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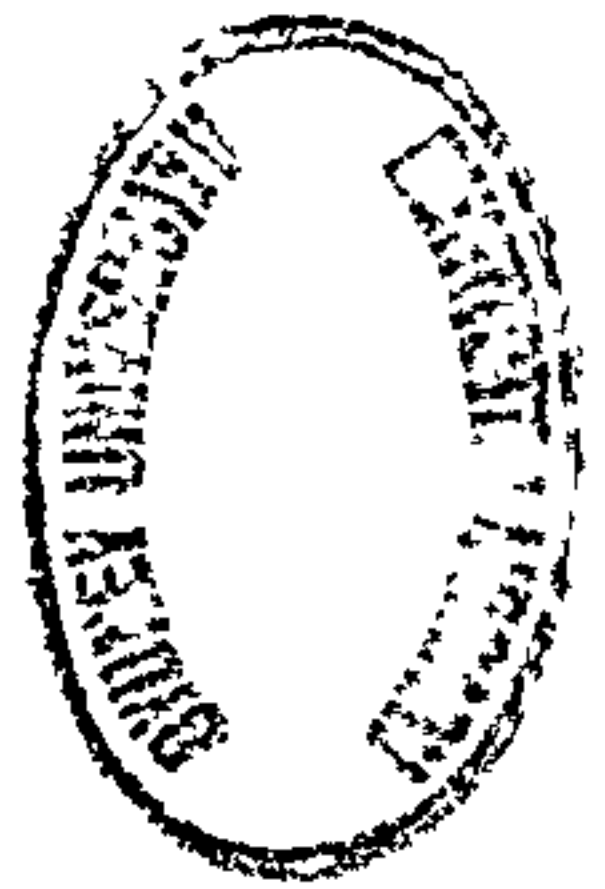
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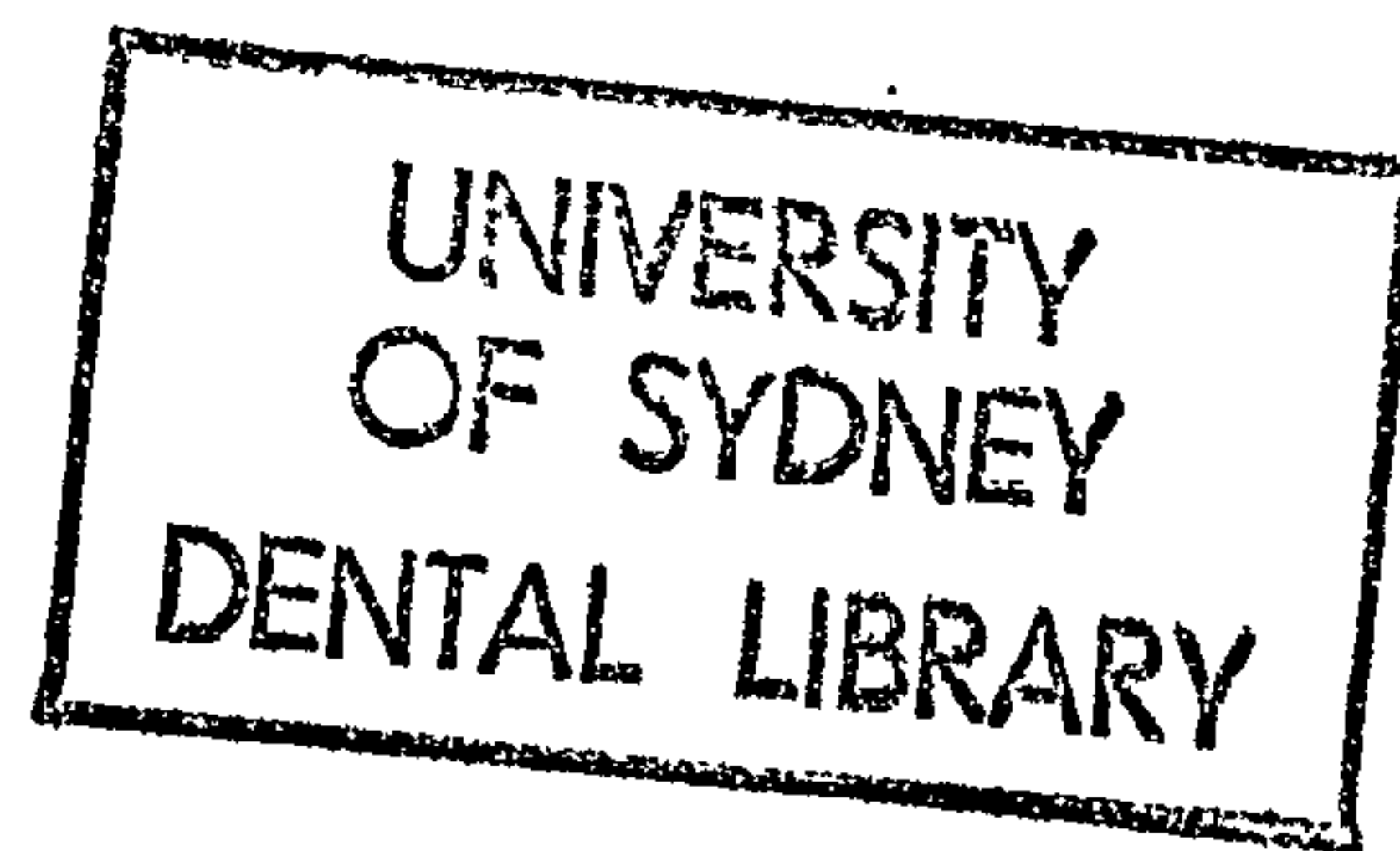


DENTAL TREATMENT NEEDS
OF A GROUP OF SCHOOL CHILDREN
IN NEW SOUTH WALES
(FILLINGS AND EXTRACTIONS)

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A Thesis submitted in partial
requirement for the
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1. INTRODUCTION

No study in Australia has been reported of dental treatment needs in terms of actual numbers of different types of fillings.

Many surveys of dental caries experience have been conducted in Australia. Some of them have investigated prevalences and incidences of decayed, missing and filled teeth in various populations; some have studied such prevalences and incidences in more detail by accounting for every tooth surface. Certain surveys have used radiographs in addition to the usual clinical examination for the detection of dental caries.

If dental filling requirements were reported they have always been mentioned as numbers of teeth or tooth-surfaces that needed to be filled. No doubt such figures indicate treatment needs. But one can only guess the numbers and proportions of the various types of fillings that will be required.

For instance, an incisor tooth reported as requiring filling might need anything from a simple lingual-pit type of filling to a more time-consuming and expensive gold Class IV inlay or crown. A premolar tooth reported as requiring one surface to be filled might need an occlusal (Class I), a cervical (Class V), or a mesio-occlusal or disto-occlusal (Class II) type of filling. A molar tooth reported as requiring two surfaces to be filled might need

separate occlusal and buccal fillings, or occlusal and lingual fillings, or buccal and lingual fillings; it might need a mesio- or disto-occlusal filling or, perhaps, a mesio-occluso-distal (MOD) filling.

These three examples are sufficient to illustrate that treatment expressed as teeth or tooth-surfaces requiring filling will not reveal a real enough estimate of the nature of dental treatment required.

Dental filling requirements expressed as numbers of the various types of fillings needed will give a closer approximation to the actual treatment needs of a population. This would facilitate more efficient planning of dental public health treatment programmes. The manpower, materials and equipment, the time and money required for execution of such programmes can be estimated with reasonable accuracy. Perhaps, in a limited treatment programme it would be seen that for a specific age a specific type (or types) of filling should be given priority over the others, and that different types of filling requirements take priority at different ages. Dentistry for children is perhaps the most needed and yet the most neglected of all the services performed by the dentist. The value of this service cannot be exaggerated, for inadequate or unsatisfactory dental treatment during childhood may damage permanently the entire masticatory apparatus, leaving the individual with many of the den-

tal problems so common in today's adult population.⁽⁹⁾ Unless regular, periodic dental care is started early in life and continued throughout life, our adolescents, young adults, and older people will continue to present accumulated dental defects and their concomitant results.⁽¹⁾

In a group of New South Wales school children caries of the permanent teeth was present in 89.7 per cent. of the children, and of permanent or deciduous teeth in 98.5 per cent. of the children.⁽²⁾ A sample of Western Australian children, two to six years of age, showed the prevalence of dental caries in the deciduous teeth to be 63.2 per cent. in the two-year-old age group and over 95 per cent. in the remaining groups.⁽¹²⁾ The prevalence of dental caries experience is high in Australian children.

The problem of dental treatment for these children seems overwhelming and perhaps discouraging. During the past half century we have acquired a vast body of knowledge on how to assure good nutrition and normal physical growth of children and to control communicable diseases. Gradually this knowledge has been made a part of the everyday living of the ordinary parent. It is believed that dental health will follow this same pattern, and gradually more and more people will be motivated to support and seek dental care.

Whereas preventive measures must certainly play a primary and significant part in the control of dental caries, treatment also serves an effective role in the control of the disease. Availability of data expressing the nature and extent of dental treatment required for a given population will help make treatment as a method of control of dental caries more efficient.

What we do for the child can be taken as a fair measure of social progress. A determination of what constitutes a reasonable investment in the dental health of children will vary from person to person and from community to community. The dental health of the child is often a sadly neglected aspect of public health, especially in developing countries. In Australia much is being done to improve the dental health of children by way of research, prevention, health education and treatment programmes. Besides governmental effort, more communities and organisations are taking positive steps towards bettering the dental health of the people. However, there is yet a long way to go before these needs can be satisfactorily met.

The need for dental treatment in children can be because of the following:-

1. caries
2. malocclusion
3. trauma
4. periodontal disease, and
5. hypoplasia.

Caries calls for professional attention very much more than do the other conditions. Indeed, some of these conditions stem from the ravages of dental caries.

In 1963, prior to the commencement of fluoridation in Tamworth, New South Wales, 4,314 children from state and private schools were examined by a survey team from the Department of Preventive Dentistry, University of Sydney. It was the first examination in a ten-year dental survey to demonstrate the improvement in dental health which the children would be expected to show as a result of the fluoridation of the Tamworth City Water Supply. From these 4,314 children a sample of 567, aged five to fifteen years, was selected for radiographic examination in addition to the standard clinical examination.

This study analyses the results and original data obtained from the sample in an attempt to determine the dental treatment needs in respect of various types of fillings and extractions.

Some Australian dental caries studies of children are reviewed with special emphasis on filling and extraction needs in the next section.

2. REVIEW OF SOME DENTAL CARIES STUDIES OF AUSTRALIAN CHILDREN

A. In this section the results of several dental surveys of Australian children are presented and discussed with regard to filling and extraction needs.

Before presenting the results of the various surveys it is pertinent to touch upon the subject of dental epidemiological studies. Such studies are being conducted on an ever-increasing scale, but very few of the results are comparable, owing to the differences in terminology and diagnostic criteria and to the varying methods employed in examination and in the recording and reporting of data.⁽¹⁶⁾ There is a crying need for standardized reporting of dental diseases and conditions so that the confusion so evident in the literature may be avoided in the future. Much of the value of expensive and time-consuming surveys is lost because of non-comparability.

Where dental caries is infrequent classification according to its presence or absence is suitable, but when ninety per cent. of the community suffers, this classification is not suitable.⁽¹⁴⁾

The DMF index is widely used as a quantitative measure of the life-time caries experience of the permanent teeth. It is the average number of permanent teeth per person which are decayed (D), missing because of caries (M), or filled (F).

Similarly, the dmf index is a quantitative expression of the caries experience in deciduous teeth. As it is difficult to differentiate between a missing deciduous tooth which has been exfoliated naturally and a missing deciduous tooth which has been lost because of caries, an Expert Committee on Dental Health convened by the World Health Organisation has recommended the df index, rather than the dmf, as being the best method of assessing caries experience in deciduous teeth. (16)

Jackson states that the dmf index can be validly used for a full mouth dentition for ages from three to five years inclusive, and for deciduous molars from three to eight years inclusive. At five years of age deciduous incisors begin to exfoliate: upper incisors have already exfoliated to the extent of about seven per cent.; lower incisors, about 16 per cent. In children from three to eight years inclusive all missing deciduous molars can safely be assumed to have been carious at some time. (Canines are prone to a premature exfoliation in a sound condition.) (14)

No standard usage of the D, M, and F (or d, m, and f) components of the index is followed. In one survey a decayed tooth is counted as such regardless of any restoration it might have: in another, a filled tooth is taken to mean a tooth which has been filled but which may also be carious. An investigator might subdivide the D or d component to differentiate between decayed teeth

requiring filling and decayed teeth indicated for extraction. Another would allocate permanent teeth indicated for extraction to the M component. While good reasons might well be put forward to support these differences in recording and reporting between different investigators a standard usage of the D, II, and F symbols would make epidemiological data more widely comparable and more easily understood and appreciated.

In certain types of studies where greater detail is desirable DMF and/or dmf surface indices are used. The unit of counting is a tooth surface. Surface counts have an advantage over tooth counts in that changes in caries experience can still be seen easily in mouths already having such high caries that almost no completely unattacked teeth remain. They indicate the amount of treatment received and treatment required much more closely and realistically than tooth counts. The surface count, however, has an inherent weakness in the fact that it is difficult to give a value in regard to surfaces that were involved in an already extracted tooth.

Standardization of diagnostic criteria is important. Some of the surveys to be reviewed will show variations in the diagnostic criteria employed. Our most imperative need at present is a uniform and universal standard of what is or is not a carious lesion.⁽¹⁰⁾ The regular use of sharp probes is generally not given due importance in dental caries surveys.

Some dental caries surveys use X-ray examination in addition to clinical examination. Others do not because the purpose of the survey may not warrant additional X-ray examination or perhaps because time and cost factors do not permit its use. Combined clinical and X-ray examinations give more accurate results of dental caries experience.

Barnard in his survey of 6,787 school children, aged six to 15 years, suggested that since all but 13 per cent. of all carious surfaces were discovered by clinical examination alone, radiograms may not be necessary for surveys aiming to determine the relative amounts of dental treatment required.⁽²⁾

Dunning, in discussing a study of 994 persons from 13 to 23 years of age, remarks that when the purpose of a survey is to determine susceptibility to dental caries X-rays are of little necessity, but they assume far greater importance when treatment needs are being considered. Although bitewings have a relatively small effect upon the DMF tooth count as determined by mirror and explorer examination, there is a much greater effect upon findings of decayed teeth (D). There are decreases in the number of filled teeth (F), since many of these teeth were found upon X-ray examination to be carious, and were thus retabulated as D instead of F.⁽⁸⁾

There seems to be a variation with age, in the usefulness of supplementary X-ray examinations as a routine procedure in dental caries surveys.

The mean values of the various components of the DMF count give actual figures for treatment need, tooth loss and treatment received.

The D component gives treatment needs in terms of teeth to be restored and teeth requiring extraction. The number of D teeth divided by DMF teeth is a good measure of the failure of dental treatment in the population. The greater the fraction (or percentage) the more is the failure.

The M component, in young persons at least, represents predominantly the end result of caries. The ratio of M teeth to DMF teeth expressed as a percentage has been termed the tooth fatality rate. It shows the proportion of affected teeth that have been extracted and is regarded as an inverse index of the level of dental care.

The F component indicates the amount of restorations present, but an allowance must be made for fillings in decayed teeth which would be included in the D component. The ratio of F teeth to DMF teeth measures in direct proportion the success of a treatment programme for dental caries.

B. Except for a few surveys conducted in New South Wales, comparability suffers to a greater or lesser extent between all the other surveys to be discussed. No single standardized method of reporting dental diseases and conditions was adopted in most of the various surveys. There were variations in the criteria employed to determine decayed and filled teeth or tooth surfaces.

Each survey will be briefly described and its results relevant to this study presented and discussed.

(1) Dental Survey of State School Children in New South Wales.
January, 1954 - June, 1955. (2)

The survey covered 6,787 children, aged six to 15 years, attending State schools in New South Wales, and was mainly of the permanent dentition. Sampling was such as to be representative of the school population of the State in the age groups six to 15 years.

Observations were recorded of carious lesions, oral hygiene, occlusion, gingival condition, mottled enamel and hypoplasia.

Examination was by a standardized clinical method as well as by X-rays. The number of bitewing radiograms taken per child varied according to whether the approximal surfaces could be examined clinically with thoroughness.

The following criteria for the presence of dental caries were used:-

- (a) Occlusal and gingival lesions: if the probe sticks and resists withdrawal or if softness is palpable;
- (b) Approximal lesions: if roughness capable of holding its point is detected with a probe;
- (c) Hard stained surfaces and enamel imperfections other than those indicated in (a) and (b) were not recorded as carious.

The following symbols were used in charting:-

- D- Carious (not including permanent teeth previously filled and having further carious lesions);
- M - Missing;
- F - Filled (irrespective of other carious lesions);
- S - Caries-free;
- X - Indicated for extraction;
- U - Unerupted.

A tooth was considered to be due for extraction when its state was such as to make repair impossible (at least half the crown destroyed) or where the roots only remained. This is included in the DMF count for the child as a decayed or previously filled tooth.

TABLE 2. 1.

MEAN NUMBER OF DIF TEETH AND TOOTH SURFACES

PER CHILD BY AGE.

