ In the combined rural group, the largest representation is from Fet where examinations were done every year 1941 to 1949 and in the second period, 1952 and 1953; a small group from Meldal is included from 1941 to 1949, and a small group from Blaker 1941 to 1946; V. Gausdal is represented by varying numbers of children in 1941 and from 1944 to 1949.

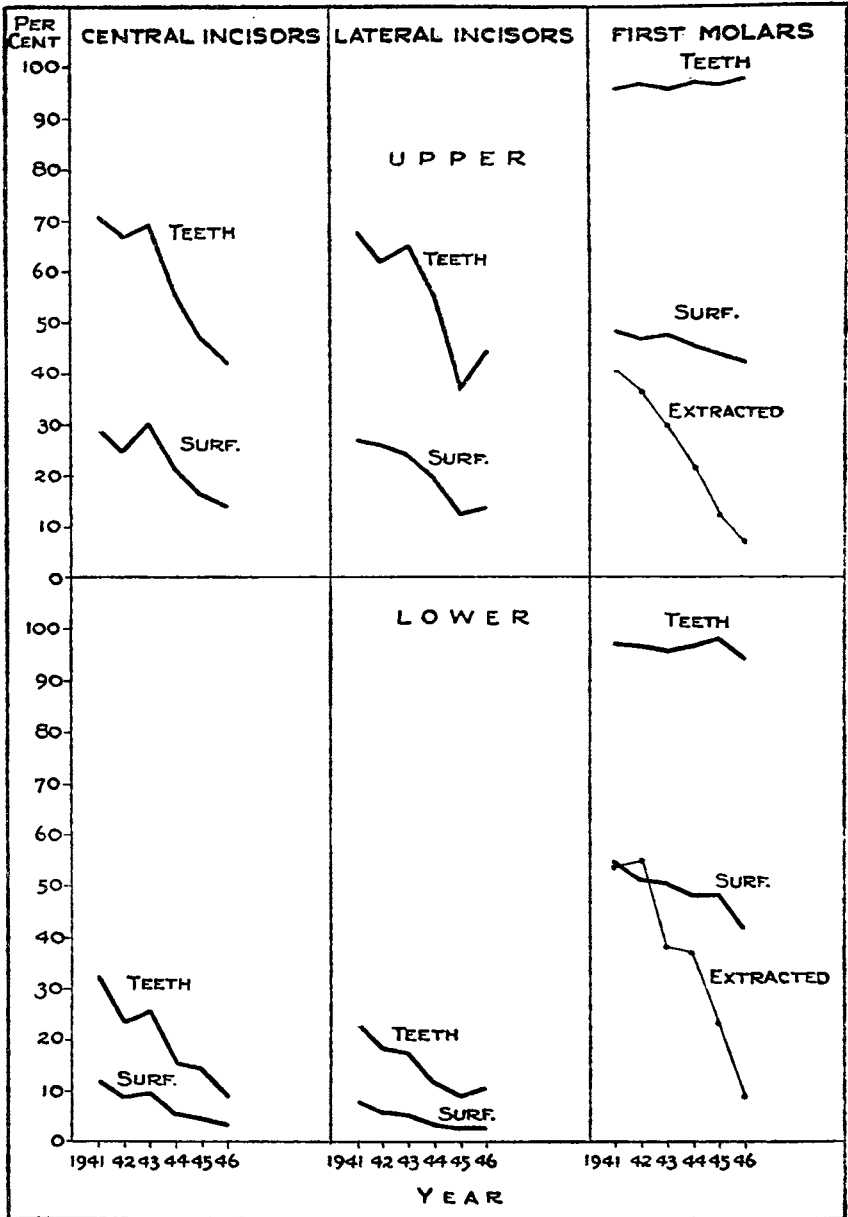


Fig. 34. PORSGRUNN: Per cent of teeth DMF and of tooth surfaces DMF for central and lateral incisors and first molars at age 13 years, combined sexes, 1940-1941 to 1945-1946.

presented independently of the other rural districts because the caries rates are somewhat lower.

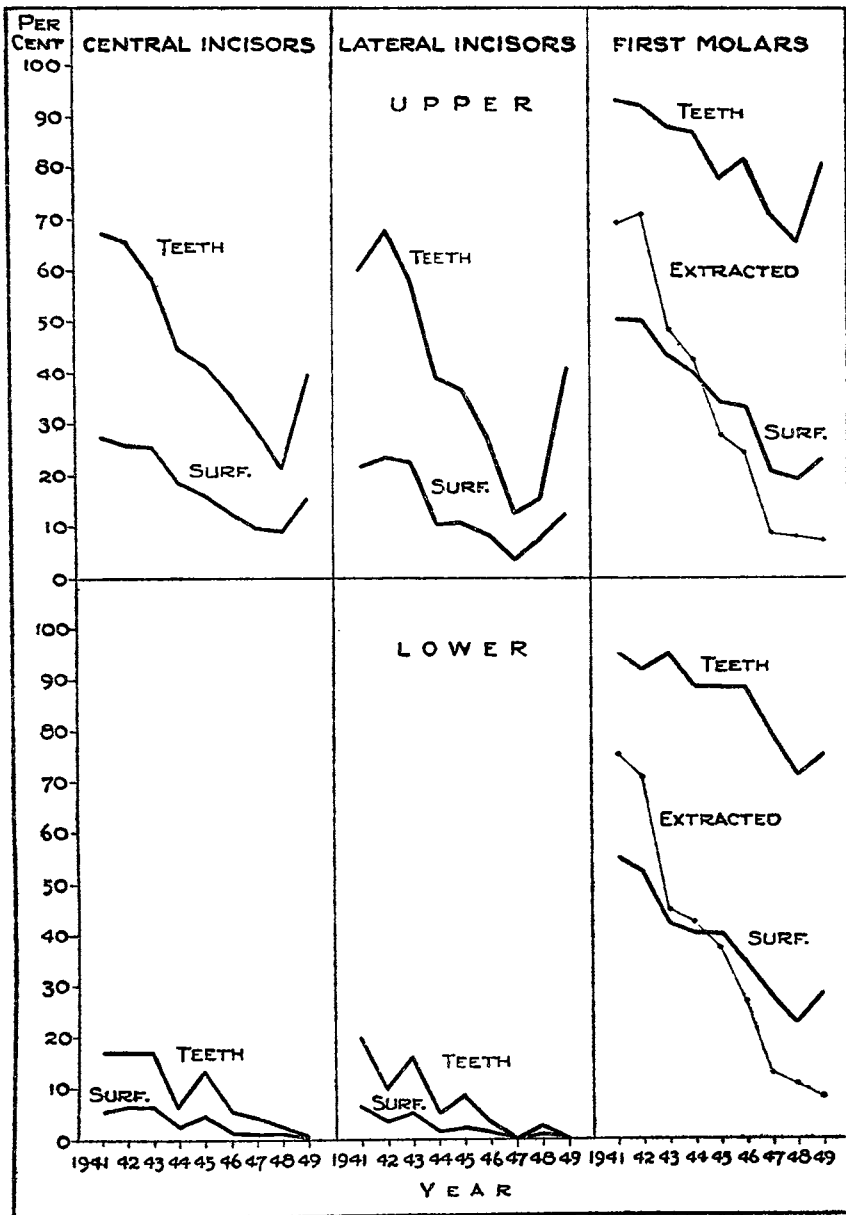


Fig. 35. BRUNLANES and HEDRUM: Per cent of teeth DMF and of tooth surfaces DMF for central and lateral incisors and first molars at age 13 years, combined sexes, 1940-1941 to 1948-1949.

In Fig. 33 (lower right section) it is seen that the curve for per cent of total teeth DMF at age 13 years, combined

sexes, in Brunlanes and Hedrum follows the usual pattern of decline. The lowest level is reached in 1947 and 1948, and is followed by a definite increase in 1949. The curve for Grue, although slightly higher, is practically identical from 1944 to 1949 with that for Brunlanes and Hedrum. Both of these rural groups have total DMF rates slightly lower than the rates for the combined rural districts, as may be seen in Table 27 and Fig. 33.

Changes in the percentages of incisors and of first permanent molars affected by caries during the period 1941 to 1949 are shown in Fig. 35 and Table 29 for 13 year-old children in

Table 29. BRUNLANES and HEDRUM: Per cent of teeth and of tooth surfaces¹ DMF for the specific permanent incisors and first molars and the per cent of first molars extracted, for 13 year-old boys and girls combined, 1940-1941 to 1948-1949.

AGE AND SCHOOL YEAR	NUMBER OF CHILDREN	CENTRAL INCISORS		LATERAL INCISORS		FIRST MOLARS		
		Teeth DMF	Surfaces DMF	Teeth DMF	Surfaces DMF	Teeth		Surfaces DMF
						DMF	Extracted	
UPPER JAW								
<i>Age 13 Years</i>								
1940-41	46	67.4	27.7	60.0	21.7	93.5	69.6	50.9
1941-42	52	65.4	26.0	68.0	23.5	92.3	71.2	50.8
1942-43	69	58.0	25.4	58.2	22.8	88.2	48.5	43.2
1943-44	63	44.4	18.7	38.7	10.5	87.3	42.9	40.0
1944-45	82	41.5	16.2	36.6	11.0	78.0	28.0	34.6
1945-46	89	36.0	12.6	27.0	8.4	82.0	24.7	33.5
1946-47	24 ^a	29.2	9.4	12.5	3.1	70.8	8.3	20.8
1947-48	38	21.1	9.2	15.8	7.2	65.8	7.9	19.5
1948-49	85	40.0	15.3	40.5	12.2	81.2	7.1	23.5
LOWER JAW								
1940-41		17.4	6.0	20.0	6.7	95.7	76.1	55.2
1941-42		17.3	6.7	9.6	3.4	92.3	71.2	52.3
1942-43		17.4	6.9	15.9	5.1	95.7	44.9	42.0
1943-44		6.3	2.4	4.8	1.6	88.9	42.9	40.3
1944-45		13.4	4.6	8.5	2.4	89.0	37.8	40.0
1945-46		5.7	1.4	3.4	1.7	88.8	27.0	34.8
1946-47		4.2	1.0	0	0	79.2	12.5	27.5
1947-48		2.6	1.3	2.6	0.7	71.1	0	22.6
1948-49		0	0	0	0	75.3	8.2	28.9

¹ Three DMF surfaces per extracted tooth.

^a Brunlanes only.

Brunlanes and Hedrum. In level and shape, the curves for the incisors generally adhere to the usual patterns of trends in DMF rates for upper and lower teeth and in rates for tooth surfaces attacked by caries. For the first molars, however, the decrease in DMF rates is much sharper than is usually found, except in Gjerpen. The per cent of first molars extracted was very high at the beginning of the period—70 to 75 per cent—but dropped very rapidly to about 8 per cent at the end of the period.

For Fet, a rural community usually included in the rural group, corresponding rates for incisors and first molars are shown in Fig. 36 and Table 30. For Fet, the curves for the incisors, in the main, follow the same patterns as those in Fig. 35 for Brunlanes and Hedrum, although there are some differences in levels of rates. However, the curves for first molars differ from those for Brunlanes and Hedrum. In Fet, the per cent of first molars DMF does not decrease for these 13 year-old children until the last year, 1949; this is more in conformity with the usual findings. The percentages of tooth surfaces affected by caries in the beginning were about as high in Fet as in Brunlanes and Hedrum, but the decrease is not quite as great. On the other hand, the extraction rate in Fet was much lower initially (31 and 45 per cent for upper and lower first molars, respectively) than in Brunlanes and Hedrum; it decreased almost to zero.

As already mentioned, Fet was included in the rural group for which the percentages of all permanent teeth DMF during the years 1941 to 1949 are shown in Fig. 33 and Table 27. DMF rates for 13 year-old children in Fet are approximately the same as for the combined rural districts.

Conclusion. Children examined in the rural districts demonstrated a greater reduction in caries rates during and after the War than did the city children. The reduction in the village group and in the city group was practically of the same magnitude. In the village of Gjerpen (not included with other villages), the greatest reduction in the prevalence

of carious teeth is shown and the smallest changes in trends are indicated for the final years in the period 1941-1949. In Trondheim, where the initial prevalence of caries was relatively high, the largest reversal of the downward trends is found for the years following the War, and it is the only community in which the 12 + 13 year-old children show an increase in caries rates for the final years of the period 1941-1949.

Table 30. FET: Per cent of teeth and of tooth surfaces¹ DMF for the specific permanent incisors and first molars, and the per cent of first molars extracted, for 13 year-old boys and girls combined, 1940-1941 to 1948-1949 and 1951-1952 and 1952-1953.

AGE AND SCHOOL YEAR	NUMBER OF CHILDREN	CENTRAL INCISORS		LATERAL INCISORS		FIRST MOLARS		
		Teeth DMF	Surfaces DMF	Teeth DMF	Surfaces DMF	Teeth		Surfaces DMF
						DMF	Extracted	
UPPER JAW								
<i>Age 13 Years</i>								
1940-41	49	73.5	28.6	61.2	28.1	98.0	30.6	49.4
1941-42	42	83.3	36.3	63.4	31.1	97.6	26.2	50.5
1942-43	51	66.7	24.0	60.0	24.0	100.0	17.6	44.3
1943-44	35	54.3	21.4	47.1	16.2	100.0	25.7	46.9
1944-45	42	42.9	14.3	45.2	20.2	97.6	7.1	38.1
1945-46	63	46.0	14.7	51.7	18.8	96.8	14.3	40.6
1946-47	45	31.1	10.6	40.9	14.8	97.8	6.7	36.9
1947-48	31	22.6	6.5	30.0	10.0	96.8	6.5	29.0
1948-49	42	28.6	10.7	35.7	10.7	90.5	2.4	28.6
1951-52	44	31.8	11.9	52.3	18.8	100.0	0	39.1
1952-53	40	42.5	12.5	52.5	15.6	100.0	0	42.0
LOWER JAW								
1940-41		16.3	6.1	18.4	6.6	98.0	44.9	55.5
1941-42		31.0	11.3	21.4	6.0	97.6	38.1	56.2
1942-43		27.5	9.3	17.6	4.4	100.0	35.3	52.5
1943-44		17.1	6.4	11.4	2.9	100.0	31.4	57.7
1944-45		7.1	2.4	4.8	1.8	97.6	19.0	41.9
1945-46		16.1	4.4	9.5	3.2	96.8	20.6	40.6
1946-47		4.4	1.1	2.2	0.6	100.0	8.9	36.0
1947-48		3.2	0.8	3.2	0.8	100.0	16.1	40.6
1948-49		2.4	1.2	2.4	0.6	88.1	0	27.1
1951-52		6.8	2.3	2.3	0.6	97.7	2.3	44.1
1952-53		2.5	0.6	2.5	1.3	90.0	5.0	47.0

¹ Three DMF surfaces per extracted tooth.