(Barnard 1956²)

Age (Years)	6	7	8	9	10	11	12	13	14	15
DIFT	0.99	2.31	3.22	4.44	5.28	6.98	9.32	10.70	12.78	13.91
DIFS	1.6	4.1	6.1	9.1	10.9	14.2	18.2	20.7	25.7	29.1

The respective increases per year in the number of DIF teeth and DIF tooth surfaces bear to each other a constant ratio of approximately 1:2.

TABLE 2. 2.

14

DISSECTION OF DMF VALUES BY AGE
(Barnard 1956²)

Age (Years)	Mean Values per Child							Percentage composition of DMF				
	M+X	X	D	M	F	DMF		D	M	F	DMF	
6	0.008	0.006	0.88	0.002	0.09	0.99		90.3	0.2	9.5	100	
7	0.074	0.017	1.82	0.057	0.42	2.31		79.1	2.6	18.3	100	
8	0.197	0.056	2.15	0.141	0.93	3.22		66.8	4.4	28.8	100	
9	0.487	0.169	2.68	0.318	1.44	4.44		60.4	7.2	32.4	100	
10	0.698	0.193	2.84	0.505	1.93	5.28		53.9	9.5	36.6	100	
11	0.904	0.220	3.86	0.684	2.39	6.98		55.7	9.9	34.4	100	
12	1.313	0.217	4.83	1.096	3.39	9.32		51.8	11.8	36.4	100	
13	1.626	0.213	5.20	1.413	4.09	10.70		48.6	13.2	38.2	100	
14	2.027	0.250	5.25	1.777	5.75	12.78		41.1	15.9	45.0	100	
15	2.491	0.180	4.36	2.311	7.25	13.91		31.3	16.6	52.1	100	
6 to 15	0.899	0.143	3.30	0.756	2.53	6.59		50.2	11.5	38.4	100	

Table 2. 2. shows by age the mean number of teeth per child due for extraction, the number of decayed teeth requiring treatment, the number lost by extraction, and the number of filled teeth.

The mean DMF count for the sample is 6.6. In 15-year-old children 14 teeth had already been attacked by caries, out of which two had been extracted.

The number of filled teeth increases from 9.5 per cent. of the DMF at six years of age to 52.1 per cent. at 15 years. Despite the steady rise with age in the number of filled teeth per child, the number of teeth still to be filled also shows a steady increase. It is not until the child's 14th or 15th year that the increment in the amount of work required diminishes. For all children, three out of six decayed teeth in the mouth were not treated.

The mean number of teeth per child due for extraction is 0.1.

Since a filled tooth was counted as such irrespective of other carious lesions, a proportion of the F component would include teeth requiring filling and teeth due for extraction. The treatment requirement as shown by the number of decayed teeth, therefore, will be greater than what is shown in the table. The value for the number of teeth due for extraction is derived out of the D and F components.

(ii) A Study of Dental Caries in a Group of Western Australian Children. Part I. The Incidence of Dental Caries in Permanent Teeth.⁽¹¹⁾

This is a study of 1,195 children aged five to 15 years, who attended for dental treatment at the Gustafson Dental Clinic, Fremantle, Western Australia, during the period from March to August in 1959. These children had been under the constant care of a dental health service. It would be seen that this group of children cannot be expected to be representative of the child population in Western Australia. The level of dental care received by this sample would tend to be higher than what the average child in Australia receives.

Examination was by mirror and probe. A permanent tooth was classified as erupted if any portion of the crown had penetrated the oral mucosa.

The following criteria for the presence of dental caries were used:-

- (a) Pits and fissures: if the point of a sharp probe required a definite pull for its removal or if softness was palpable;
- (b) Proximal surfaces: if a roughness was present capable of holding the point of a sharp probe;

- (c) Stained pits or fissures, enamel imperfections and stained areas on smooth surfaces were not considered carious unless evidence of enamel dissolution was present.

The dental conditions recorded for the permanent teeth of each child were:-

D - number which were untreated or both decayed and filled;

M_1 - number indicated for extraction;

M_2 - number actually missing;

M - number actually missing and the number indicated for extraction;

F - number filled;

DMF - total of D, M, and F teeth.

A tooth was considered due for extraction when its state was such that it could not be repaired or where roots only remained.

These teeth were not included amongst the D teeth.

TABLE 2. 3.

AGE DISTRIBUTION OF SAMPLE

(Halikis 1962¹¹)

Age last birthday	5	6	7	8	9	10	11	12	13	14	15	All ages
No. of children	105	93	127	157	129	117	113	106	114	70	64	1195

Table 2. 4. shows the percentage of children with caries-free permanent teeth. 94 per cent. of five-year-old children have permanent teeth free from caries. (This is because the permanent teeth these children have are few and newly erupted.) This percentage, however, rapidly diminishes with increase in age, the six-year-old group showing only 50 per cent. of the children caries-free. 15 per cent. of all children had caries-free permanent teeth. The severity of attack by dental caries is shown by the fact that 2.6 per cent. of all eleven-year-olds have between 17-20 DMF counts, 3.8 per cent. of the 12-year-olds have 21-24 DMF counts and 2.2 per cent. of 15-year-olds have 25-28 DMF teeth. The high percentage of children in the younger age groups with 1-4 DMF teeth would indicate a very early attack on the permanent first molars.

TABLE 2.5.
DISSECTION OF DMF VALUES BY AGE
(Halikis 1962¹¹)

Age	D	M		F	DMF	Percentage composition of DMF				
		M ₁	M ₂			D	M		F	DMF
							M ₁	M ₂		
5	0.1	-	-	-	0.1	100	-	-	-	100
6	1.1	0.0+	-	0.1	1.2	91.7	0.0+	-	8.3	100
7	1.9	0.1	0.0+	0.5	2.5	76.0	4.0	0.0+	20.0	100
8	2.6	0.1	0.1	1.2	4.0	65.0	2.5	2.5	30.0	100
9	2.8	0.2	0.3	1.3	4.6	60.9	4.3	6.5	28.3	100
10	3.6	0.4	0.5	1.4	5.9	61.0	6.8	8.5	23.7	100
11	4.6	0.4	0.9	2.2	8.1	56.8	4.9	11.1	27.2	100
12	6.7	0.4	1.3	2.7	11.1	60.4	3.6	11.7	24.3	100
13	7.9	0.5	1.6	3.5	13.5	58.5	3.7	11.9	25.9	100
14	7.9	0.1	2.3	4.3	14.6	54.1	0.7	15.7	29.4	100
15	7.0	0.4	2.6	5.9	16.0	43.8	2.8	16.2	36.9	100

Table 2.5. analyses the DMF count into its components. The DMF value rises from 0.1 at the age of five years to 16.0 at 15 years. Except for the 15-year-old children the percentage of

decayed teeth needing attention ($D+M_1$) is never under 50 per cent., the children in the majority of the age groups averaging well over 60 per cent. of the DMF rate. Only in the oldest group have more than 30 per cent. of affected permanent teeth been successfully filled.

TABLE 2. 6.

THE ANNUAL INCREMENT OF DMF, D, M, AND F TEETH

BY AGE.

(Halikis 1962¹¹)

	AGE GROUPS (in years)									
	5.5- 6.5	6.5- 7.5	7.5- 8.5	8.5- 9.5	9.5- 10.5	10.5- 11.5	11.5- 12.5	12.5- 13.5	13.5- 14.5	14.5- 15.5
DMF	1.1	1.3	1.5	0.6	1.3	2.2	3.0	2.4	1.1	1.4
D	1.0	0.8	0.7	0.2	0.8	1.0	2.1	1.2	0.0	0.9
M	0.0	0.1	0.1	0.3	0.4	0.4	0.4	0.4	0.3	0.6
F	0.1	0.4	0.7	0.1	0.1	0.8	0.5	0.8	0.8	1.6

The annual increment of DMF, D, M, and F teeth of each age group is shown in Table 2.6. The attack rate varies from 0.6 teeth per year to a maximum of 3.0 teeth per year. The highest annual attack occurs between the ages of 10.5 years and 13.5 years. In most of the age groups the F rate lags well behind the attack rate, and only in the older children are more teeth filled than the number attacked.

(iii) A Study of Dental Caries in a Group of Western Australian Children. Part III. Caries Experience Expressed as DMF Tooth Surfaces. (13)

Data for this study were obtained from the same sample of children used in Part I which was just reviewed.

The method of examination, criteria for the presence of dental caries and reporting dental conditions were essentially the same as employed in Part I. Each surface of all teeth present was examined and classified as carious, non-carious, or filled.

The value of 3.32 carious surfaces was assigned to a tooth that had been extracted because of caries. This value was estimated by averaging the number of surfaces involved in teeth indicated for extraction.

TABLE 2. 7.
DISSECTION OF DMFS VALUES BY AGE
(Halikis 1965¹³)

Age last birthday	Decayed	Missing	Requiring extraction	Filled	DMF tooth surfaces
5	0.14	—	—	—	0.14
6	1.35	—	0.05	0.14	1.55
7	2.58	0.21	0.13	1.03	3.95
8	3.85	0.39	0.35	2.29	6.88
9	3.94	0.98	0.39	3.02	8.35
10	5.70	1.72	0.67	3.07	11.16
11	6.66	2.82	1.56	4.59	15.63
12	10.06	3.93	1.19	5.55	20.73
13	11.34	4.92	1.62	7.91	25.79
14	11.12	7.71	0.26	9.68	28.76
15	10.20	8.43	1.41	13.55	33.58

The DMF tooth surfaces per child are shown in Table 2.7.

The DMFS rate per child ranges from 0.14 tooth surfaces at the age of five years to 33.58 tooth surfaces at 15 years of age. The average five-year-old child has 0.14 unfilled surfaces. At age six, this figure is 1.35 surfaces; at eight years of age, 3.85 surfaces and at age fourteen 11.12. At age 15 there is a drop to 10.20 unfilled

surfaces. This drop in D tooth surfaces corresponds to a rise in the F tooth surfaces at age 15. The six-year-old has a tooth mortality of three per cent. of its DMFS rate. This rises sharply to 28 per cent. at the age of eleven years and varies between 24 per cent. and 29 per cent. of the DMFS rate between the ages of eleven years and 16 years.

TABLE 2. 8.

THE ANNUAL INCREMENT OF THE DMFS RATE

(Halikis 1965¹³)

Age group (years)	5.5- 6.5	6.5- 7.5	7.5- 8.5	8.5- 9.5	9.5- 10.5	10.5- 11.5	11.5- 12.5	12.5- 13.5	13.5- 14.5	14.5- 15.5
DMFS Increment	1.41	2.40	2.93	1.47	2.81	4.47	5.10	5.06	2.97	4.82

The yearly rate of development of carious defects is shown in Table 2.8. The annual DMFS increment varies from 1.41 tooth surfaces increase during the year from five and a half years of age to six and a half years of age to a maximum of 5.06 tooth surfaces increase in the year from twelve and a half years to thirteen and a half years.

TABLE 2.9.
A COMPARISON OF DMES RATES OF CHILDREN
BETWEEN THE AGES OF SIX YEARS AND 15 YEARS IN
NEW SOUTH WALES AND WESTERN AUSTRALIA

Author	Population group	A g e (y e a r s)									
		6	7	8	9	10	11	12	13	14	15
Barnard 1956 ²	New South Wales	1.6	4.1	6.1	9.1	10.9	14.2	18.2	20.7	25.7	29.1
Helikis 1962 ¹³	Western Australia	1.55	3.95	6.88	8.35	11.16	15.63	20.73	25.79	28.76	33.58

The DMFS rates in Western Australia are generally higher than those from New South Wales, as shown in Table 2.9. This might be because many of the children included in the Western Australian study had attended the Gustafson Dental Clinic seeking and requiring dental treatment.

(iv) A Study of Dental Caries in a Group of Western Australian Children. Part II. The Incidence of Dental Caries in Children Aged 2 - 6 years. (12)

This is a study of 361 children who attended the Gustafson Dental Clinic, Fremantle, Western Australia, for treatment during the period from March to August, 1959.

The review considers children aged five and six only. 105 children comprised the five year age group and 93 the six year age group.

The method of examination and the criteria for the presence of dental caries were essentially the same as employed in Part I of this series.

The dental conditions recorded for each child's teeth were:-

d = number of decayed, untreated deciduous teeth or filled teeth with subsequent caries;

e = number of decayed deciduous teeth indicated for extraction;

f = number of filled deciduous teeth;

m = number of missing deciduous molars;

defm = total of d, e, f, and m deciduous teeth.

The method of reporting DMF was as in Part I.

The following symbols were also used in reporting:-

- ds = number of surfaces of deciduous teeth decayed or
 filled and subsequently decayed;
- es = number of decayed surfaces of deciduous teeth indicated
 for extraction;
- fs = number of filled surfaces of deciduous teeth;
- defts = total number of ds, es, and fs surfaces;
- ms = number of decayed surfaces represented by each missing
 deciduous molar;
- defmts = total number of ds, es, fs, and ms surfaces.

TABLE 2.10.

CARIES EXPERIENCE IN CHILDREN AGED 5 AND 6
YEARS EXPRESSED AS def AND defm TEETH PER CHILD
(Halikis 1963¹²)

Age (last birthday)	d	e	f	def	m	defm
5	8.42	1.03	0.63	10.08	0.87	10.95
6	7.29	1.31	1.03	9.63	1.54	11.17

From table 2.10, it will be seen that the def count at five years is 10.08, and at six years, 9.63. The decrease in def teeth can be attributed to the large number of deciduous teeth missing in these age groups.

0.87 deciduous molars per child was lost in five-year-old children and 1.54 deciduous molars in the six-year-old.

The proportion of the total defm rate represented by decayed teeth in the five years of age group is 76 per cent., and in the six years, 65 per cent. The proportion of the defm rate represented by successfully filled teeth is 5 per cent. at five years and 9 per cent. at six years. The gross dental neglect of these children is obvious.

The proportion of the affected teeth indicated for extraction is 10 per cent. at five years and 12 per cent. at six years. 9 per cent. of the total defm teeth at five years and 14 per cent. at six years is represented by missing molars.

TABLE 2. 11.

CARIES EXPERIENCE IN CHILDREN AGED 5 AND 6 YEARS

EXPRESSED AS def AND defm TOOTH SURFACES PER CHILD

(Halikis 1963¹²)

Age (last birthday)	d _s	e _s	f _s	deft _s	m _s	defmts
5	14.10	3.53	1.66	19.29	2.84	22.13
6	13.05	4.46	2.63	20.14	5.07	25.21

The defts rate is 19.29 and 20.14 for five and six-years of age respectively. The high proportion of decayed and untreated surfaces is in agreement with the high proportion of teeth which

are untreated and again reflects the gross dental neglect of these children. In the five years age group 80 per cent. defects surfaces remain untreated, 16 per cent. requiring extraction; while in the six years group 69 per cent. required treatment, 17 per cent. requiring extraction.

In the five-years age group 7 per cent. of all defects surfaces have been filled and require no further treatment. The corresponding figure for the six-year-old child is 11 per cent.

TABLE 2. 12.

THE PREVALENCE OF DENTAL CARIES IN THE FIRST
PERMANENT MOLARS AT FIVE AND SIX YEARS OF AGE

(Halikis 1963¹²)

Age (last birthday)	No. of children with one or more permanent molars erupted.	Children with affected molars		Total number of molars erupted	Affected molars	
		Number	Per cent.		Number	Per cent.
5	26	6	23.1	67	13	19.4
6	73	46	63.1	257	109	42.4

Table 2.12. shows that 23.1 per cent. of all children with one or more permanent first molars at the age of five years have at least one affected tooth, while at the age of six years the proportion of children with one or more affected first permanent molars increases to 63.1 per cent.

TABLE 2. 13.

THE PREVALENCE OF DMF TEETH AND COMBINED DMF,

defm TEETH OF CHILDREN FIVE AND SIX YEARS OF AGE

(Halikis 1963¹²)

Age (last birthday)	No. of children	Permanent molars affected per child					defm teeth	DMF + defm
		D	M ₁	M ₂	F	DMF		
5	105	0.11	-	-	-	0.11	10.95	11.06
6	93	1.05	0.03	-	0.10	1.18	11.17	12.35

Table 2. 13. presents the prevalence of dental caries in the children five and six years of age as a DMF value per child and as a combined value of defm and DMF teeth. The scores are 11.06 defm and DMF teeth per child at the age of five years and 12.35 defm and DMF teeth per child at the age of six years.

(v) Dental Survey of 6-year-old Children in the Grafton and Lower Clarence Region of New South Wales - A Pre-Fluoridation Study. (15)

In October 1964, 275 children (6 years of age) were examined after excluding 81 children who had a "fluoride history", i.e., had been resident for some period of their life in natural or artificial fluoridated areas, or had been given fluoride in tablet or liquid form. This was a pre-fluoridation "base-line" survey done by two examiners.

Each child was seen by both examiners using mirror and probe. Any discrepancies in observations between the examiners were evened out by re-examination.

The following criteria for the presence of dental caries were used:-

- (a) Lesions in pits and fissures: if softened dentine was encountered by the explorer point or where there was visible evidence of backward decay at the dentino-enamel junction.
- (b) Approximal and gingival lesions: if a definite enamel discontinuity was demonstrated with the explorer.
- (c) Arrested caries was counted as carious and exposed dentine in hypoplastic teeth was only recorded as decayed if there was positive evidence of softening.

The DMF and df indices as recommended by the World Health Organization were employed. In addition, a dmf index (taking into account missing deciduous molars only) and a DMF surface index were used.

TABLE 2. 14.

RESULTS OF EXAMINATION OF 275 CHILDREN,

6 YEARS OF AGE, IN THE CRAFTON AND

LOWER CLARENCE REGION OF NEW SOUTH WALES

(Page 1964¹⁵)

No. of children examined	No. of children caries- free	Permanent teeth		DMF index	6-year old molars		Deciduous teeth			dmf index	DMF + dmf
		No. decayed	No. missing		No. erupted	No. decayed	No. decayed	No. missing	No. filled		
275	10	268	1	1.01	788	279	1723	457	123	8.37	9.38

Table 2. 14. shows that 10 out of 275 children were free from caries, i.e., caries was prevalent among 96 per cent. of the children.

The DMF index is 1.01 and the combined DMF, dmf count is 9.38. 95 per cent. of decayed teeth has not been treated. 35 per cent. of 6-year-old molars are already decayed in the first year of their eruption. Each child suffered a loss of 1.6 deciduous molars.

The investigation also revealed that 55 out of the 275 children had received one or more fillings. 18 permanent teeth had been filled of which seven required further restoration. 202 deciduous teeth had been filled out of which 79 required further restoration.

(vi) A Study in Dental Public Health. (7)

Since 1949 regular, free dental treatment has been provided for about 90 per cent. of children in the Australian Capital Territory.

This study investigates the effect of regular treatment on these children. It deals with the caries experience (permanent teeth only) of children aged five to twelve years, who were examined during the period from 1950 to 1955 inclusive. A total of 13,922 examinations was done. They were divided into six groups:-

(a) Five groups comprised children examined in each of the years 1951 to 1955;

(b) The sixth group - "untreated group" (not previously treated by Child Dental Health Service of Commonwealth Department of Health) - comprised 240 children first examined in 1950, and 187 children examined for the first time during subsequent years.

Examination was mainly by mirror and probe. In some instances, radiographic examination was done at the discretion of the examiners who were dental officers of the Commonwealth Department of Health.

The following symbols were used in recording:-

D - a permanent tooth which is decayed, irrespective of previous restorations; not including teeth marked for extraction;

M - a permanent tooth missing or requiring extraction;

F - a permanent tooth filled and apparently caries free.

TABLE 2. 15

AVERAGE DMF RATES OF CHILDREN IN CANBERRA

(Figures based on 13,922 examinations
carried out during 1950 to 1955 inclusive)

Age (last birthday)	No. of children	D	M	F	DMF
5	1737	0.08	0.001	0.002	0.08
6	2022	0.56	0.01	0.07	0.64
7	2174	1.15	0.03	0.48	1.66
8	1735	1.11	0.09	1.25	2.45
9	1811	1.36	0.16	1.85	3.37
10	1757	1.59	0.29	2.20	4.08
11	1589	2.10	0.53	2.95	5.58
12	857	3.11	0.88	3.18	7.17

It is seen from Table 2.15. that the DMF count ranges from 0.08 at five years of age to 7.17 at 12 years. These values are much lower than those found by Barnard in New South Wales⁽³⁾ and Halikis in Western Australia.⁽¹¹⁾

TABLE 2. 16.
DMF RATES OF CHILDREN WHO WERE
EXAMINED EACH YEAR, INCLUDING THE
RATIOS OF D, M, AND F TO THE TOTAL DMF
(Carr 1957⁷)

Group	No. examined	Average Age					Percentage com- position of DMF		
			D	M	F	DMF	D	M	F
"Untreated" [*]	427	8y. 9m.	2.42	0.43	0.53	3.38	71.7	12.7	15.6
1951	2231	8y. 4m.	1.38	0.28	1.06	2.72	50.7	10.4	38.9
1952	2544	8y. 7m.	1.21	0.22	1.41	2.84	42.7	7.7	49.6
1953	2418	8y. 8m.	1.20	0.16	1.44	2.80	43.0	5.6	51.4
1954	2913	8y. 7m.	1.32	0.17	1.21	2.70	48.9	6.1	45.0
1955	3576	8y. 6m.	1.10	0.13	1.24	2.47	44.7	5.1	50.2

^{*}This group had not previously been treated by the Commonwealth
Department of Health.

Table 2.16. shows the effect of regular treatment on the ratios of decayed, missing and filled teeth to the total DMF. With incremental care the number of filled teeth rises from 15.6 per cent. of the DMF in the "untreated group" to 51.4 per cent. in the 1953 group.

There is a correspondingly sharp drop in the number of decayed teeth from 71.7 per cent. of the DMF in the "untreated group" to 43.0 per cent. in the 1953 group.

The proportion of M to DMF has declined steadily, from 12.7 per cent. of the DMF in the "untreated group" to 5.1 per cent. in the 1955 group. The reduction in the tooth mortality is a good indication of the improvement in the dental condition of the children as a result of regular treatment.

(vii) Caries Prevalence in School Children in the Huon and Channel District, Southern Tasmania. (6)

Between 1955 and 1958, examinations of 1,722 children, aged six to 16 years, were recorded when they attended the school dental clinic for routine inspection and treatment.

The data are presented in three age groupings:-

Group 1 - Children six to eight years of age inclusive.

Group 2 - Children nine to 12 years of age inclusive.

Group 3 - Children 13 years and over.

Examination was by mirror and probe, using transillumination across incisors.

Regardless of whether fissures were stained or not, initial lesions were classified as carious if the probe would catch and could be forced into the tooth in a detectable amount.

In recording, the DMF index was modified to the DMFX. (17)
X was assigned to a tooth which was grossly decayed (more than two surfaces) requiring extraction.

The mean def per 100 erupted deciduous canines and molars in children aged six to eight years was 60.2. No child more than eight years of age was free of caries.

TABLE 2. 17.

AVERAGE DMF RATES OF CHILDREN IN THE HUON
AND CHANNEL DISTRICT, SOUTHERN TASMANIA
(Brothers 1962⁶)

Age (years)	6	7	8	9	10	11	12	13	14	15
DMF	1.5	3.0	4.3	6.0	7.4	9.6	12.0	14.7	16.3	16.4

Table 2. 17. shows the DMF index to range from 1.5 at six years of age to 16.4 at 15 years. The 10-year-old child has 7.4 DMF teeth. The corresponding figure found by Barnard in New South Wales was 5.28⁽²⁾, by Halikis in Western Australia 5.9⁽¹¹⁾, while Carr in the Australian Capital Territory reported a DMF of 4.08⁽⁷⁾.

TABLE 2. 18.

PREVALENCE OF DENTAL CARIES IN THE ANTERIOR
AND POSTERIOR PERMANENT TEETH, EXPRESSED
AS A PERCENTAGE OF ERUPTED TEETH
(Brothers 1962⁶)

DMF per 100 erupted teeth			
Anterior			Posterior
Group 1.	Group 2.	Group 3.	Group 3.
4.0	18.1	29.9	79.7

It is seen from Table 2.18. that by the age of 16 years almost one-third of the permanent anterior teeth have been attacked by caries; so also have four-fifths of the permanent posterior teeth.

TABLE 2. 19.
CARIOUS FIRST AND SECOND PERMANENT
MOLARS IN CHILDREN AGED SIX TO 16 YEARS
(Brothers 1962⁶)

First permanent molars									Second permanent molars	
DMF/100 erupted			N/100 erupted			X/100 erupted			DMF/100 erupted	
Group			Group			Group			Group	
1	2	3	1	2	3	1	2	3	2	3
75.8	97.9	100.0	1.9	18.5	50.1	9.8	38.0	52.5	61.1	91.3

Table 2.19. shows that of 100 erupted first permanent molars 76 are decayed by eight years of age, 98 by 12 years and all hundred by 16 years.

10 out of 100 teeth were due for extraction by the age of eight years, 38 per 100 teeth by 12 years and 53 per 100 teeth by 16 years.

Caries attacks 61 out of 100 erupted second permanent molars by the time the child is 12 years old, and 91 out of 100 erupted second permanent molars by the child's sixteenth year.

(viii) Yass Dental Surveys. (5)

The city of Yass in New South Wales has had its water supply fluoridated at 1.0 ppm. since mid-1956.

In 1962 and 1967 a team from the Department of Preventive Dentistry, University of Sydney, conducted dental surveys of the children of Yass to study the effects of fluoridation. The examiners were standardized and the methods of examination and recording were as in the Tamworth Fluoridation Dental Survey of 1963 which is described in (ix).

About 800 children, aged four to 12 years, were examined each year. It was found of children, five to 12 years of age, that 201 in 1962 and 309 in 1967 had either taken the fluoridated water since birth or since its introduction. The data obtained from these children (Group I) are discussed here.

In 1962 Yass was in its sixth year of fluoridation so that all children in Group I five years and under would have taken water containing 1.0 ppm. fluoride throughout their lives. By 1967 exposure to fluoride would have covered all children under 10 years.

TABLE 2. 21.
 DISSECTION OF DMF VALUES OBTAINED
 FROM YASS DENTAL SURVEY, 1967
 (Barnard 1967⁵)

Age (Years)	No. in group	No. caries free	Mean values per child				Percentage composition of DMF		
			D	M	F	DMF	D	M	F
5	59	58	0.03	0.000	0.00	0.03	100	0	0
6	35	30	0.20	0.000	0.00	0.20	100	0	0
7	40	20	1.25	0.000	0.08	1.32	94.0	0	6.0
8	44	14	1.70	0.000	0.09	1.80	94.8	0	5.2
9	28	7	1.61	0.000	0.54	2.14	74.9	0	25.1
10	38	6	2.34	0.078	0.95	3.37	69.3	2.3	28.4
11	36	1	2.94	0.111	1.67	4.72	62.3	2.4	35.4
12	29	2	3.34	0.206	1.45	5.00	66.8	4.2	29.0

Table 2.21. shows that no child has lost a permanent tooth until 10 years of age when the number of teeth missing is 0.078. Barnard's study of New South Wales State school children⁽³⁾ revealed an M value of 0.505 at 10 years.

TABLE 2. 22.

DISSECTION OF dmf VALUES OBTAINED

FROM YASS DENTAL SURVEY, 1967

(Barnard 1967⁵)

Age (Years)	No. in group	No. caries free	No. decid. teeth present	Mean values per child			Percentage composition of dmf			
				d	m	f	dmf	d	m	f
5	59	27	19.46	1.15	0.152	0.64	1.95	59.0	7.8	32.8
6	35	8	17.86	3.00	0.171	0.31	3.48	86.2	4.9	8.9
7	40	5	13.62	2.07	0.350	1.40	3.82	54.2	9.2	36.6
8	44	6	10.43	2.81	0.636	1.39	4.84	58.1	13.1	28.7
9	28	2	7.89	1.75	0.500	1.96	4.21	41.6	11.8	46.6
10	38	9	5.66	1.64	0.500	1.45	3.58	45.7	13.9	40.5
11	36	14	3.83	1.42	0.138	0.58	2.14	66.4	6.5	27.1
12	29	14	2.03	0.76	0.000	0.31	1.07	71.0	0	29.0

It is seen from Table 2.22. that the mean number of deciduous teeth present per child drops from 19.46 out of a possible 20 at five years of age to 2.03 per child at 12 years. The fewer teeth at risk in the older children and attributing more missing teeth to exfoliation explains the decline in the dmf values through these ages.

The dmf values at five years and six years of age are 1.95 and 3.48 teeth respectively. Corresponding values found by Halikis⁽¹²⁾ for Western Australian children are 10.95 and 11.17 teeth respectively. It should be remembered that the children of Yass had been exposed to fluoridated water from the very beginning of tooth development, and that Halikis' sample comprised children who attended the Gustafson Dental Clinic primarily for treatment.

(ix) Tamworth Fluoridation Dental Survey, 1963. (3)

The city of Tamworth in New South Wales commenced fluoridation of its water supply at 1 ppm. in October, 1963. Prior to this a team from the Department of Preventive Dentistry of the University of Sydney and the Division of Dental Services of the New South Wales Department of Public Health examined 4,314 children between the ages of four and 16 years as a "base-line" survey. This was the first of a series of 10 annual dental surveys, the results of which are expected to demonstrate the efficacy of fluoridation in improving dental health in Tamworth.

Examiners were standardized and examination was by mirror and probe. Notes on the criteria and coding instructions appear in Appendix II.

A deciduous tooth was deemed missing because of caries if it was absent from the dentition before the average age for its exfoliation. No chronology of exfoliation, however, is set out in the criteria. A reasonable margin of error, therefore, could be incurred in the values obtained for missing deciduous teeth. In this population of five to 15-year-old children it would be expected that almost all the deciduous teeth counted as missing because of caries are canines and molars.

The following symbols are used in tabulation:-

D or d - carious, regardless of the presence of any
filling;

M or m - missing because of caries;

F or f - filled, and apparently caries-free;

X or e - indicated for extraction.

The X component is part of the D component. Similarly, the e component is part of the d component.

TABLE 2.23.
DISSECTION OF DMF VALUES BY AGE
(Barnard 1963³)

Age (Years)	Mean Values per Child					Percentage Composition of DMF		
	X	D	M	F	DMF	D	M	F
5	0.00	0.21	0.00	0.00	0.21	100	0	0
6	0.00	1.19	0.00	0.10	1.29	92.2	0	7.8
7	0.01	2.11	0.01	0.37	2.49	84.7	0.4	14.9
8	0.04	2.19	0.06	0.88	3.14	71.1	1.8	28.0
9	0.10	2.52	0.15	1.32	3.98	63.3	3.7	33.1
10	0.06	2.93	0.30	1.78	5.01	58.5	6.0	35.5
11	0.12	3.61	0.39	2.35	6.35	56.8	6.2	37.0
12	0.16	4.32	0.71	3.39	8.42	51.3	8.4	40.3
13	0.18	4.30	0.96	5.05	10.31	41.7	9.3	49.0
14	0.14	4.41	1.37	5.85	11.62	37.9	11.8	50.3
15	0.12	3.65	1.27	7.56	12.48	29.2	10.2	60.6

Table 2.23. analyses the DMF count into its components. The DMF value rises from 0.21 at the age of five years to 12.48 at 15 years. The need for extraction arises at seven years of age when one permanent tooth per 100 children requires extraction. The X value reaches a maximum in the 13-year-old age group when 18 teeth per 100 children require extraction.

TABLE 2. 24.
DISSECTION OF DMFS VALUES BY AGE
(Barnard 1963³)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
Decayed	0.25	1.44	2.74	3.03	3.89	4.07	4.87	5.66	5.62	5.71	4.80
Missing	0.00	0.32	0.04	1.31	0.76	1.64	1.93	3.57	4.77	6.68	6.34
Filled	0.00	0.18	0.67	1.55	2.94	3.71	4.37	6.34	9.98	11.69	15.43
DMF tooth surfaces	0.25	1.94	3.45	5.89	7.59	9.42	11.17	15.57	20.37	24.08	26.57

The DMF tooth surfaces per child are shown in Table 2.24. The DMFS rate ranges from 0.25 tooth surfaces at the age of five years to 26.57 tooth surfaces at 15 years of age. The average five-year-old child has 0.25 decayed surfaces. At age six, this figure is 1.44 surfaces; at nine years of age, 3.89 surfaces; and at age 14 years, 5.71. At 15 years of age, there is a drop to 4.80 decayed surfaces. This drop corresponds to a marked rise in the F tooth surfaces at age 15 years, namely, 15.43 surfaces.

TABLE 2.25.
DISSECTION OF $\bar{d}mf$ VALUES BY AGE
(Barnard 1963³)

Age (Years)	Mean Values per Child					Percentage composition of $\bar{d}mf$		
	e	d	m	f	$\bar{d}mf$	d	m	f
5	0.42	4.57	0.72	0.58	5.87	77.8	12.3	9.9
6	0.77	4.86	1.25	1.07	7.19	67.6	17.4	14.9
7	0.74	4.20	1.71	1.13	7.04	59.6	24.3	16.1
8	0.69	3.35	2.04	1.15	6.54	51.2	31.2	17.6
9	0.56	2.88	1.64	0.82	5.35	53.8	30.7	15.4
10	0.39	1.77	1.23	0.61	3.61	49.0	34.1	16.9
11	0.24	0.91	0.66	0.24	1.82	50.0	36.3	13.6
12	0.14	0.39	0.24	0.09	0.73	54.2	33.3	12.50
13	0.06	0.13	0.04	0.02	0.19	68.4	21.1	10.5
14	0.02	0.05	0.03	0.01	0.09	55.6	33.3	11.1
15	0.01	0.03	0.02	0.02	0.07	42.8	28.6	28.6

From table 2.25. it will be seen that the $\bar{d}mf$ count reaches the highest values at six and seven years of age when it is 7.19 and 7.04 respectively. From a value of 6.54 at eight years of age the $\bar{d}mf$ count drops through the years to 0.07 at 15 years of age. This decrease in $\bar{d}mf$ counts can be attributed to the large number of

deciduous teeth that have been exfoliated in these age groups.

The need for extraction in the various ages follows a pattern similar to the dmf distribution. The e value is 0.42 at five years of age. It is a maximum of 0.77 at six years. From then on it drops to 0.56 at nine years, 0.24 at 11 years, 0.06 at 13 years, and 0.01 at 15 years.