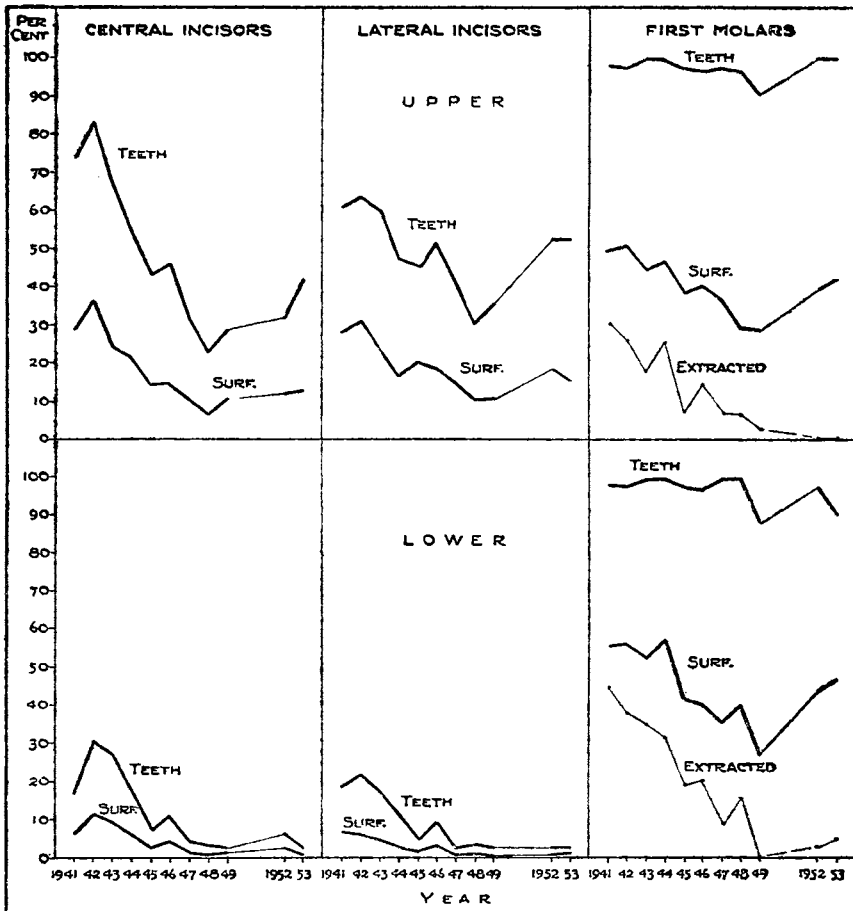


Fig. 36. FET: Per cent of teeth DMF and of tooth surfaces DMF for central and lateral incisors and first molars at age 13 years, combined sexes. 1940-1941 to 1948-1949, and 1951-1952 and 1952-1953.

CARIES RATES FOR THE PERMANENT DENTITION IN 1951-1952 AND 1952-1953 COMPARED WITH THOSE FOR 1940-1941 TO 1948-1949

In the second period of the investigation, 1951-1952 and 1952-1953, it was not possible to obtain examinations for the school population in a number of communities included in the first period. Consequently, the child population of the main community groups—cities, villages, and rural districts—in the second period was not comparable with that for the first period.

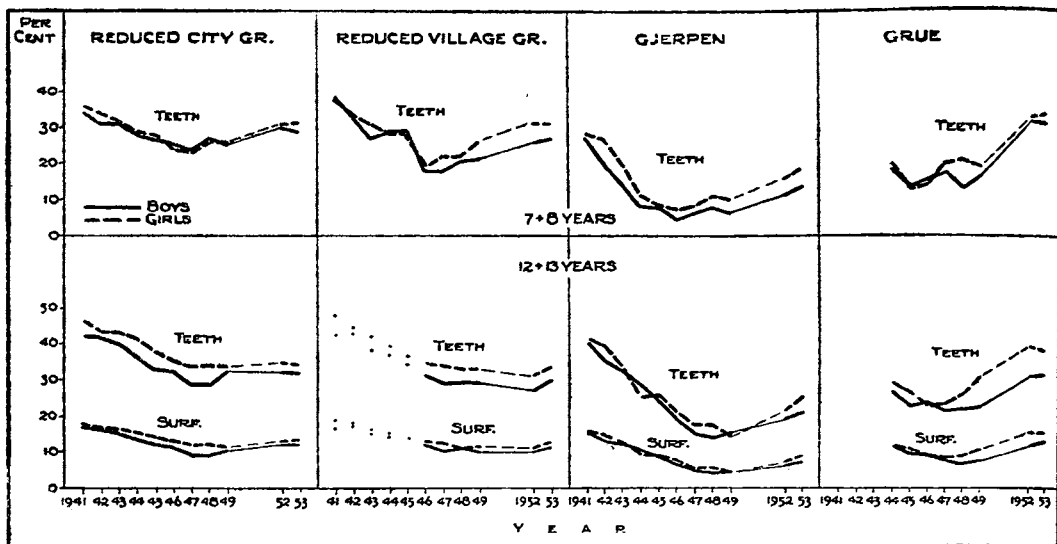


Fig. 37. Per cent of total teeth DMF in 1951-1952 and 1952-1953 compared with first period, 1940-1941 to 1948-1949 for ages 7+8 years and 12+13 years in reduced city and reduced village groups, in Gjerpen and in Grue.

A "reduced" group of cities and of villages was formed to include only those communities with examinations in both periods¹¹ and for these groups, rates in the second period are compared with those in the earlier period. Of the original rural group, only Fet is available in the second period. Two communities studied separately in the first period, Grue and Gjerpen, are available also in the second period.

DMF Rates for Total Teeth at Ages 7+8 Years. For both periods of the Study, the annual percentages of total teeth DMF are shown in Fig. 37 and Table 31 for boys and girls aged 7+8 years in the reduced city group, the reduced village group, Gjerpen, and Grue. The rise in the curve for each sex-age group in each of the four communities that began in the years 1946-1949 continued and values for the later period, 1952 and 1953, are much higher than those at the end of the first period. The increase seems to be greatest in Grue, where, unfortunately, values prior to 1943-1944 are not available and it is not possible to determine whether the rates had reached the level that

¹¹ The reduced group of cities is the same as the main group except that Tromsø is omitted; the reduced village group includes only Oppedgård, Baerum, and Stord.

existed at the beginning of the War. In the other three community groups, caries rates in the second period had not yet reached the initial high levels. In this respect, there does not seem to be any difference between the sexes.

DMF Rates for Total Teeth and Surfaces at Ages 12 + 13 Years. For the age group 12 + 13 years, the annual DMF rates for total teeth and the percentages of total tooth surfaces affected by caries are shown in Fig. 37 and Table 32 for boys and girls in the four community groups.¹²

Table 31. For 7+8-year-old boys and girls, per cent of total permanent teeth DMF in reduced cities, reduced villages, Gjerpen, and Grue, 1940-1941 to 1948-1949 and 1951-1952 and 1952-1953.