TABLE 2. 26.
DISSECTION OF dmfs VALUES BY AGE
(Barnard 1963³)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
Decayed	7.71	8.90	7.81	6.45	5.73	3.50	2.00	0.93	0.40	0.17	0.07
Missing	3.62	6.20	8.71	10.21	8.22	6.17	3.30	1.20	0.19	0.17	0.09
Filled	1.23	2.22	2.46	2.53	1.87	1.39	0.55	0.22	0.04	0.01	0.03
dmf tooth surfaces	12.56	17.32	18.98	19.19	15.82	11.06	5.85	2.35	0.63	0.35	0.19

The dmf tooth surfaces per child are shown in Table 2.26. From 12.56 tooth surfaces at five years of age the dmfs rate increases to reach a peak of 19.19 at the age of eight years. In the 10-year age group the dmfs count is 11.06. It drops sharply at the age of 11 years when the value is 5.85. The count continues to decrease through successive ages giving a value of 0.19 at 15 years of age.

The five-year-old child has 7.71 tooth surfaces requiring treatment. At six years of age, this figure reaches a maximum of 8.90. The treatment needs steadily decrease to 5.73 surfaces at nine years of age. There is a sharp drop at 10 years with 3.50 tooth surfaces requiring treatment. With successive ages, fewer and fewer tooth surfaces require treatment. At 15 years of age, the value is 0.07 tooth surfaces. At no age is the number of filled tooth surfaces greater than 2.53. Treatment needs diminish with age because more and more deciduous teeth are exfoliated with increasing age.

3. DENTAL TREATMENT NEEDS (FILLINGS AND EXTRACTIONS)

In this section the prevalence of dental caries in a group of children is presented, and its treatment needs expressed in numbers of specific types of fillings and numbers of extractions.

A. From the 4,314 school children examined in the Tamworth Fluoridation Survey of 1963 (mentioned in the previous section) a sample of 567, aged five to 15 years, was taken for further radiographical examination. A set of five to seven bitewings per child was used. Differences, if any, between radiographical and clinical observations of each child were noted in its record card. (A copy of a completed record card and instructions on the criteria and coding of the dental examinations are set out as Appendices I and II respectively.)

The distribution of the children by age is given in Table 3.1. The prevalence of dental caries in deciduous and permanent teeth is shown in Tables 3.2. to 3.5. The reader might wish to compare some of these figures with those appearing in Tables elsewhere.

The dental caries experienced by Tamworth school children in each age group is similar to that of the average New South Wales school child, but slightly lower than that of the Metropolitan High School children. The amount of dental care sought and received by this sample of Tamworth children was slightly more than that received by the average New South Wales school child, but less than the amount of dental care received by Sydney Metropolitan High School children.⁽⁴⁾

TABLE 3.1.
DISTRIBUTION OF 567 CHILDREN BY AGE.
(Tamworth Sample 1963³)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15	5 to 15
Number	35	57	37	53	48	60	53	57	82	49	36	567

TABLE 3.2.
DISSECTION OF DMF VALUES BY AGE
(Tamworth Sample 1963³)

Age (Years)	Mean Values per Child					Percentage composition of DMF		
	X	D	M	F	DMF	D	M	F
5	0.00	0.23	0.00	0.00	0.23	100	0	0
6	0.00	1.09	0.00	0.08	1.17	93.2	0	6.8
7	0.03	1.87	0.00	0.43	2.30	81.3	0	18.7
8	0.04	2.41	0.02	0.96	3.39	71.1	0.6	28.3
9	0.13	3.00	0.11	1.38	4.49	66.8	2.4	30.8
10	0.09	3.07	0.26	1.42	4.75	64.6	5.4	30.0
11	0.23	4.81	0.32	2.32	7.45	64.6	4.3	31.1
12	0.23	6.14	0.69	2.73	9.56	64.2	7.2	28.6
13	0.19	6.30	0.79	4.87	11.97	52.6	6.7	40.7
14	0.43	7.63	1.27	4.27	13.17	57.9	9.6	32.4
15	0.03	6.66	1.83	4.69	13.17	50.5	13.9	35.6

TABLE 3.3.

DISSECTION OF DMFS VALUES BY AGE

(Tamworth Sample 1963³)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
Decayed	0.26	1.40	2.46	3.43	4.31	4.55	6.93	8.87	8.72	11.74	9.34
Missing	0.00	0.00	0.00	0.03	0.98	0.49	1.16	3.29	3.46	5.58	8.69
Filled	0.00	0.23	0.84	1.78	2.95	3.42	4.38	5.71	10.89	10.37	11.86
DMF tooth surfaces	0.26	1.63	3.30	5.24	8.24	8.46	12.47	17.87	23.07	27.69	29.89

TABLE 3. 4.
DISSECTION OF dmf VALUES BY AGE
(Tamworth Sample 1963³)

Age (Years)	Mean Values per Child					Percentage composition of dmf		
	e	d	m	f	dmf	d	m	f
5	0.57	5.49	0.46	0.63	6.58	83.5	6.9	9.6
6	0.96	6.91	1.13	0.93	8.97	77.0	12.6	10.4
7	0.65	5.62	1.51	0.89	8.02	70.1	18.8	11.1
8	0.65	4.78	1.80	1.54	8.12	58.9	22.1	19.0
9	0.60	4.30	1.87	0.36	6.53	65.9	28.6	5.5
10	0.37	2.77	1.42	0.47	4.67	59.4	30.4	10.1
11	0.43	1.09	0.70	0.11	1.90	57.4	36.8	5.8
12	0.19	0.55	0.39	0.03	0.97	56.7	40.2	3.1
13	0.08	0.16	0.05	0.01	0.21	76.1	23.8	4.7
14	0.02	0.10	0.04	0.02	0.16	62.5	25.0	12.5
15	0.00	0.03	0.00	0.06	0.09	33.3	0	66.7

TABLE 3. 5.
 DISSECTION OF $\bar{d}mf$'s VALUES BY AGE
 (Tamworth Sample 1963³)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
Decayed	9.34	13.13	10.24	8.89	8.49	5.38	3.00	1.22	0.49	0.25	0.03
Missing	2.26	5.04	7.38	8.54	8.55	6.97	3.38	1.67	0.24	0.20	0.00
Filled	1.54	2.70	2.43	4.26	1.30	1.53	0.43	0.21	0.01	0.04	0.14
$\bar{d}mf$ tooth surfaces	13.14	20.87	20.05	21.69	18.34	13.88	6.81	3.10	0.74	0.49	0.17

B. The original data on each child's record card were used to extract the following information in respect of deciduous as well as permanent teeth:-

- (i) the number and types of fillings required as determined by clinical examination and by further radiographical examination;
- (ii) the number and types of fillings present, as determined by clinical examination and by further radiographical examination;
- (iii) the number of teeth requiring extraction, as determined by clinical examination and by further radiographical examination.

TYPES OF FILLINGS

Fees and operative time largely influenced the classification of fillings into the following categories:-

- (i) Fillings of anterior teeth divided into the following types:-
 - Proximal or labial;
 - lingual;
 - class IV; and
 - crown.
- (ii) Fillings of posterior teeth divided into the following types:-

occlusal;
 pit or cervical;
 mesio-occlusal or disto-occlusal;
 mesio-occluso-distal; and
 crown.

METHOD USED IN DETERMINING THE TYPE OF FILLING

The status of each tooth surface as to whether it was carious or filled was taken into account when determining the type (or types) of filling required or present in each tooth.

ANTERIOR TEETH

Proximal or Labial Type

Involvement of any proximal or labial surface of a tooth.

This is essentially a Class III or Class V silicate restoration.

Class III's constitute the great majority of fillings (required or present) in this category.

Lingual Type

Involvement of the lingual surface of a tooth.

This would be an amalgam filling mostly in the lingual fossae of the upper incisors.

Class IV Type

Involvement of any proximal surface as well as the incisal edge of a tooth.

This type constitutes only a very small proportion of the total number of fillings. Most of the Class IV restorations, present or indicated, would be gold inlays. However, it is likely that the few Class IV type of fillings observed in deciduous teeth are either silicate or amalgam restorations.

Crown Type

A tooth is counted as having a crown if it is noted as such (S_5 4 or D_5 4) in the record card. (Please see Appendix II.)

It is not possible to determine from the surface count whether or not a crown is indicated. For example, a tooth recorded as having all five surfaces decayed might need a Class IV inlay and a Class III silicate filling rather than a crown.

POSTERIOR TEETHOcclusal Type

Involvement of the occlusal surface only of a tooth. This is almost always a Class I amalgam filling.

Pit or Cervical Type

Involvement of any buccal or lingual surface of a tooth.

This is usually an amalgam filling of a buccal or lingual pit or a Class V filling along the gingival portion of the crown.

Where caries is reported as occurring on the occlusal as well as the buccal or lingual surface of a molar, it is not possible to determine whether the occlusal filling requires a buccal or lingual extension, or whether two separate fillings should be done. In this study these cavities are taken as requiring two separate fillings.

Similarly, fillings reported as being present on the occlusal as well as the buccal or lingual surface of a molar are counted as two distinct restorations, although a number of continuous occluso-buccal or occluso-lingual fillings would have been present in the teeth of the children.

Mesio-occlusal (MO) or disto-occlusal (DO) Type

Such a type of filling is indicated when caries is recorded on only one proximal surface of a tooth, regardless of whether its occlusal surface is decayed, or whether a tooth is immediately adjacent to the lesion.

It is realised that a decayed proximal surface having no tooth immediately adjacent to it might well be treated as a one-surface filling. However, since there were only a few such instances it was decided to ignore this possibility.

When caries is observed on the occlusal surface of a tooth by clinical examination and when further radiological examination reveals a carious proximal surface, then the tooth is classified as requiring an MO or DO type of filling as determined by further radiographical examination.

An MO or DO type of filling is frequently of amalgam although occasionally it may be an inlay.

The presence of this type of filling in a tooth is determined in the same way as indications for an MO or DO type of filling are determined.

Some posterior teeth have fillings on a proximal surface which do not extend on to the occlusal. As such fillings comprise an insignificant number they are not counted separately.

A posterior tooth with a filling on its occlusal surface and caries on a proximal surface is considered as having an occlusal type of filling, and requiring an MO or DO type of filling.

Mesio-occluso-distal (MOD) Type

Involvement of both proximal surfaces of a tooth, regardless of whether its occlusal surface is decayed or filled, or whether it is bounded on one or both sides by an immediately adjacent tooth.

If one proximal surface of a tooth is found to be involved by clinical examination and the other by further radiological examination, then the MOD type of filling is classified as being detected by further radiological examination.

An MOD type of filling is frequently of amalgam although occasionally it may be an inlay.

A tooth with an occlusal or an MO or DO restoration and with caries on its other proximal surface is considered as having an occlusal or MO or DO filling, and requiring an MOD type of filling.

Crown Type

A tooth is counted as having a crown if it is noted as such (S₅ 4 or D₅ 4) in the record card. (Please see Appendix II.)

It is not possible to determine from the surface count whether or not a crown is indicated. For example, a tooth recorded as having all five surfaces decayed might need an MOD and small, simple fillings on its buccal and lingual surfaces rather than a crown.

R E S U L T S

I. FILLING REQUIREMENTS

- (i) FILLING REQUIREMENTS ACCORDING TO AGE AND TYPE OF FILLING
FOR DECIDUOUS AND PERMANENT TEETH

TABLE 3.6.

FILLING REQUIREMENTS ACCORDING TO AGE AND TYPE OF
 FILLING FOR DECIDUOUS AND PERMANENT TEETH
 (Mean per 100 Children)

Age (Years)	Anterior teeth						Posterior teeth							
	Type of Filling						Type of Filling							
	Prox./lab.		ling		Cl. IV		Occl.		pit/cerv.		MO/DO		MOD	
	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.
5	186	-	-	-	-	-	69	17	37	-	229	-	31	-
6	282	-	4	-	2	-	72	96	65	33	249	4	58	-
7	138	-	5	-	-	-	62	135	38	59	251	32	57	-
8	119	11	6	-	2	-	34	168	30	66	211	36	57	6
9	90	65	2	17	2	-	29	146	19	106	127	92	77	6
10	60	73	-	3	-	-	22	132	25	105	133	83	37	-
11	11	140	-	13	2	-	9	215	6	108	32	115	17	8
12	11	153	2	5	-	-	7	332	-	105	21	132	2	23
13	1	109	-	12	-	-	2	267	4	88	5	183	-	34
14	-	214	-	16	-	-	2	288	-	82	6	206	2	35
15	3	119	-	14	-	-	-	222	3	100	3	242	-	39

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Table 3. 6. shows the numbers of the various types of fillings required per 100 children in each age group.

For deciduous teeth, it is children about five, six, and seven years of age that generally require the most treatment. At six years of age, 282 proximal or labial and 249 MO or DO fillings are required per 100 children. Nine-year-old children, however, require the most number of MOD fillings. The greatest need is for proximal or labial fillings in anterior teeth and MO or DO fillings in posterior teeth. The need for occlusal type of fillings is relatively low. (It should be remembered, however, that the method used in determining the types of fillings required would include a number of occlusal fillings in the MO or DO or MOD categories. For example, if a tooth is found to be carious on its occlusal and one proximal surface, then the tooth is considered as requiring an MO/DO type of filling.) Very few lingual and Class IV types of fillings are required, most age groups not needing such fillings at all. There is a decrease in filling needs among the older age groups with the values tending to zero at 15 years of age. This must be expected since more deciduous teeth are shed with increasing age and they disappear from the dentition by about 15 years of age.

For the permanent dentition, fillings in anterior teeth are required from eight years of age and onwards, while posterior teeth need fillings from the lowest age group, i.e., five years. At

eight years of age, eleven proximal or labial fillings are required per 100 children, this value being a maximum of 214 per 100 children at 14 years of age. At five years of age, 17 occlusal fillings are required per 100 children; at 12 years of age 332 occlusal fillings are required per 100 children. The greatest need is for occlusal, MO/DO, and proximal/labial types of fillings. Relatively few lingual fillings are required. No Class IV type of filling is required for permanent teeth.

In the deciduous dentition MO/DO fillings are required more than occlusal fillings. The converse is the case in the permanent dentition: occlusal fillings are required more than MO/DO fillings. This would suggest that there is proportionately more inter-proximal caries in deciduous teeth than in permanent teeth of children between five and 15 years of age.

Figures 3.1. to 3.5. compare specific types of filling requirements for deciduous and permanent teeth according to age.

Figure 3.1. compares proximal or labial filling requirements. At six years of age a maximum number of 282 fillings per 100 children is required for deciduous teeth. For permanent teeth the maximum number required per 100 children is 214 fillings at 14 years of age. Up to eight years of age, practically all the filling requirements are for deciduous teeth. From the age of eleven years almost all proximal or labial fillings are required for permanent teeth only.

Figure 3.2. compares occlusal filling requirements. Of the fillings required in permanent teeth of children the occlusal type is needed earliest. At five years of age 17 occlusal fillings are required in the permanent teeth of 100 children. Filling requirements for deciduous teeth do not exceed 72 per 100 children at any age. Omitting the five-year age group, the requirement for permanent teeth is never below 96 per 100 children. The values are 332, 267, 288, and 222 fillings per 100 children at 12, 13, 14, and 15 years of age respectively.

Figure 3.3. compares pit or cervical filling requirements. From seven years onwards, more permanent teeth require fillings than deciduous teeth. The maximum requirement for deciduous teeth is 65 fillings per 100 children at six years of age. From nine years of age and on the requirement in permanent teeth is about 100 fillings per 100 children in each age group.

Figure 3.4. compares MO/DO filling requirements. The younger age groups show a great need for fillings in deciduous teeth while the older children show a similar need in permanent teeth. 229, 249, 251, and 211 fillings per 100 children are required in deciduous teeth at five, six, seven, and eight years of age respectively. 183, 206, and 242 fillings per 100 children are required in permanent teeth at 13, 14, and 15 years of age respectively. The filling requirements at nine and ten years of age are similar.

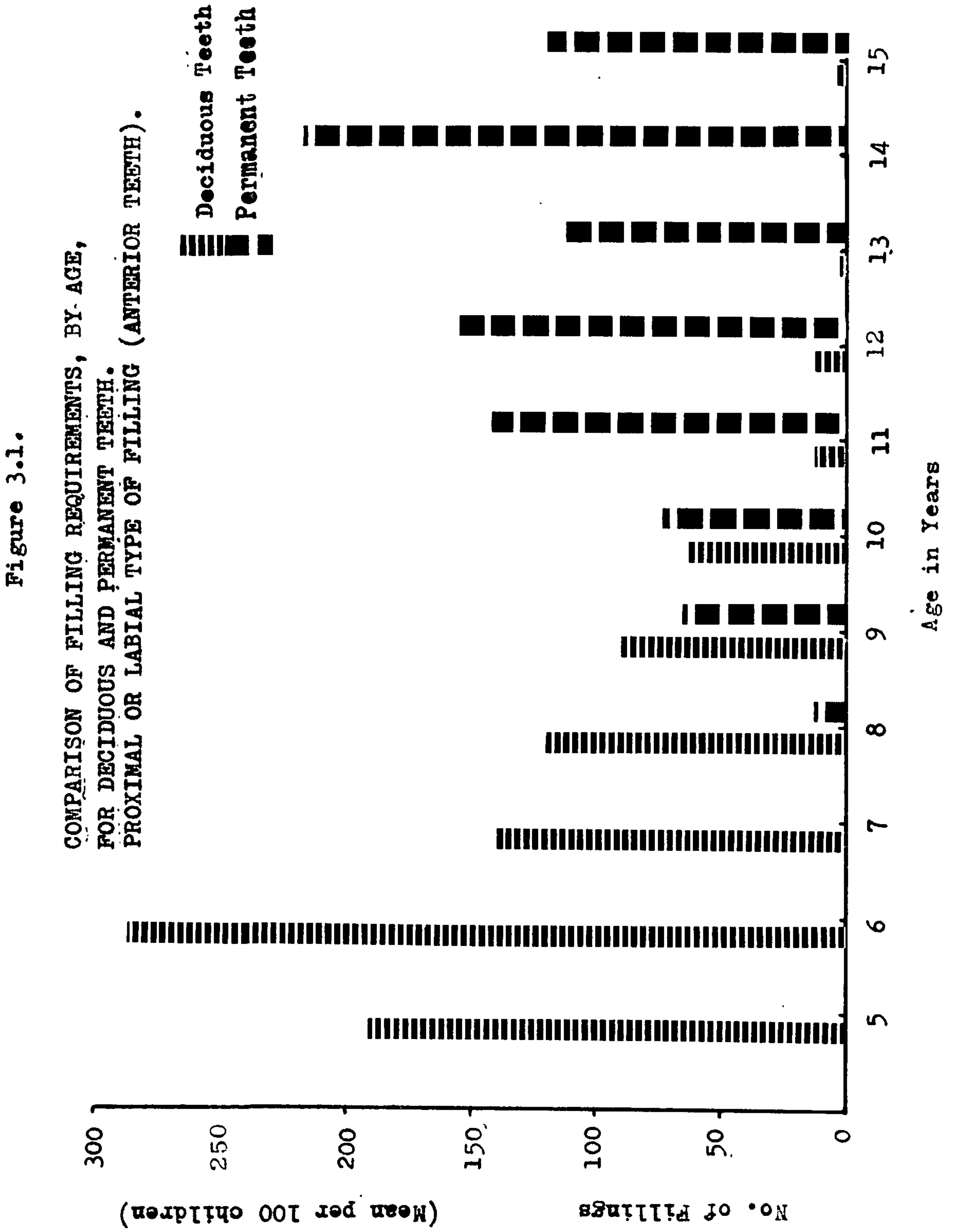


Figure 3.2.

COMPARISON OF FILLING REQUIREMENTS, BY AGE,
FOR DECIDUOUS AND PERMANENT TEETH.
OCCLUSAL TYPE OF FILLING.

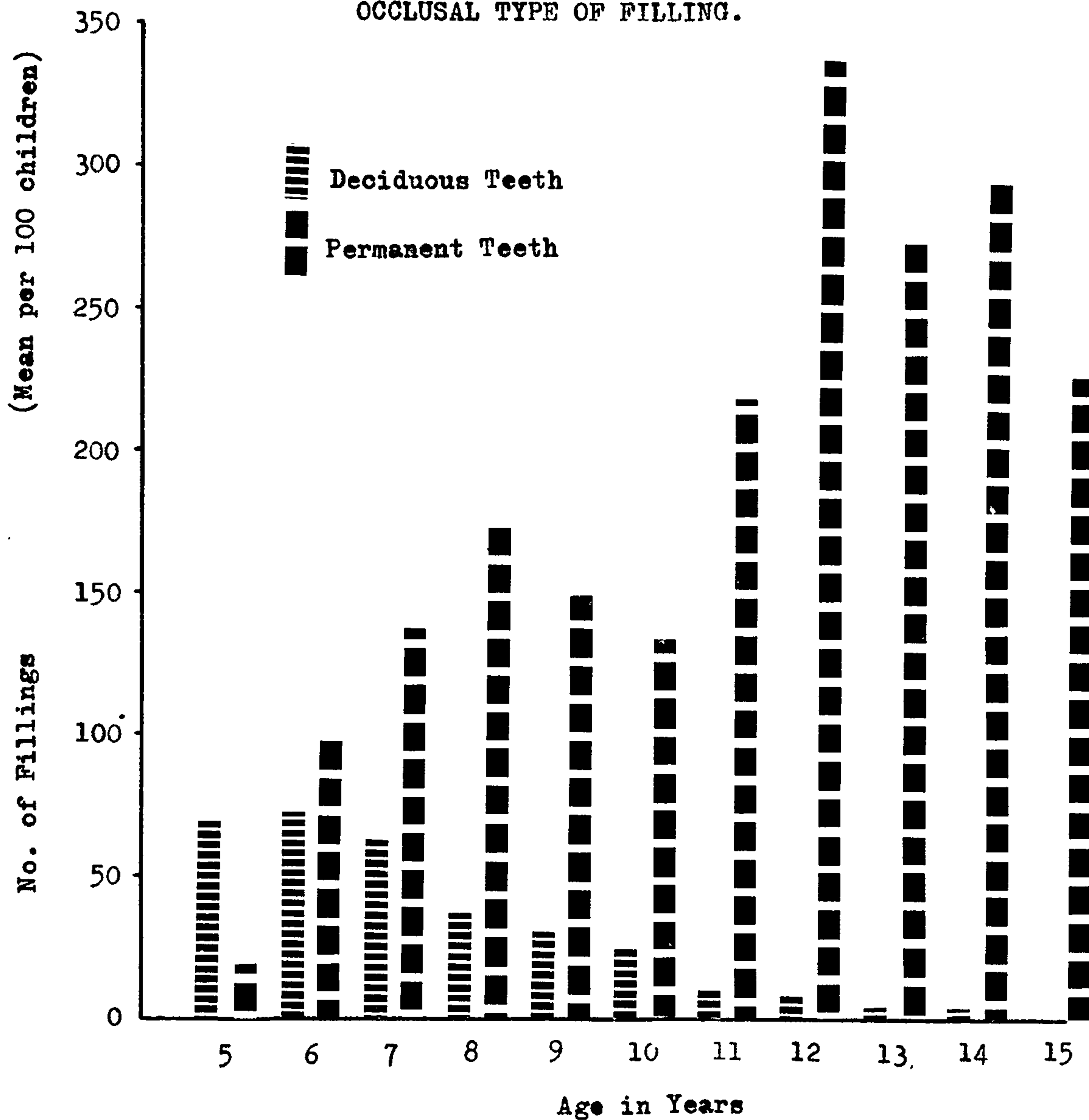


Figure 3.3.
 COMPARISON OF FILLING REQUIREMENTS, BY AGE,
 FOR DECIDUOUS AND PERMANENT TEETH.
 PIT/CERVICAL TYPE OF FILLING (POSTERIOR TEETH).

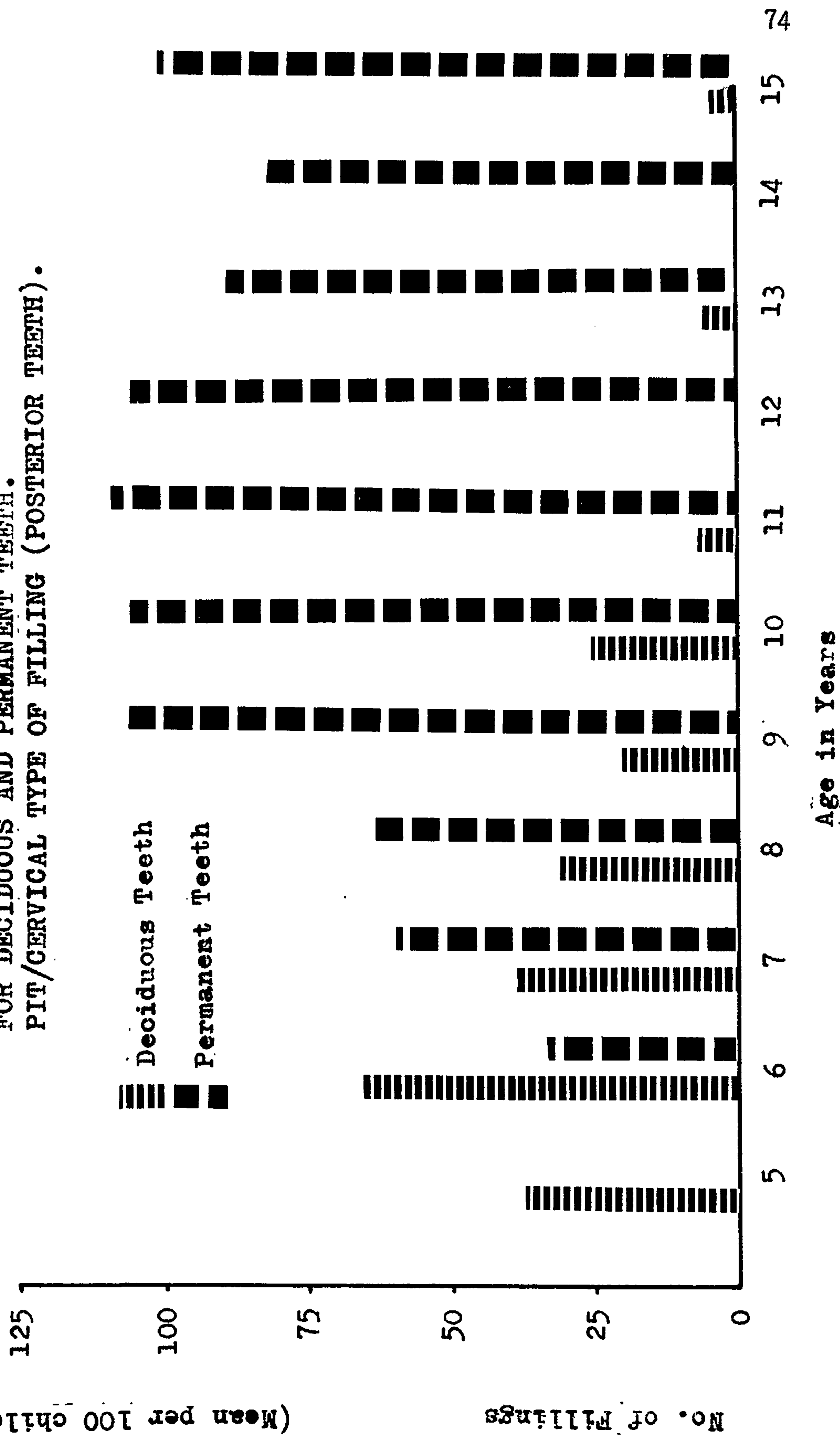


Figure 3.4.

COMPARISON OF FILLING REQUIREMENTS, BY AGE,
FOR DECIDUOUS AND PERMANENT TEETH.
M.O./D.O. TYPE OF FILLING.

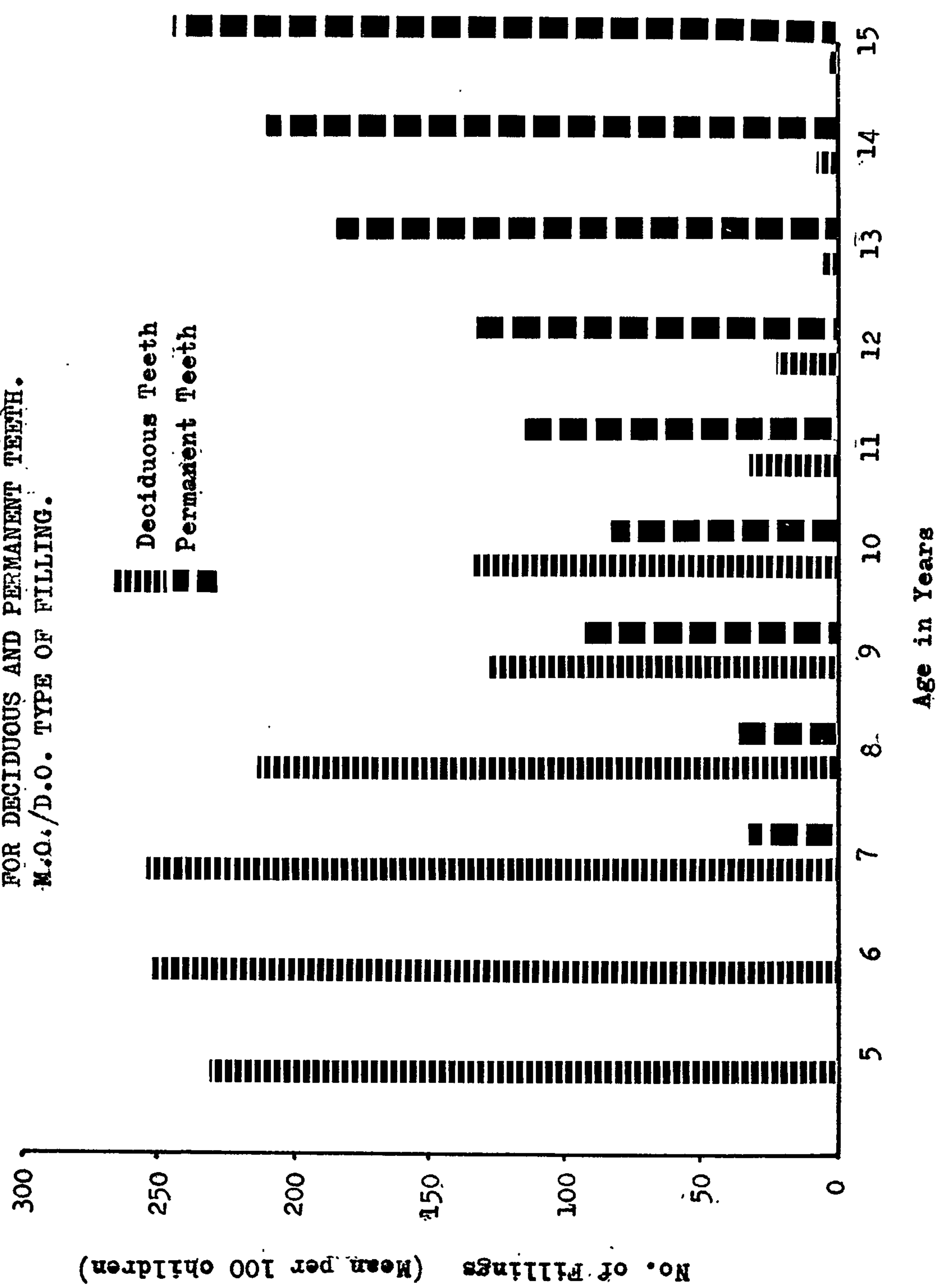
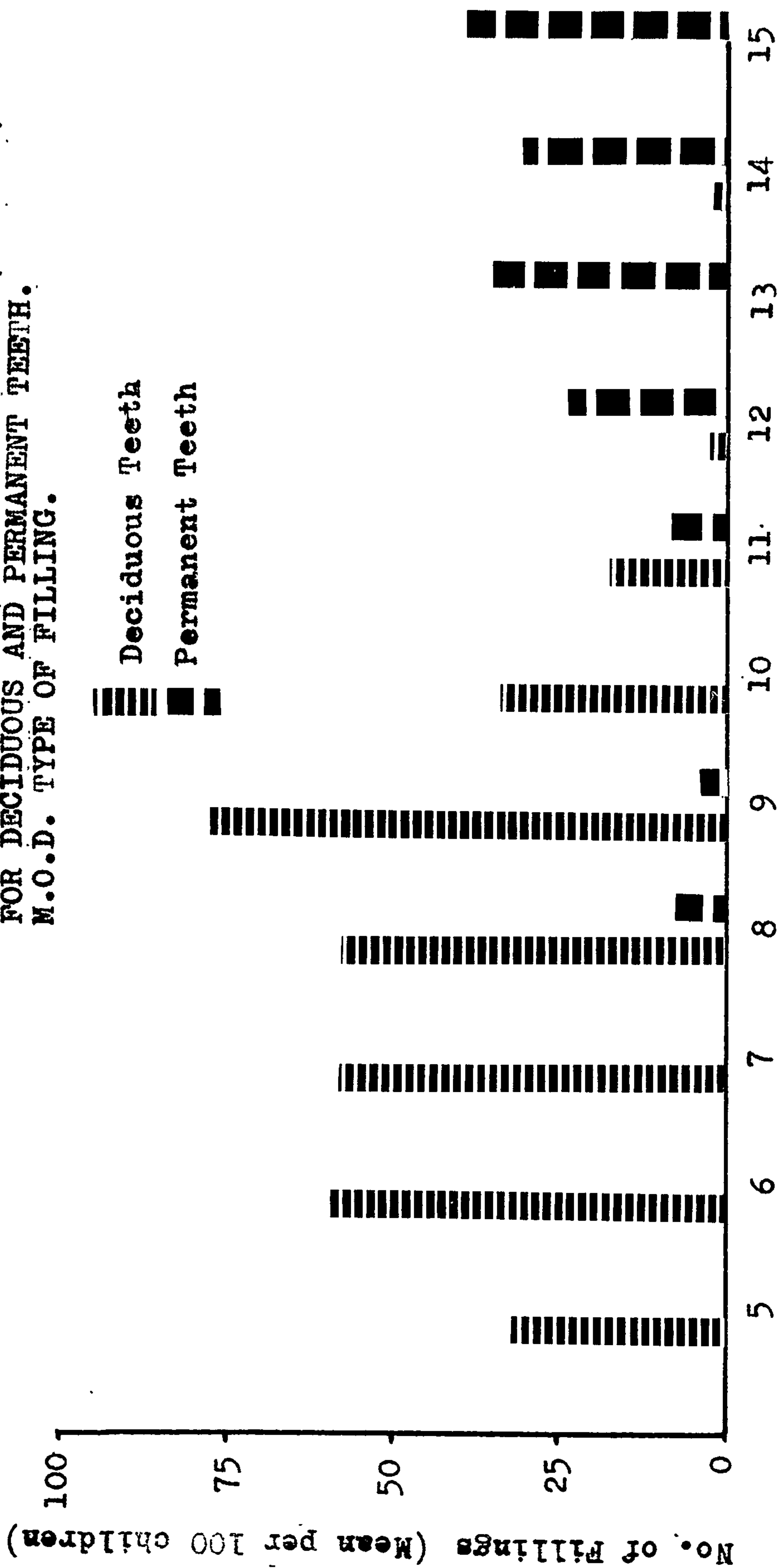


Figure 3.5. compares MOD filling requirements. For the whole group, filling requirements of deciduous teeth are more than double that for permanent teeth. For deciduous teeth 58, 57, 57, and 77 fillings are required per 100 children at six, seven, eight, and nine years of age respectively. For permanent teeth 23, 34, 35, and 39 fillings are required per 100 children at 12, 13, 14, and 15 years of age respectively.