SCHOOL YEAR	Boys				Girls			
	Reduced Cities	Reduced Villages	Gjerpen	Grue ¹	Reduced Cities	Reduced Villages	Gjerpen	Grue ¹
PER CENT OF TEETH DMF								
1940-41	34.7	37.9	27.7	—	36.3	37.6	28.5	—
1941-42	31.1	32.4	20.3	—	33.8	32.9	26.9	—
1942-43	30.9	26.9	15.3	—	31.7	31.0	19.9	—
1943-44	27.9	28.4	8.5	18.4	28.7	28.7	11.6	19.8
1944-45	26.5	28.8	7.8	14.2	27.4	28.6	8.7	13.1
1945-46	24.8	18.2	4.6	15.4	23.8	18.8	7.4	14.3
1946-47	23.9	17.9	6.4	17.4	24.2	21.8	8.5	19.9
1947-48	27.2	20.7	7.8	13.5	26.4	22.2	11.1	21.1
1948-49	25.2	21.0	6.4	17.3	25.4	26.3	10.0	19.7
1951-52	29.8	26.3	11.7	31.9	30.3	30.9	16.0	33.3
1952-53	28.7	27.2	14.3	31.4	30.8	30.9	19.2	34.0
NUMBER OF ERUPTED PERMANENT TEETH								
1940-41	1,088	704	506	—	1,172	892	519	—
1941-42	1,324	993	582	—	1,421	1,192	476	—
1942-43	1,324	1,058	570	—	1,431	1,157	478	—
1943-44	1,274	880	505	375	1,231	985	439	384
1944-45	1,237	495	489	367	1,188	626	520	350
1945-46	1,357	875	566	351	1,137	1,008	632	335
1946-47	1,420	968	652	321	1,280	1,023	718	468
1947-48	1,447	1,042	625	230	1,605	1,111	659	350
1948-49	1,403	943	596	191	1,578	1,172	643	249
1951-52	1,694	966	770	505	1,750	1,038	882	460
1952-53	1,863	1,449	1,003	513	1,846	1,335	1,055	568

¹ No examinations prior to 1943-1944.

¹² Rates for a comparable group of villages could not be computed for the entire (Continued on page 187)

Table 32. For 12+13 year-old boys and girls, per cent of total permanent teeth DMF and per cent of total surfaces¹ DMF in reduced cities, reduced villages, Gjerpen, and Grue, 1940-1941 to 1948-1949 and 1951-1952 and 1952-1953.

SCHOOL YEAR	Boys				GIRLS			
	Reduced Cities	Reduced ² Villages	Gjerpen	Grue ³	Reduced Cities	Reduced ² Villages	Gjerpen	Grue ³
PER CENT OF TEETH DMF								
1940-41	42.3	—	39.6	—	46.4	—	40.2	—
1941-42	41.4	—	34.7	—	43.2	—	39.0	—
1942-43	40.2	—	32.4	—	43.3	—	33.5	—
1943-44	36.2	—	28.8	27.3	40.8	—	24.9	29.1
1944-45	32.4	—	25.2	22.8	37.4	—	26.0	26.6
1945-46	31.8	30.8	18.7	24.2	35.3	34.4	21.7	23.2
1946-47	28.5	29.1	15.8	21.6	33.5	34.3	18.4	23.7
1947-48	28.7	29.6	14.6	21.8	34.1	33.0	18.3	26.1
1948-49	32.1	29.2	15.3	22.7	33.5	32.9	14.6	31.0
1951-52	32.1	27.1	18.9	30.9	34.4	31.2	21.6	39.5
1952-53	31.4	30.2	21.2	31.5	33.8	33.4	25.7	38.1
PER CENT OF TOTAL SURFACES DMF								
1940-41	17.1	—	15.1	—	18.1	—	15.6	—
1941-42	16.2	—	13.1	—	16.7	—	14.6	—
1942-43	15.4	—	12.5	—	16.5	—	12.9	—
1943-44	13.8	—	10.6	11.1	15.6	—	9.2	11.2
1944-45	12.2	—	9.1	9.3	14.2	—	9.6	10.7
1945-46	11.5	11.7	6.4	9.2	13.0	13.0	7.8	9.1
1946-47	9.3	10.3	4.9	7.6	12.0	12.4	5.6	8.3
1947-48	9.4	10.8	4.5	6.8	12.2	11.1	5.8	9.1
1948-49	10.6	10.0	4.7	7.7	11.2	11.3	4.7	10.7
1951-52	12.5	10.0	6.3	11.8	13.3	11.1	7.2	15.4
1952-53	12.6	11.3	7.3	12.9	13.8	12.6	8.9	15.3
NUMBER OF ERUPTED PERMANENT TEETH								
1940-41	2,697	—	1,871	—	2,411	—	2,063	—
1941-42	2,158	—	1,782	—	2,356	—	1,987	—
1942-43	2,485	—	1,699	—	2,083	—	1,959	—
1943-44	3,197	—	1,690	1,074	3,412	—	1,763	1,319
1944-45	3,367	—	1,640	1,099	3,480	—	1,781	1,084
1945-46	2,955	2,545	1,581	1,220	3,138	2,457	1,464	1,126
1946-47	3,086	2,143	1,641	1,132	3,020	2,097	1,427	1,151
1947-48	3,117	2,425	1,653	1,071	3,305	2,400	1,182	984
1948-49	3,013	2,356	1,343	564	2,765	2,346	1,200	730
1951-52	3,624	1,970	2,207	996	3,885	1,890	1,949	1,473
1952-53	3,342	2,272	2,115	1,004	3,962	2,434	1,777	1,289

¹ Three carious surfaces counted for each extracted tooth.

² Data not comparable in 1940-1941 to 1944-1945.

³ No examinations prior to 1943-1944.

The lowest part of each curve for the percentages of teeth DMF and also for the percentages of tooth surfaces DMF is usually found in 1947 or 1948. Except for Grue, rates for girls aged 12 + 13 years do not show any increase up to 1949. For boys, in the cities there is a tendency for the DMF rates for teeth and for tooth surfaces to rise at the end of the first period; in Gjerpen, only DMF rates for teeth show this tendency.

In the second period, in Gjerpen and Grue the percentages of teeth DMF and of surfaces DMF have increased considerably over the 1949 rates; and for the reduced village group, these rates show a tendency to rise in 1953 above the 1949 rates. For the reduced city group, the rates for carious surfaces but not for DMF teeth are higher in the second period than at the end of the first period.

At ages 12 + 13 years, the increase in DMF rates from the end of the first period to the second is greatest in Grue, as it was at ages 7 + 8 years. Only in Grue are the rates for 12 + 13 year-old boys and girls higher in the second period than in 1943-1944.

DMF Rates for Permanent First Molars. Caries rates for first molars in the upper and lower jaws in 1952 and 1953 are compared with rates in the earlier period in Fig. 38 and in Table 33 for 7 + 8 year-old boys and girls. In each of the four community groups, reduced cities and villages, Gjerpen and Grue, the increase from the low levels recorded in 1946 or 1947 to 1949 has continued. It is apparent in Fig. 38 that the percentages of teeth DMF and the percentages of tooth surfaces caries affected have risen from the end of the first period to the second period. For the first molars, as for total teeth, the increase in caries is greatest for children in Grue, and it is very probable that in this community rates in 1953 had reached the levels that prevailed at the beginning of the War.

first period and for the second period, since in one village included in the second period, Stord, 12 and 13 year old children were examined only from 1945-1946 to 1948-1949 in the first period. Therefore, the original village group has been used for the years 1940-1941 to 1944-1945, and comparison of the second period for reduced villages with early years of the first period may not be very reliable.