Figure 3.5.

COMPARISON OF FILLING REQUIREMENTS, BY AGE,
FOR DECIDUOUS AND PERMANENT TEETH.
M.O.D. TYPE OF FILLING.



(11) FILLING REQUIREMENTS FOR DECIDUOUS TEETH AS DETERMINED BY CLINICAL EXAMINATION, AND BY FURTHER RADIOGRAPHICAL EXAMINATION.

Table 3.7. shows, according to age and type of filling, the number of restorations (per 100 children) required in deciduous teeth by clinical examination, and the number required by further radiographical examination. X-ray examination has added much more to the numbers of fillings found to be required by clinical examination in the case of MOD, MO/DO, and proximal/labial types of fillings. While making no significant difference to the total, it is noteworthy that eight occlusal carious lesions were missed in clinical examination but detected by further X-ray examination. It is clear that supplementary X-ray examination is valueless as far as estimation of lingual, Class IV, occlusal, and pit/cervical filling requirements is concerned.

Figure 3.6. shows the difference in proximal/labial filling requirements for deciduous teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children, 16 per cent. of the total filling requirements is found by additional X-ray examination. The greatest difference is at six years of age when 18 per cent. of the total filling requirements is detected by further X-ray examination.

Figure 3.6.

FILLING REQUIREMENTS FOR DECIDUOUS TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.
PROXIMAL/LABIAL TYPE OF FILLING (ANTERIOR TEETH).

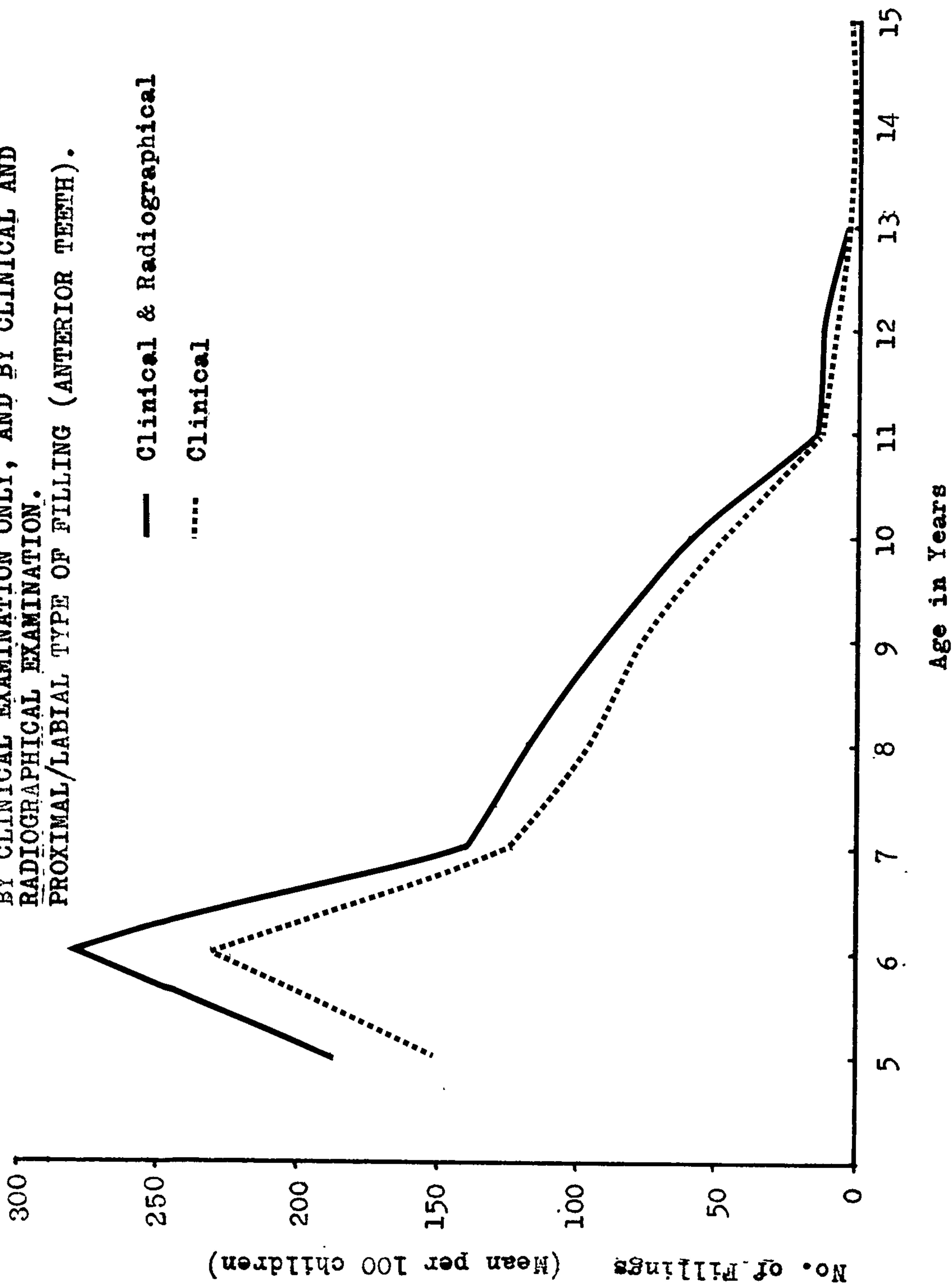


Figure 3.7. shows the difference in MO/DO filling requirements for deciduous teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children 51 per cent. of the total filling requirements is found by additional X-ray examination. The differences are greatest in the younger children where at five years of age 55 per cent., at six years 47 per cent., at seven years 48 per cent., and at eight years 63 per cent. of the total filling requirements are detected by further X-ray examination. In the eight-year old child, less than two-fifths of the MO/DO filling requirements for deciduous teeth is found by mirror and probe.

Figure 3.8. shows the difference in MOD filling requirements for deciduous teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children, 62 per cent. of the total MOD filling requirements is found by additional X-ray examination. At ten years of age, less than one-fifth of the MOD filling requirements for deciduous teeth is found by clinical examination only.

Figure 3.7.

FILLING REQUIREMENTS FOR DECIDUOUS TEETH AS DETERMINED BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND RADIOGRAPHICAL EXAMINATION.
M.O./D.O. TYPE OF FILLING.

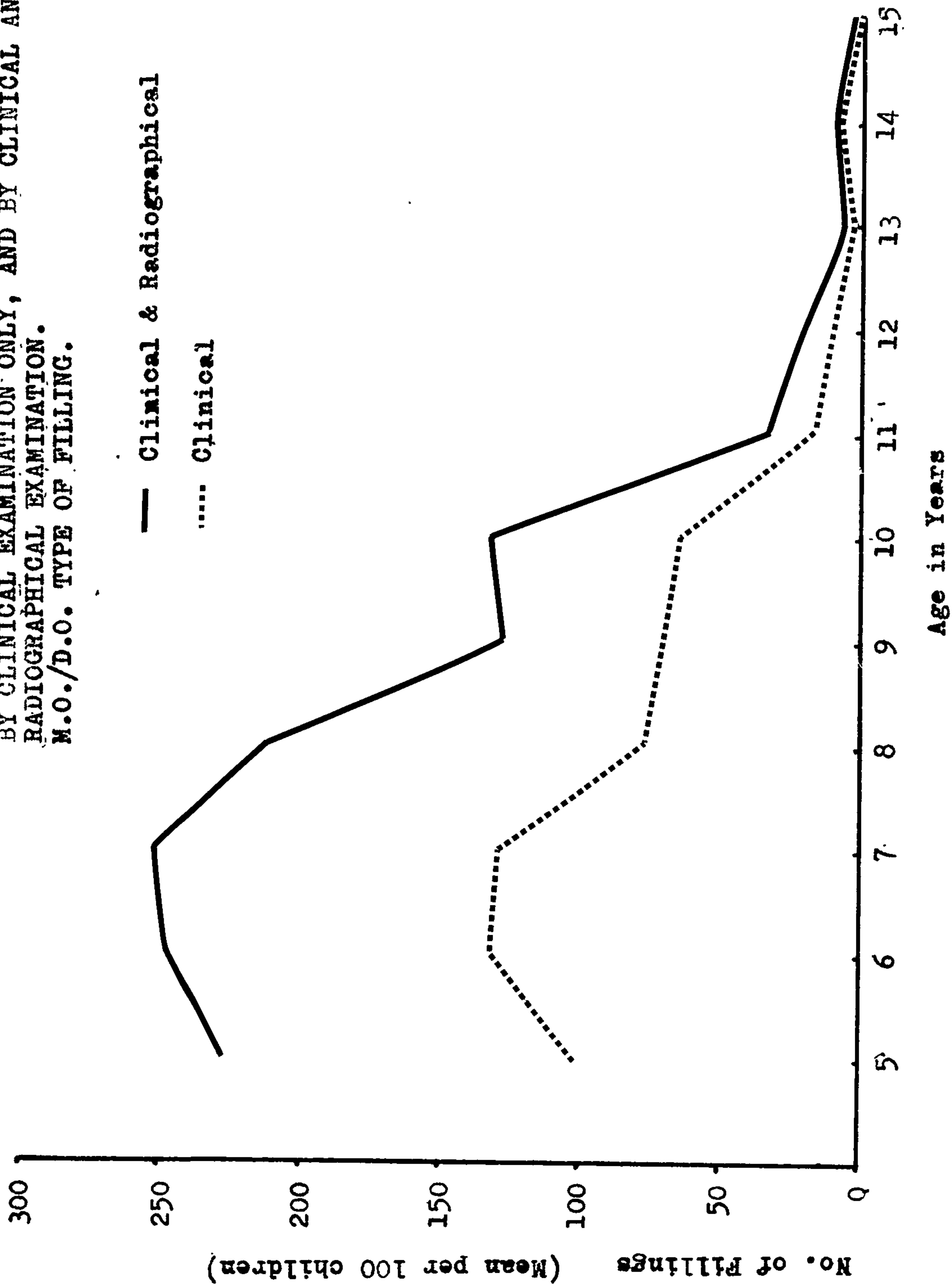
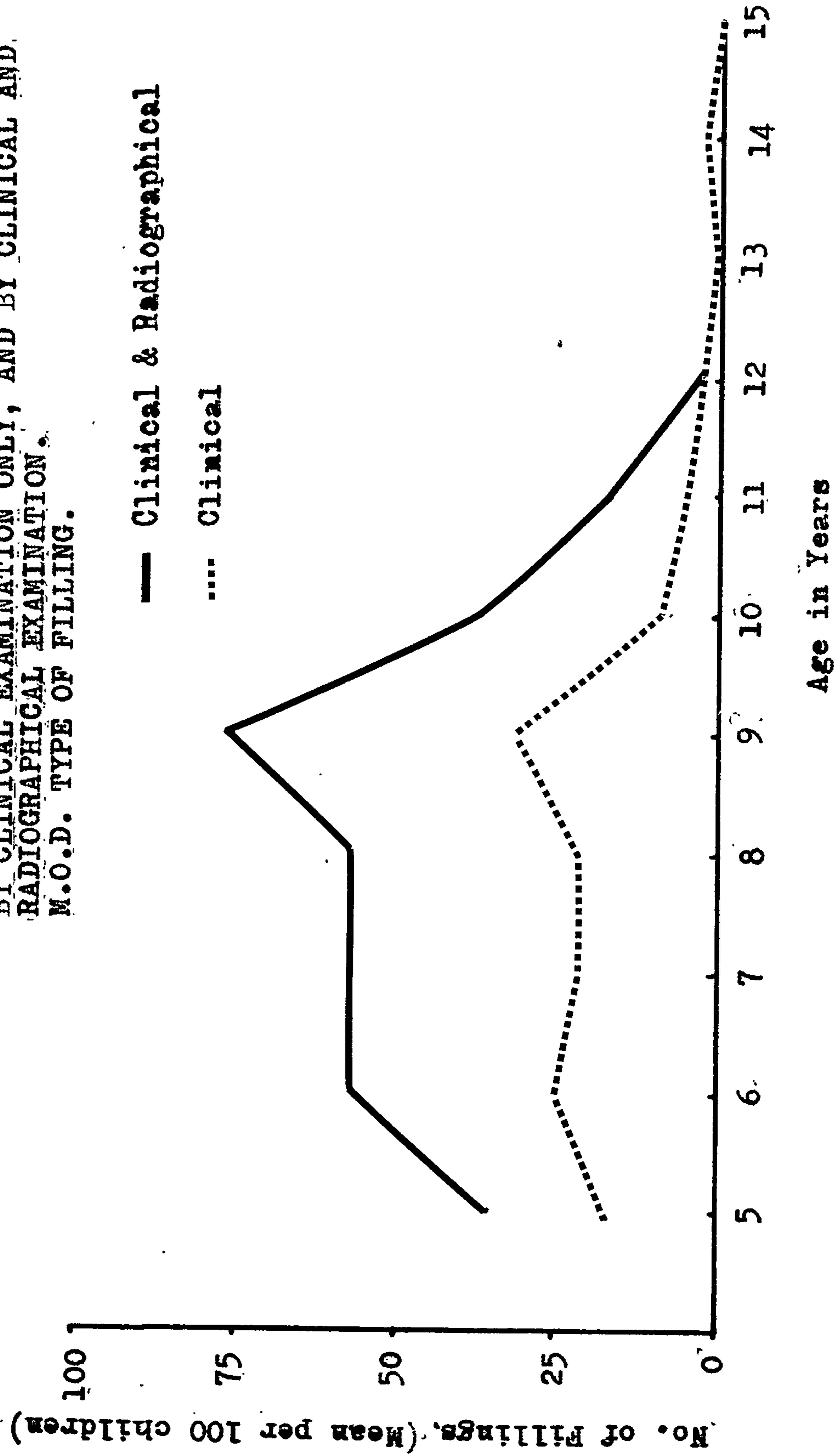


Figure 3.8.

FILLING REQUIREMENTS FOR DECIDUOUS TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.
M.O.D. TYPE OF FILLING.



(iii) FILLING REQUIREMENTS FOR PERMANENT TEETH AS DETERMINED BY CLINICAL EXAMINATION, AND BY FURTHER RADIOGRAPHICAL EXAMINATION.

Table 3.8. shows, according to age and type of filling, the number of restorations (per 100 children) required in permanent teeth by clinical examination, and the number required by further radiographical examination. As with the deciduous dentition, X-ray examination has added much more to the numbers of fillings found to be required by clinical examination in the case of MOD, MO/DO, and the proximal/labial types of fillings. In fact, more MO/DO and MOD fillings were found to be required by X-ray examination only than by clinical examination only. It is seen that supplementary X-ray examination is valueless as far as estimation of lingual, Class IV, occlusal, and pit/cervical filling requirements is concerned.

Figure 3.9. shows the difference in proximal/labial filling requirements for permanent teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children, 31 per cent. of the total filling requirements is found by additional X-ray examination. From nine years of age, filling requirements as found clinically and that as found by combined clinical and radiographical examination run roughly parallel to each other.

Figure 3.9.

FILLING REQUIREMENTS FOR PERMANENT TEETH AS DETERMINED BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND RADIOGRAPHICAL EXAMINATION.
PROXIMAL/LABIAL TYPE OF FILLING (ANTERIOR TEETH).

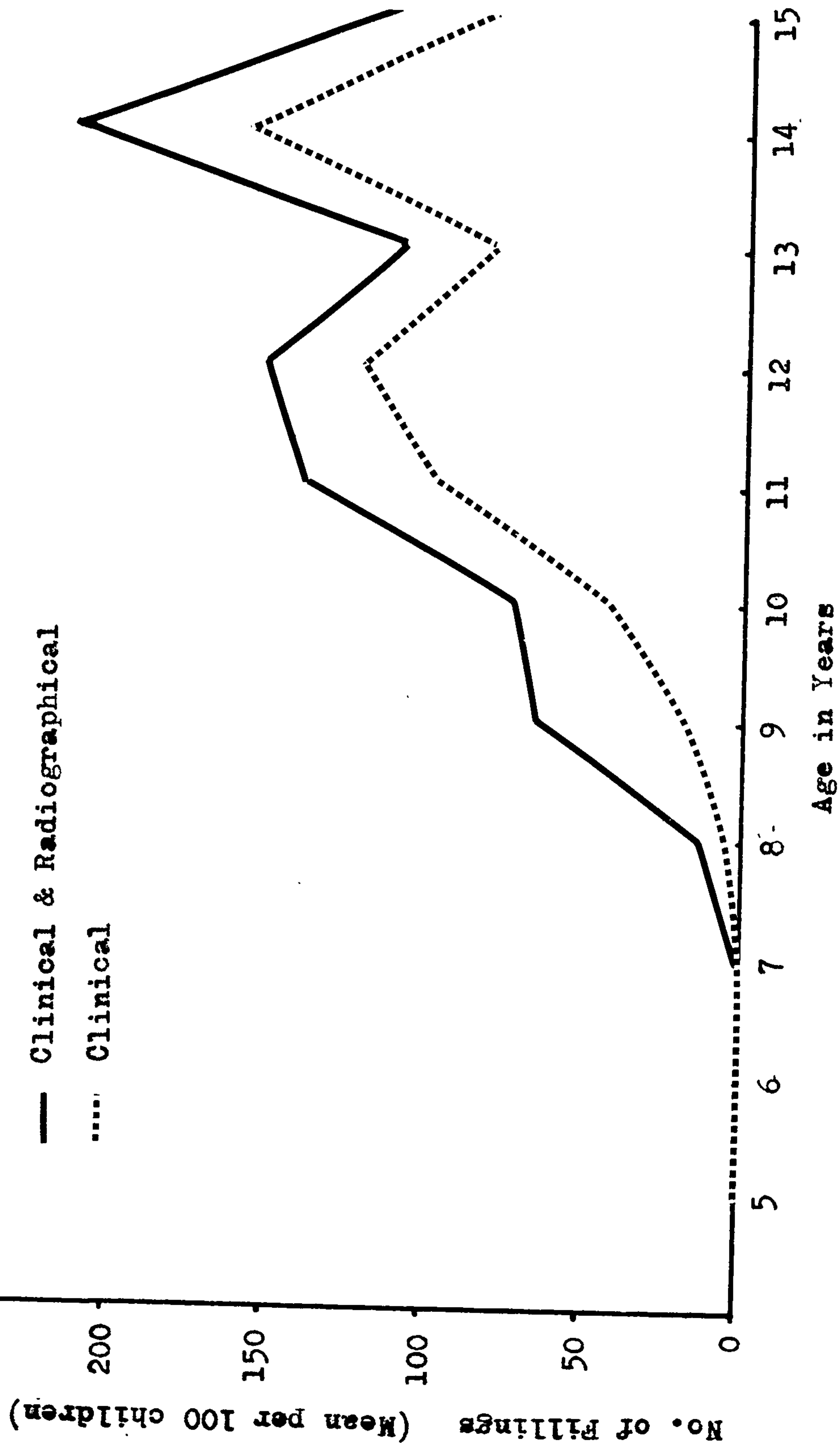


Figure 3.10. shows the difference in MO/DO filling requirements for permanent teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children, 80 per cent. of the total filling requirements is found by additional X-ray examination. The additional filling requirements detected by further X-ray examination increases with age. Of the 242 MO/DO fillings required per 100 children at 15 years of age, 203 fillings were found to be required as a result of additional radiographical examinations.

Figure 3.11. shows the difference in MOD filling requirements for permanent teeth when determined by clinical examination alone and when supplementary X-ray examination is used. For the whole group of children, 85 per cent. of the total filling requirements is found by additional X-ray examination. At 15 years of age, out of the total requirement of 33 MOD fillings per 100 children, only six were detected by mirror and probe.

Figure 3.10.

FILLING REQUIREMENTS FOR PERMANENT TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.
M.O./D.O. TYPE OF FILLING.

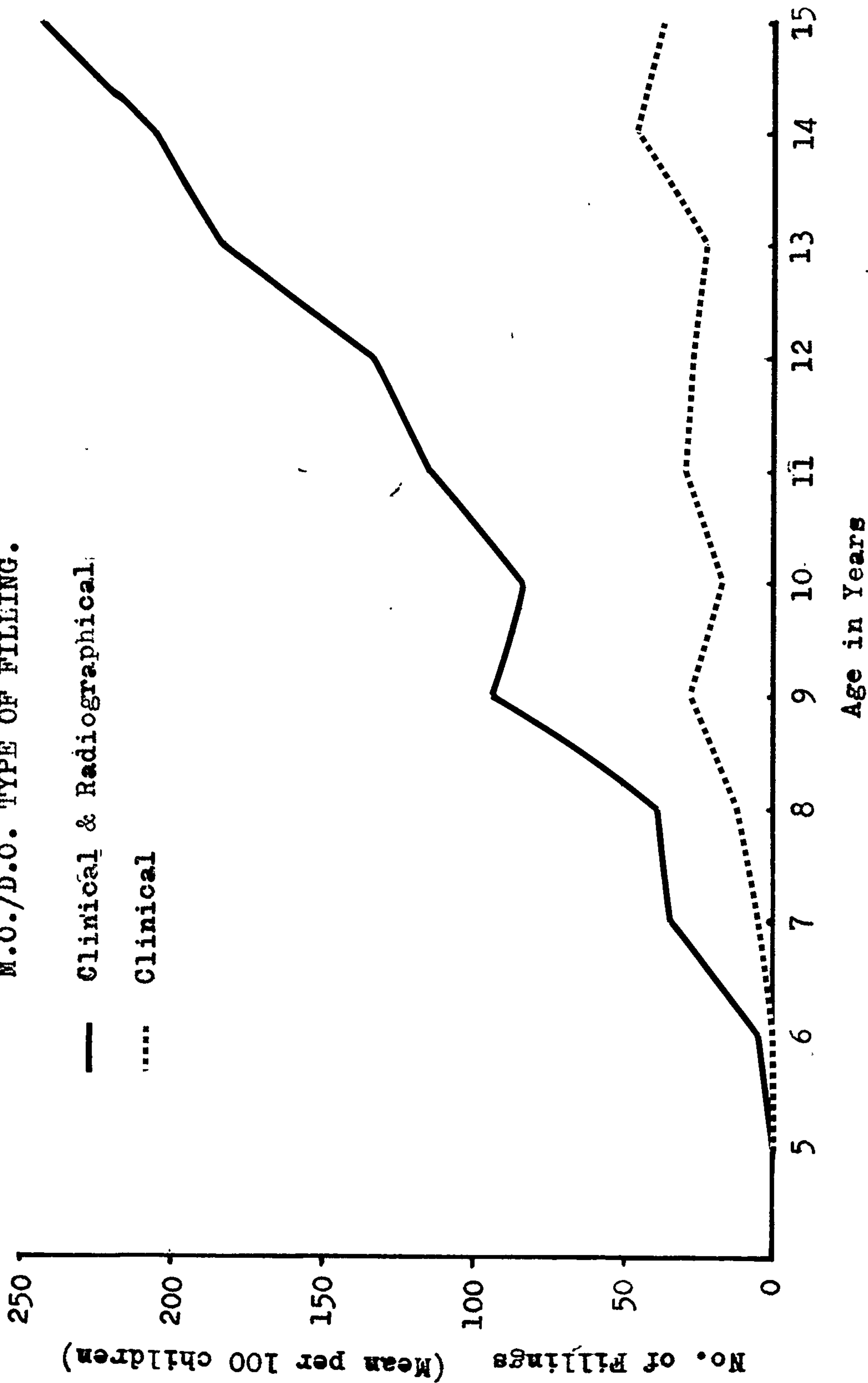
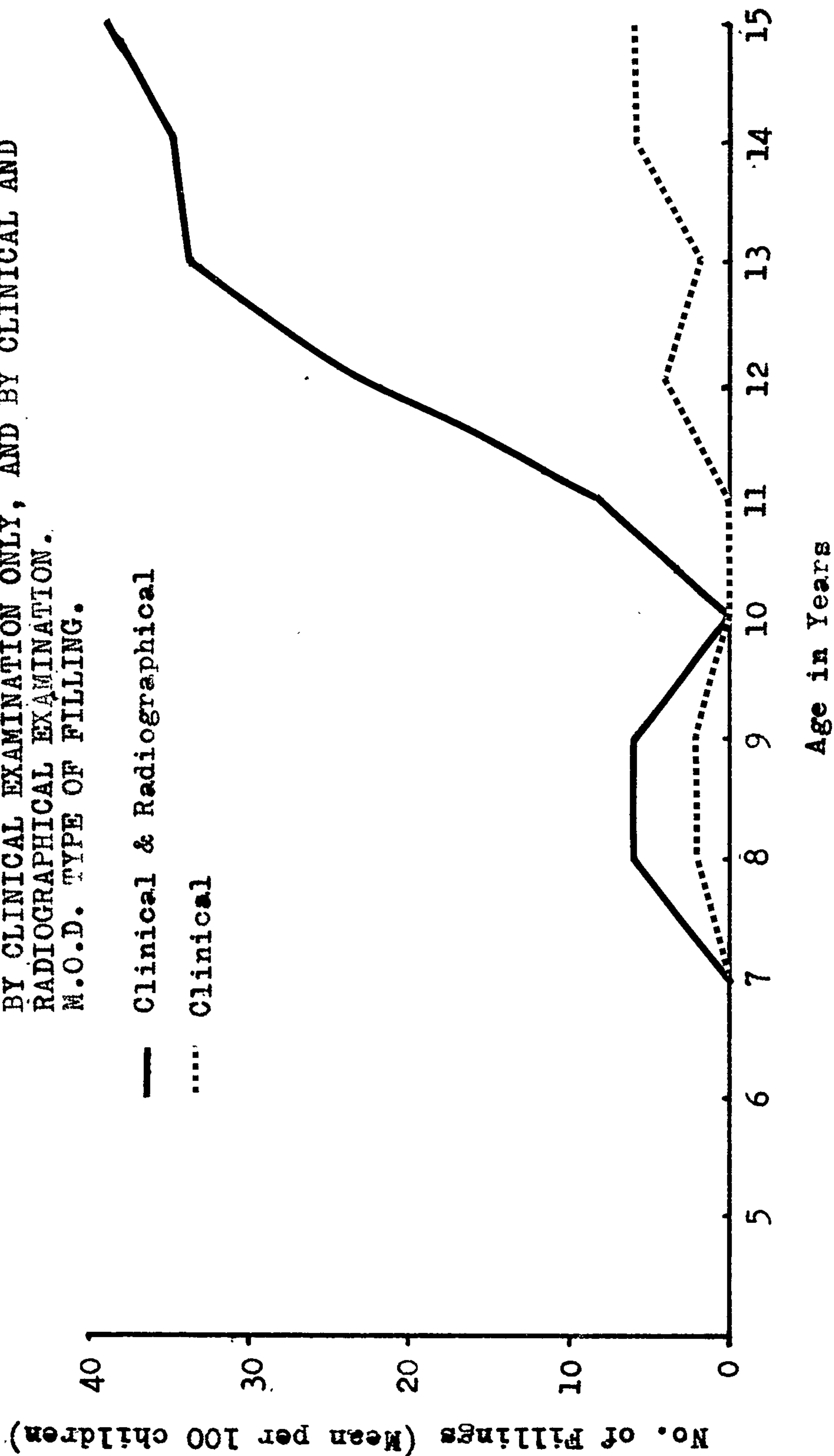


Figure 3.11.

FILLING REQUIREMENTS FOR PERMANENT TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.
M.O.D. TYPE OF FILLING.



II. FILLINGS PRESENT

(i) FILLINGS PRESENT BY AGE AND TYPE OF FILLING IN DECIDUOUS AND PERMANENT TEETH.

Table 3.9. shows the mean number of fillings present per 100 children according to age and type of filling for deciduous and permanent teeth. More operative work has been done on permanent teeth than on deciduous teeth.

In deciduous teeth, MO/DO and occlusal types of fillings are mostly present. At eight years of age, 168 MO/DO fillings and 81 occlusal fillings are present per 100 children. There are very few proximal/labial fillings present. Except for three crowned posterior teeth per 100 children at seven years of age, crowns are absent in the deciduous dentition. No lingual type of filling is found in deciduous teeth.

In permanent teeth, occlusal, pit/cervical, MO/DO, and proximal/labial types of fillings are mostly present. At 15 years of age, 261 occlusal, 144 pit/cervical, 111 MO/DO, and 169 proximal/labial fillings per 100 children are present. The number of MOD fillings remains low until 13 years of age when it is 46 per 100 children at 15 years of age. Ten Class IV type of fillings per 100 children are present in the 13-year age group. Crowns on anterior teeth are present in children aged 12, 13, and 14, numbering two, one, and two per 100 children at these respective ages. No crown is present on the permanent posterior teeth.

TABLE 3.9.
 FILLINGS PRESENT BY AGE AND TYPE OF
 FILLING IN DECIDUOUS AND PERMANENT TEETH
 (Mean per 100 Children)

Age (Years)	Anterior teeth						Posterior teeth											
	Type of Filling						Type of Filling											
	Prox./lab.		ling		Cl. IV		Crown		Occl.		pit/cerv.		MO/DO		MOD		Crown	
	Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.		Decid. Perm.	
5	-	-	-	-	-	-	-	-	66	-	17	-	40	-	6	-	-	-
6	6	-	-	-	-	-	-	-	51	6	32	11	93	4	9	-	-	-
7	3	-	-	-	-	-	-	-	51	49	11	24	76	-	11	-	3	-
8	4	4	-	-	-	-	-	-	81	123	15	60	168	4	9	-	-	-
9	4	21	-	10	-	-	-	-	31	160	4	56	67	33	2	2	-	-
10	2	27	-	15	2	3	-	-	27	185	5	53	43	43	8	2	-	-
11	-	40	-	13	-	-	-	-	19	221	-	64	15	45	4	8	-	-
12	-	72	-	19	-	-	-	2	5	230	-	123	9	81	2	12	-	-
13	-	135	-	35	-	10	-	1	1	301	-	170	-	151	-	46	-	-
14	-	198	-	14	-	2	-	2	-	204	-	120	2	139	-	78	-	-
15	-	169	-	56	-	6	-	-	-	261	-	144	3	111	3	106	-	-

III. RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED

(i) RATIO OF FILLINGS PRESENT TO FILLINGS REQUIRED ACCORDING TO AGE AND TYPE OF FILLING FOR DECIDUOUS TEETH

The number of fillings present indicates the amount of operative work done. The number of fillings required indicates the amount of operative work still to be done before treatment, in respect of these fillings, can be considered as completed.

Table 3.10. shows the ratio of fillings present to fillings required according to age and type of filling for deciduous teeth. As mentioned earlier, it was not possible to determine filling requirements in respect of crowns from data on the record cards. It is clearly seen that only a very small proportion of filling needs has been met. It appears that the pattern of treatment has been to concentrate on posterior teeth, especially on occlusal, pit/cervical and MO/DO fillings. The occlusal fillings show the highest ratio of fillings present to fillings required, and yet for this type of restoration only about half the needs has been met. Proximal or labial filling requirements have been almost completely neglected. No lingual type of filling is present in the deciduous teeth. Except for the MO/DO type, the need for fillings in deciduous teeth is negligible by 12 years of age. The reason for this is that relatively few deciduous teeth remain in the dentition because of exfoliation and premature loss due to caries.

TABLE 3. 10.
 FILLINGS PRESENT AND FILLINGS REQUIRED BY
 AGE AND TYPE OF FILLING FOR DECIDUOUS TEETH
 (Mean per 100 Children)

Age (Years)	Anterior teeth								Posterior teeth									
	Type of filling								Type of filling									
	Prox./lab		ling.		Cl. IV		Crown		Occl.		pit/cerv.		MO/DO		MOD		Crown	
	Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.		Present Req'd.	
5	-	186	-	-	-	-	-	?	66	69	17	37	40	229	6	31	-	?
6	6	282	-	4	-	2	-	?	51	72	32	65	93	249	9	58	-	?
7	3	138	-	5	-	-	-	?	51	62	11	38	76	251	11	57	3	?
8	4	119	-	6	-	2	-	?	81	34	15	30	168	211	9	57	-	?
9	4	90	-	2	-	2	-	?	31	29	4	19	67	127	2	77	-	?
10	2	60	-	-	2	-	-	?	27	22	5	25	43	133	8	37	-	?
11	-	11	-	-	-	2	-	?	19	9	-	6	15	32	4	17	-	?
12	-	11	-	2	-	-	-	?	5	7	-	-	9	21	2	2	-	?
13	-	1	-	-	-	-	-	?	1	2	-	4	-	5	-	-	-	?
14	-	-	-	-	-	-	-	?	-	2	-	-	2	6	-	2	-	?
15	-	3	-	-	-	-	-	?	-	-	-	3	3	3	3	-	-	?

Figures 3.12. to 3.16. show, for particular types of fillings, the numbers present against the numbers required in deciduous teeth according to age.