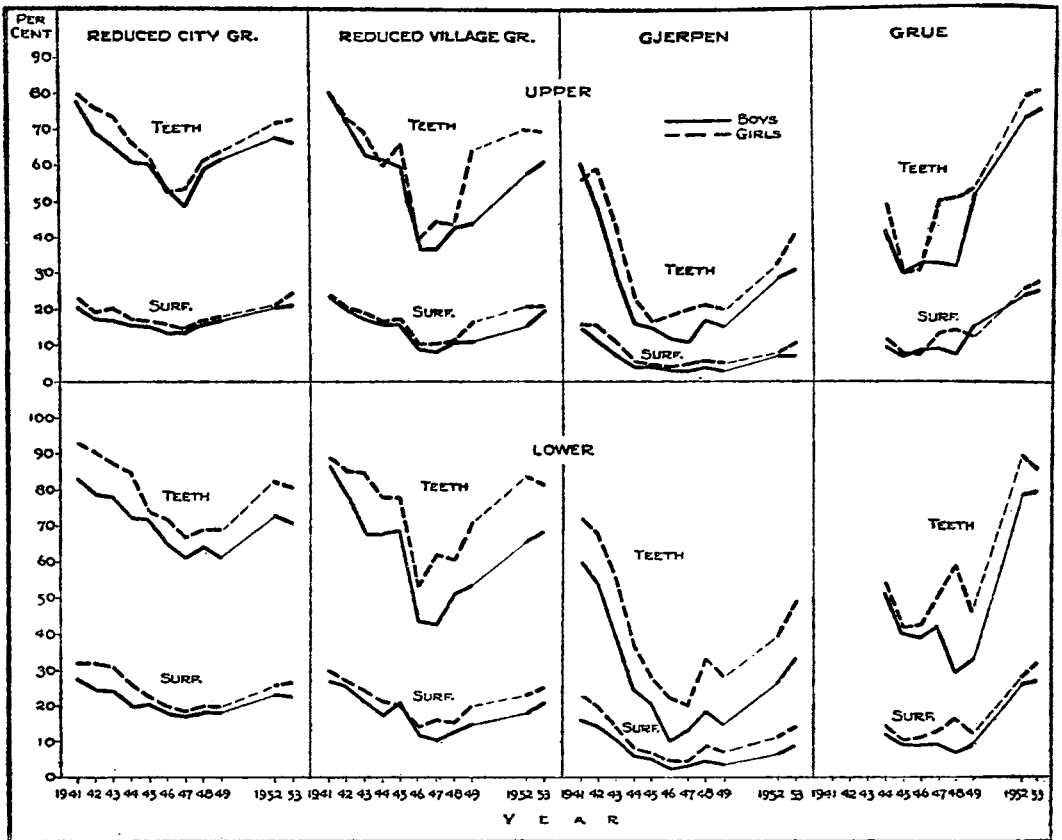


Fig. 38. Per cent of permanent first molars DMF and per cent of tooth surfaces DMF at ages 7 + 8 years in 1951-1952 and 1952-1953 compared with first period, 1940-1941 to 1948-1949, in reduced city and reduced village groups, in Gjerpen and in Grue.

Comparison of the relative increase in the percentages of first molars affected by caries and the percentages of tooth surfaces carious indicates that for boys and girls aged 7 + 8 years the increase has been greater for surfaces affected than for teeth affected in every community. Expressed in another way, the general picture is that the average number of carious surfaces per affected tooth was higher in 1952 and 1953 than in the later years of the first period.

The DMF rates for first molars at these younger ages increased more than the DMF rates for total permanent teeth as may be seen by comparing Fig. 37 and Fig. 38.

Table 33. For 7+8 year-old boys and girls, per cent of teeth and of surfaces DMF for the permanent first molars in the reduced cities, reduced villages, Gjerpen and Grue, 1940-1941 to 1948-1949, and 1951-1952 and 1952-1953.

SCHOOL YEAR	NUMBER OF BOYS	Boys				NUMBER OF GIRLS	GIRLS			
		Upper First Molars		Lower First Molars			Upper First Molars		Lower First Molars	
		Per Cent DMF					Per Cent DMF			
		Teeth	Surf.	Teeth	Surf.		Teeth	Surf.	Teeth	Surf.
REDUCED CITIES										
1940-41	227	77.9	20.7	83.6	27.1	211	80.3	23.3	93.3	31.9
1941-42	262	69.1	17.4	79.2	24.5	261	76.2	19.3	90.3	32.3
1942-43	268	65.5	17.3	78.0	24.2	256	74.1	19.9	87.1	31.2
1943-44	257	61.0	15.6	72.6	20.2	230	66.4	17.3	85.1	26.0
1944-45	253	60.6	15.4	72.1	20.4	237	62.2	16.4	73.8	22.4
1945-46	293	53.1	13.4	65.3	18.1	215	52.4	15.4	72.3	20.3
1946-47	307	48.6	13.6	61.6	17.0	250	53.6	14.1	66.8	18.5
1947-48	310	58.8	16.3	64.5	18.0	303	61.0	17.0	69.0	19.9
1948-49	290	62.2	17.0	61.6	17.8	291	64.2	18.2	69.1	19.7
1951-52	344	68.1	20.5	73.2	22.9	326	72.2	21.1	82.6	26.2
1952-53	376	66.4	20.9	70.8	22.4	335	73.2	24.6	80.4	26.6
REDUCED VILLAGES										
1940-41	158	81.1	23.9	86.8	26.9	176	81.2	24.2	89.0	29.9
1941-42	203	71.7	20.1	78.7	25.4	225	73.1	20.2	85.5	26.9
1942-43	209	62.9	17.6	68.0	20.9	214	69.6	19.0	85.3	24.5
1943-44	191	62.0	16.2	67.8	17.6	191	60.2	16.7	77.8	20.8
1944-45	108	59.8	15.9	68.9	21.2	126	66.7	17.5	77.9	20.2
1945-46	190	37.1	9.1	43.6	11.8	199	39.7	10.3	53.6	13.9
1946-47	212	36.8	8.5	42.4	10.6	202	44.4	10.4	62.1	16.2
1947-48	228	43.3	10.8	51.4	13.1	229	43.7	11.3	60.5	15.3
1948-49	205	44.2	11.3	53.8	15.2	222	64.4	17.2	71.7	20.0
1951-52	205	58.1	15.6	66.2	18.0	198	70.4	20.8	83.4	22.9
1952-53	297	61.5	19.9	68.5	21.3	249	69.7	21.1	81.3	25.3
GJERPEN										
1940-41	103	61.2	15.1	60.0	16.2	95	56.2	15.7	72.0	23.2
1941-42	114	48.1	11.3	54.1	14.4	87	59.5	15.7	68.2	20.0
1942-43	117	30.2	7.6	39.3	10.4	89	44.7	11.3	55.7	14.1
1943-44	100	16.5	4.1	24.2	6.1	85	22.8	4.8	36.9	8.3
1944-45	104	14.9	3.8	20.6	5.3	100	16.8	3.8	27.6	6.9
1945-46	120	11.8	3.2	10.0	2.3	121	17.9	3.9	21.8	4.5
1946-47	141	10.9	2.9	12.9	3.0	137	20.1	5.2	19.9	4.4
1947-48	131	17.5	3.8	18.4	4.5	122	21.6	5.9	32.8	8.9
1948-49	121	15.4	3.1	14.4	3.4	120	19.8	5.0	28.3	7.2
1951-52	167	29.2	7.7	25.9	6.4	169	32.5	8.1	38.9	11.1
1952-53	210	31.4	7.6	33.7	9.0	196	41.7	11.1	49.2	14.6
GRUE ¹										
1943-44	72	42.0	10.1	51.4	12.5	69	49.3	11.9	54.4	14.4
1944-45	71	30.0	7.7	40.0	9.7	60	30.0	8.3	41.7	10.7
1945-46	69	33.3	9.0	39.1	9.0	61	31.7	8.3	42.6	11.1
1946-47	65	33.3	9.5	42.2	9.7	89	50.6	13.8	51.1	13.2
1947-48	53	32.0	8.0	29.4	7.1	66	50.8	15.1	59.1	16.7
1948-49	39	52.6	15.8	33.3	9.2	48	54.3	13.0	45.8	12.1
1951-52	99	74.2	24.7	79.2	26.3	81	80.0	26.3	90.1	28.1
1952-53	98	76.8	26.1	80.0	27.2	102	82.2	28.7	86.0	32.2

¹ No examinations prior to 1943-1944.

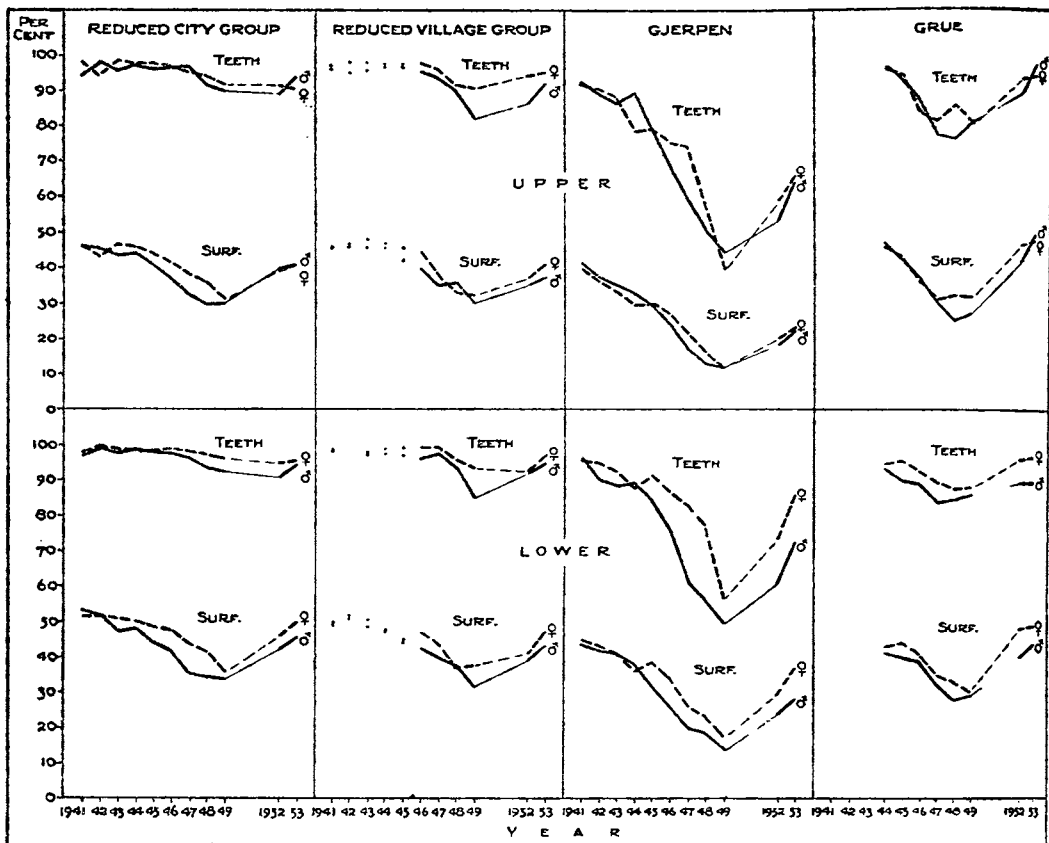


Fig. 39. Per cent of permanent first molars DMF and per cent of tooth surfaces DMF at ages 12 + 13 years in 1951-1952 and 1952-1953 compared with first period, 1940-1941 to 1948-1949, in reduced city and reduced village groups, in Gjerpen and in Grue.

For the age group 12 + 13 years, the percentages of first permanent molars DMF were at the lowest level in 1948 or 1949 for all community groups, as is shown in Fig. 39 and Table 34. These four community groups differed greatly in the reduction in DMF rates for the first molars during the first period, the reduction being least in cities and most in Gjerpen where the decrease in rates also started earlier. In the second period, 1952 and 1953, the percentages of first molars DMF showed an increase over the 1949 rates in villages, in Gjerpen, and in Grue. In the cities, there was little change, but the rates for upper and lower molars of boys showed a tendency to rise in 1953.

Table 34. Per cent of teeth and of surfaces DMF for the permanent first molars of 12+13 year-old boys and girls in the reduced cities, reduced villages, Gjerpen and Grue—1940-1941 to 1948-1949, and 1951-1952 and 1952-1953.

SCHOOL YEAR	NUMBER OF BOYS	Boys				NUMBER OF GIRLS	GIRLS			
		Upper First Molars		Lower First Molars			Upper First Molars		Lower First Molars	
		Per Cent DMF					Per Cent DMF			
		Teeth	Surf.	Teeth	Surf.		Teeth	Surf.	Teeth	Surf.
REDUCED CITIES										
1940-41	206	94.7	45.8	97.1	53.0	180	97.8	45.6	97.8	51.3
1941-42	168	98.2	45.0	98.8	51.3	176	93.8	42.7	98.9	51.7
1942-43	194	95.4	43.0	97.4	47.2	156	98.7	46.4	98.7	51.0
1943-44	250	97.6	43.8	99.2	48.1	256	97.3	45.6	98.4	50.0
1944-45	269	96.3	40.4	97.4	43.9	264	97.7	43.5	97.7	48.6
1945-46	234	96.6	36.7	97.4	41.9	237	97.0	41.3	98.7	47.4
1946-47	249	96.4	31.7	96.0	35.0	230	94.8	37.8	98.3	43.7
1947-48	245	91.4	29.6	93.1	34.1	250	94.0	35.8	96.8	41.3
1948-49	237	89.8	29.7	91.9	33.6	212	91.5	30.1	96.2	35.7
1951-52	287	89.2	39.6	90.6	41.9	294	91.5	39.3	94.6	45.8
1952-53	271	94.1	40.5	94.1	45.1	298	90.3	40.4	95.3	49.8
REDUCED VILLAGES ¹										
1945-46	205	95.6	39.3	96.1	42.1	189	97.4	44.8	98.9	46.9
1946-47	171	93.6	34.7	97.7	39.9	162	95.7	37.3	98.8	43.8
1947-48	196	89.8	35.8	93.4	37.4	185	90.8	32.2	95.1	37.0
1948-49	196	82.1	29.4	84.7	31.9	183	90.7	31.9	92.9	37.5
1951-52	160	86.3	34.4	91.9	38.6	147	93.9	36.6	91.8	40.8
1952-53	183	91.8	37.0	94.5	43.0	189	95.2	40.3	96.8	46.6
GJERPEN										
1940-41	146	91.8	41.1	95.9	43.2	157	92.4	39.6	94.9	44.2
1941-42	138	89.1	37.0	89.9	41.7	151	90.1	35.4	94.7	42.9
1942-43	135	86.7	34.7	88.1	40.6	148	87.8	32.8	91.9	40.7
1943-44	135	89.6	32.6	88.9	37.2	132	78.0	28.8	87.1	35.8
1944-45	131	79.4	29.0	84.0	31.0	135	79.3	29.2	91.1	38.2
1945-46	130	68.5	23.4	75.4	25.2	112	75.0	26.1	86.6	33.8
1946-47	133	57.9	16.2	60.9	19.2	109	74.3	20.9	82.6	25.9
1947-48	132	50.0	12.6	56.1	18.0	94	57.4	15.5	76.6	23.0
1948-49	109	44.0	11.4	49.5	13.8	95	38.9	11.6	55.8	17.1
1951-52	180	52.8	17.3	60.6	23.2	149	58.4	19.3	73.2	29.3
1952-53	173	64.2	22.0	72.3	28.0	138	71.0	22.9	85.5	36.5
GRUE ²										
1943-44	86	96.5	46.7	93.0	40.9	98	95.9	45.3	93.9	42.2
1944-45	86	93.0	41.6	89.5	39.3	82	93.9	42.9	95.1	43.4
1945-46	97	87.6	36.7	88.7	38.4	86	83.7	35.1	91.9	40.5
1946-47	92	77.2	29.6	83.7	31.7	90	81.1	30.4	88.9	34.0
1947-48	88	76.1	24.8	84.1	27.3	77	85.7	31.7	87.0	32.7
1948-49	48	81.3	26.7	85.4	28.8	56	80.4	31.1	87.5	29.6
1951-52	82	89.0	41.2	89.0	40.0	114	92.9	46.2	95.6	47.4
1952-53	83	97.6	49.6	89.2	43.4	99	93.9	47.5	96.0	48.5

¹ Reduced village data not comparable for ages 12+13 years in 1940-1941 to 1944-1945.² No examinations prior to 1943-1944.

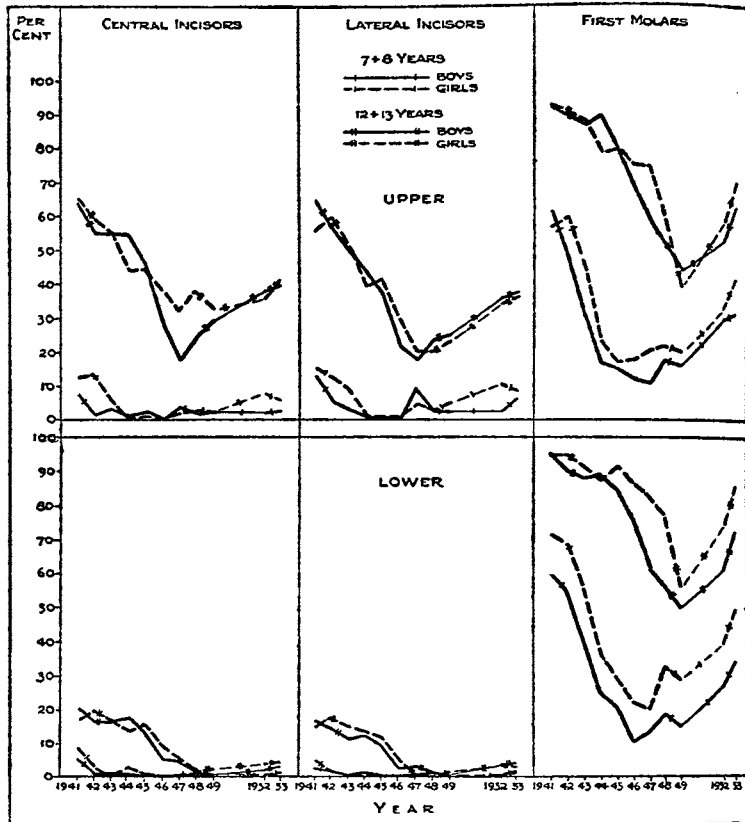
In Gjerpen the DMF rates in 1953 had increased almost to the levels in 1946, and in Grue the rates had reached the 1944 level, the earliest year of record for this community.

The percentages of surfaces of permanent first molars affected by caries for 12 + 13 year-old boys and girls declined more in

all four community groups than the percentages of teeth DMF, and were at the lowest level in 1948 or 1949. In the later period, rates for surfaces affected had increased greatly over the 1949 rates.

Gjerpen, DMF Rates for Specific Teeth. In Fig. 40, caries rates for each specific tooth for boys and girls in Gjerpen are shown for the two periods of study.

The large increase in DMF rates for first molars at ages 7 + 8 years from the end of the first period to the second period has been discussed. There were small increases in DMF rates for the upper lateral incisors for both sexes and for the upper central incisors in girls only. At this age, the lower incisors have such low caries rates that significant changes would be hard to demonstrate.



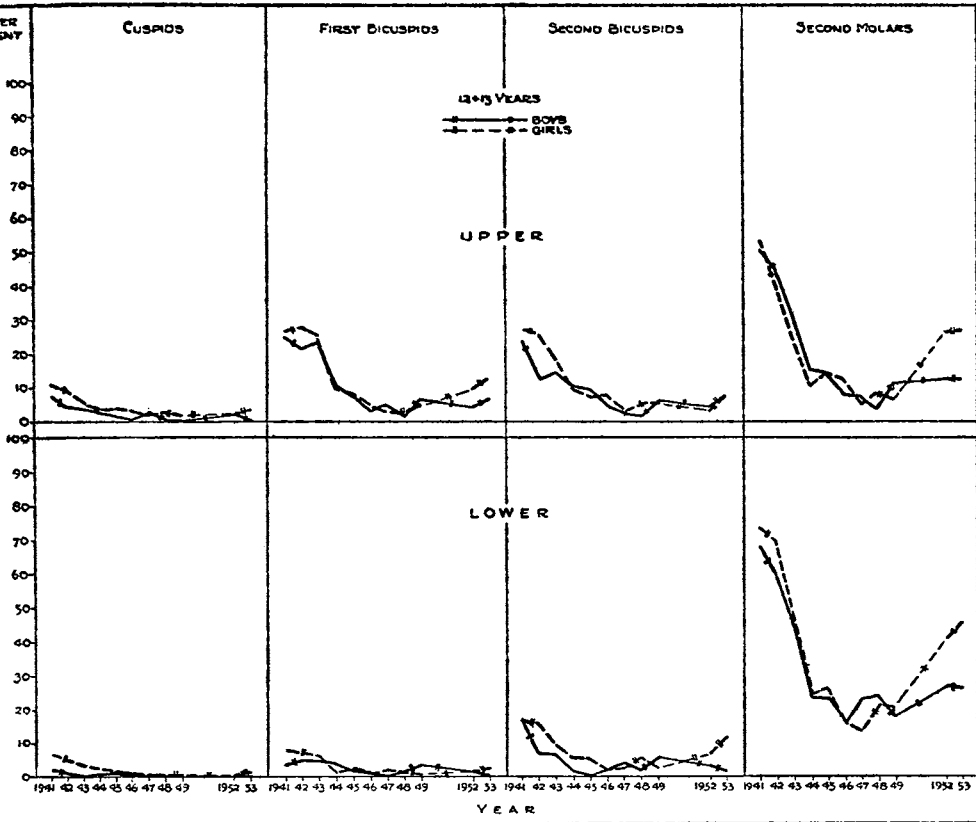


Fig. 40. GJERPEN: Per cent of specific teeth DMF at ages 7+8 years and 12+13 years in 1951-1952 and 1952-1953 compared with first period, 1940-1941 to 1948-1949.

At ages 12 + 13 years, the DMF rates in Gjerpen are much higher in 1953 than in 1949 for upper and lower incisors, and for upper and lower molars. For the cuspids and bicuspids, annual rates are somewhat irregular but a tendency to increase may be seen in rates for the upper first bicuspids in both sexes and the lower second bicuspids in girls. For none of the teeth have the caries rates in 1953 reached the levels for 1941.

DMF Rates in Fet at Age 13 Years. Prevalence of caries in 1952 and 1953 in Fet, a rural community, is shown in Fig. 36 and Table 30 for children 13 years of age, both sexes. As previously discussed, during the first period there was a rapid downward trend in DMF rates for incisors and first molars and

the minimum rates were recorded in 1949 for upper and lower first molars and both lower incisors but rates for upper incisors were slightly higher in 1949 than in 1948. In the second period, there is a sharp increase in caries rates for upper incisors and also for upper first molars. Caries in lower incisors do not seem to have increased from 1949 to 1953. The percentages of lower first molars DMF are irregular in both periods, but the per cent of surfaces affected is much higher in the second period than in 1949. The rate of extraction of lower first molars, but not of upper molars, also shows a tendency to increase in the second period.

CONCLUSION

The principal findings from this study of caries in the permanent dentition of 7 to 13 year-old children based on annual examinations from 1941 to 1949 and in 1952 and 1953 in groups of cities, of villages, and of rural districts, in Trondheim, in Gjerpen and in several other small communities, are briefly summarized in the following paragraphs.

A study of bilateral symmetry for examinations in one year showed that the occurrence of caries in each side of the mouth is nearly equal in terms of prevalence rates for specific teeth affected by caries.

The percentages of children aged 7 + 8 years who had no caries in the permanent dentition increased three to four times from 1941 to 1946. After 1946, the percentages decreased to 1949 but remained above the initial levels.

The average number of DMF teeth per child and also the percentage of total teeth DMF showed a definite decrease in 1942, or in 1943, in almost every instance. In the younger age group (7 + 8 years), the minimum values usually were reached in 1946, whereas in the older age group (12 + 13 years) the lowest values occurred one to three years later. The percentage reduction in DMF rates was greater at the younger than at the older ages; and varied for different community groups from 31 to 83 per cent at the younger ages and from 27 to 64 per cent at older ages.

The reduction in the per cent of specific teeth DMF showed great variation from tooth to tooth. The teeth with the lowest caries susceptibility—the incisors, the first bicuspid, and the cuspid in the lower jaw—demonstrated the greatest reduction in caries rates. In the age group 12 + 13 years the drop was close to 100 per cent for several teeth. The smallest reduction was found for the first molars of 12 + 13 year old children. The percentage reductions in caries rates for the upper incisors in this age group were about the same for both the lateral and the central and were also of nearly the same magnitude as that for the first molars in the 7 + 8 year old children. Within groups of teeth of the same morphological type, the tooth with the lowest susceptibility showed the greatest reduction relatively.

The trend of the curves for the percentage of total surfaces DMF was generally similar to that for the percentage of teeth DMF. Here, too, an inverse correlation between caries susceptibility and caries reduction was found.

The rate of extraction of first molars dropped in all communities, and in most of them from a level, in the older age groups, of 40–45 per cent in 1941 to a point close to zero at the end of the first period, 1949.

A comparison of the various community groups showed that the greatest reduction in caries took place in the village community Gjerpen (not included in the main village group). Next in order came the rural group. The village group and the city group were about equal.

In all groups the per cent of total teeth DMF, the per cent of total surfaces DMF, the per cent of specific teeth DMF, and the per cent of surfaces DMF in specific teeth increased during the second period of study, 1951–1952 and 1952–1953. Except for a few instances, the latest values did not, however, reach the levels of the initial rates.

The girls generally showed higher caries rates than boys. The maximum reductions in caries rates for girls and boys did not show any constant differences which might point to an actual sex differential in changes in caries status in response to the

nutritional and environmental conditions operating during the period of study.

A more general discussion of the changes in the dental status in relation to the diet during the war and post-war years will be given in the next section of this report.

REFERENCES

Brekhus, P. J.: A Report of Dental Caries in 10,445 University Students. *Journal of the American Dental Association*, 1931, 18, p. 1350.

Calonius, P.-E. B.: STATISTICAL STUDIES ON THE FREQUENCY OF CARIES IN THE PERMANENT DENTITION OF CHILDREN. Helsinki, Suomalaisen Kirjaleisuuden Seuran Kirjapainon Cy., 1953.

Finn, S. S.: Prevalence of Dental Caries. In A SURVEY OF THE LITERATURE OF DENTAL CARIES. Washington, D. C., National Academy of Science-National Research Council, 1952.

Hewat, R. E. T., and Eastcott, D. F.: DENTAL CARIES IN NEW ZEALAND. The Medical Research Council of New Zealand.

Hurme, V. C.: Ranges of Normalcy in the Eruption of Permanent Teeth. *Journal of Dentistry for Children*. 1949, 16, Sec. Quarter, p. 11.

Klein, H. and Palmer, C. E.: Studies on Dental Caries, VII. Sex Differences in Dental Caries Experience of Elementary School Children. *Public Health Reports*, 1938, 53, p. 1685.

Palmer, C. E.; Klein, H.; and Kramer, M.: Studies on Dental Caries III. A Method of Determining Post-eruptive Tooth Age. *Growth*, II, No. 2, p. 149.

Sloman, E.: Sex and Age Factors in the Incidence of Dental Caries. *Journal of the American Dental Association*, 1941, 28, p. 441.

Toverud, G.: Grunnlaget for et kariesprofylaktisk arbeid idag. *Odontologisk Tidsskrift*, 1946, 54, p. 277.

Toverud, G.: Decrease in Caries Frequency in Norwegian Children During World War II. *Journal of the American Dental Association*, 1949, 39, p. 127.

Toverud, G.: Dental Caries in Norwegian Children During and After the Last World War. A Preliminary Report. *Proceedings of the Royal Society of Medicine*, 1949, XLII, p. 249.

Toverud, G.: Dental Caries in Norwegian Children During and After the Second World War. *Journal of the American Dietetic Association*, 1950, 26, p. 673.

Toverud, G.: The Influence of War and Post-War Conditions on the Teeth of Norwegian School Children. I. Eruption of Permanent Teeth and Status of Deciduous Dentition. *The Milbank Memorial Fund Quarterly*, October, 1956, xxxiv, pp. 354-430.

Welander, E.: THE OCCURRENCE OF DENTAL CARIES IN THE PERMANENT DENTITION. Uppsala, Almqvist & Wicksell, 1955.