Figure 3.12. clearly illustrates the very small amount of operative work done in relation to the need for proximal/labial fillings. The maximum number of fillings present is at six years of age when six are present per 100 children whereas 282 fillings are required per 100 children. In the five-year-old child 186 fillings per 100 children are required but none is present.

Figure 3.13. shows that the need for occlusal fillings in deciduous teeth has been met about half way. The number of fillings per 100 children at six years of age is 51 present against 72 required. After the age of seven years, the number of fillings present is generally more than which is required. The number of fillings per 100 children at eight years of age is 81 present against 34 required.

Figure 3.14. shows that up to eight years of age the ratio of pit/cervical fillings present to fillings required in deciduous teeth is about 1:2. At the ages of nine and 10 years the ratio is about 1:5. The filling requirements drop sharply from 11 years of age. No filling is present in these older age groups.

Figure 3.12.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
DECIDUOUS TEETH.
PROXIMAL/LABIAL TYPE OF FILLING (ANTERIOR TEETH).

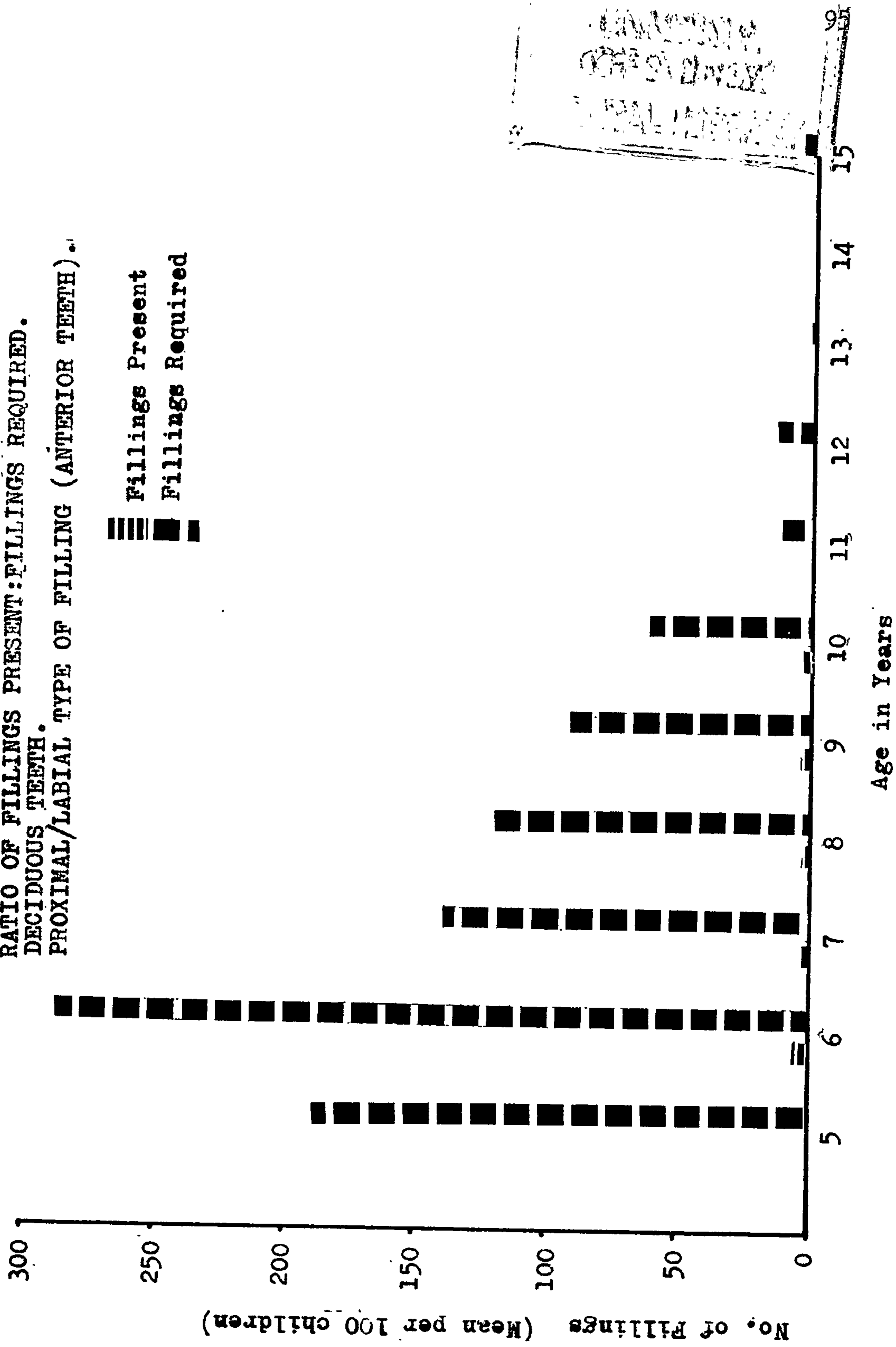


Figure 3.13.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED.
DECIDUOUS TEETH.
OCCLUSAL TYPE OF FILLING.

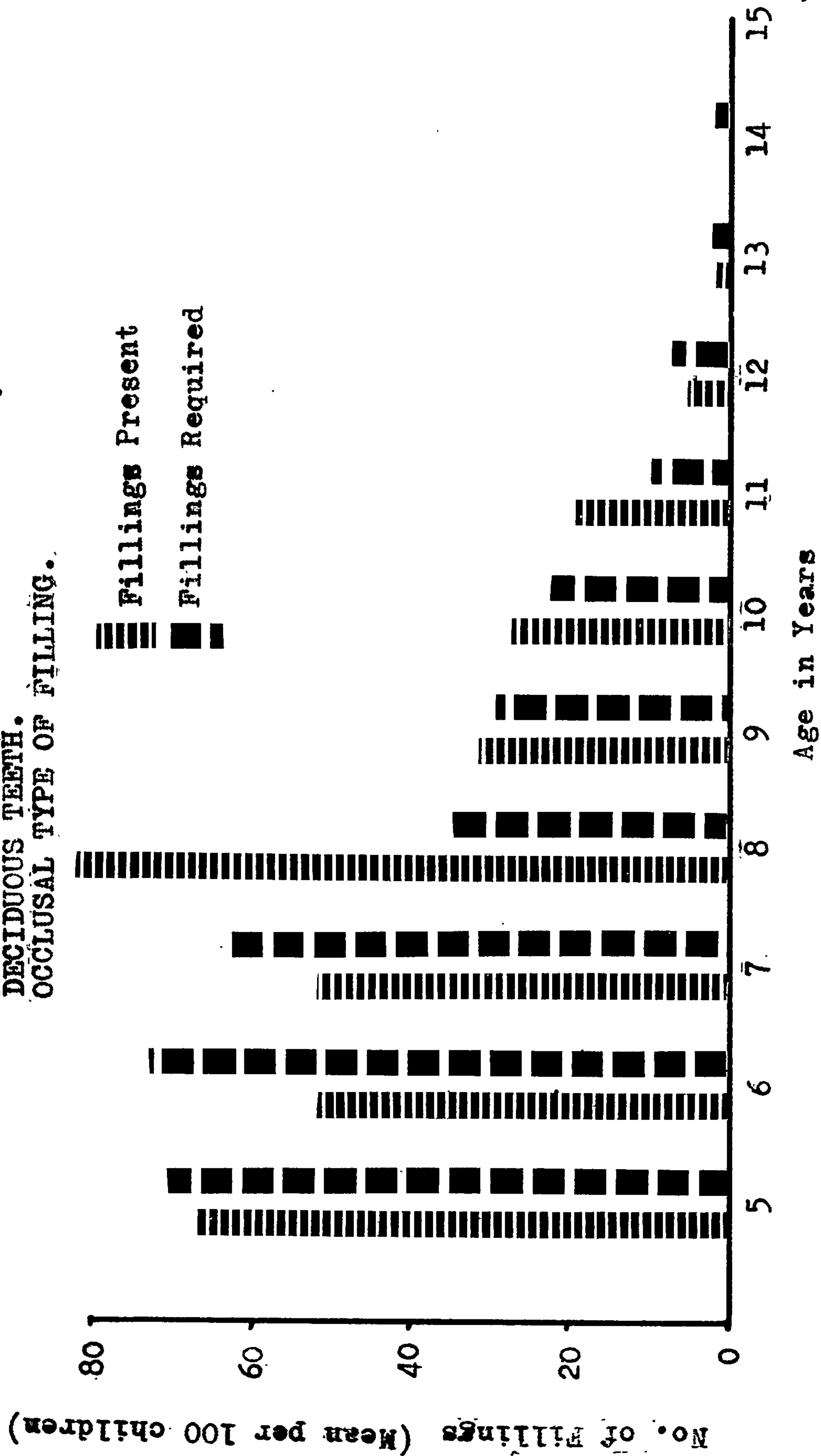


Figure 3.14.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED.
DECIDUOUS TEETH.
PIT/CERVICAL TYPE OF FILLING.

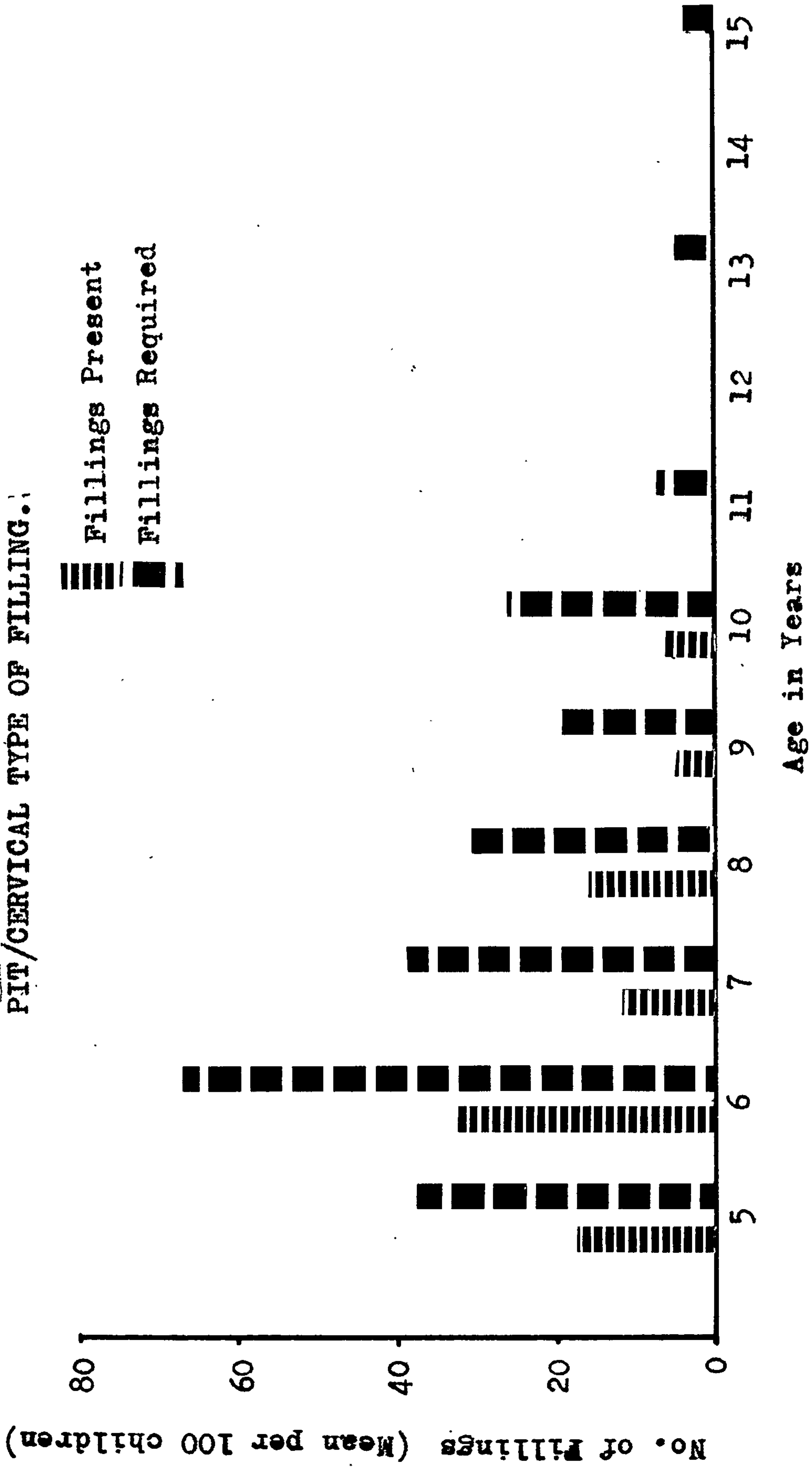


Figure 3.15. shows that for MO/D0 fillings in deciduous teeth the ratio of fillings present to fillings required (per 100 children) increases from 40:229, or about one-sixth, at six years of age to 168:211, or about four-fifths, at eight years of age. From the age of nine years the ratio fluctuates between approximately one-half and two-thirds. With deciduous molars beginning to be exfoliated in these older age groups the need for fillings is reduced.

Figure 3.16. shows that only a very small amount of operative work has been done in relation to the need for MOD restorations in deciduous teeth. At five years of age six fillings per 100 children are present as against 31 required. The corresponding values at six years are nine present against 58 required; at seven years it is eleven against 57; at eight years, seven against 57. The number of fillings required reaches a maximum of 77 per 100 children at nine years of age when the number of fillings present (per 100 children) is only two.

Figure 3.15.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED.
DECIDUOUS TEETH.
M.O./D.O. TYPE OF FILLING.

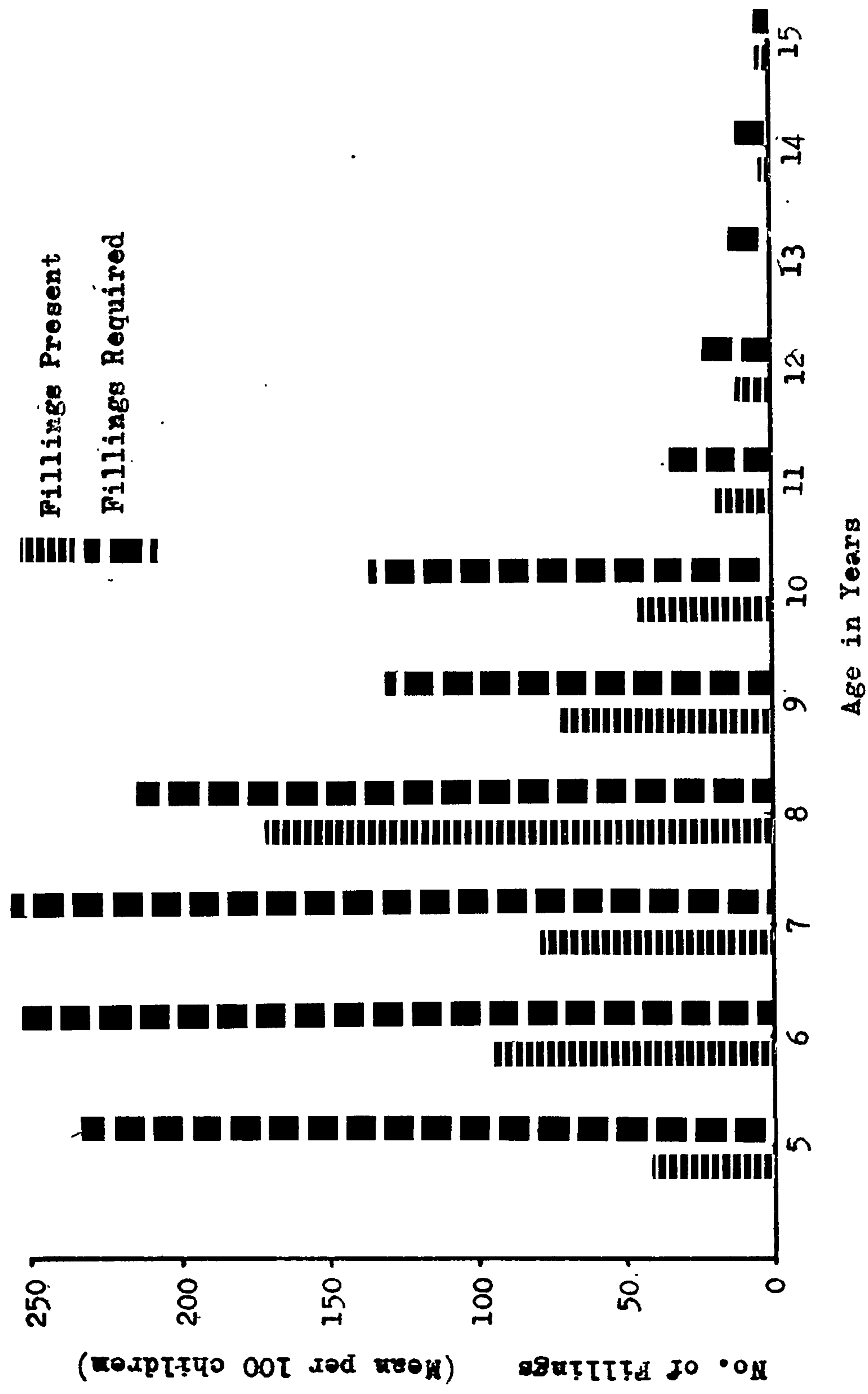
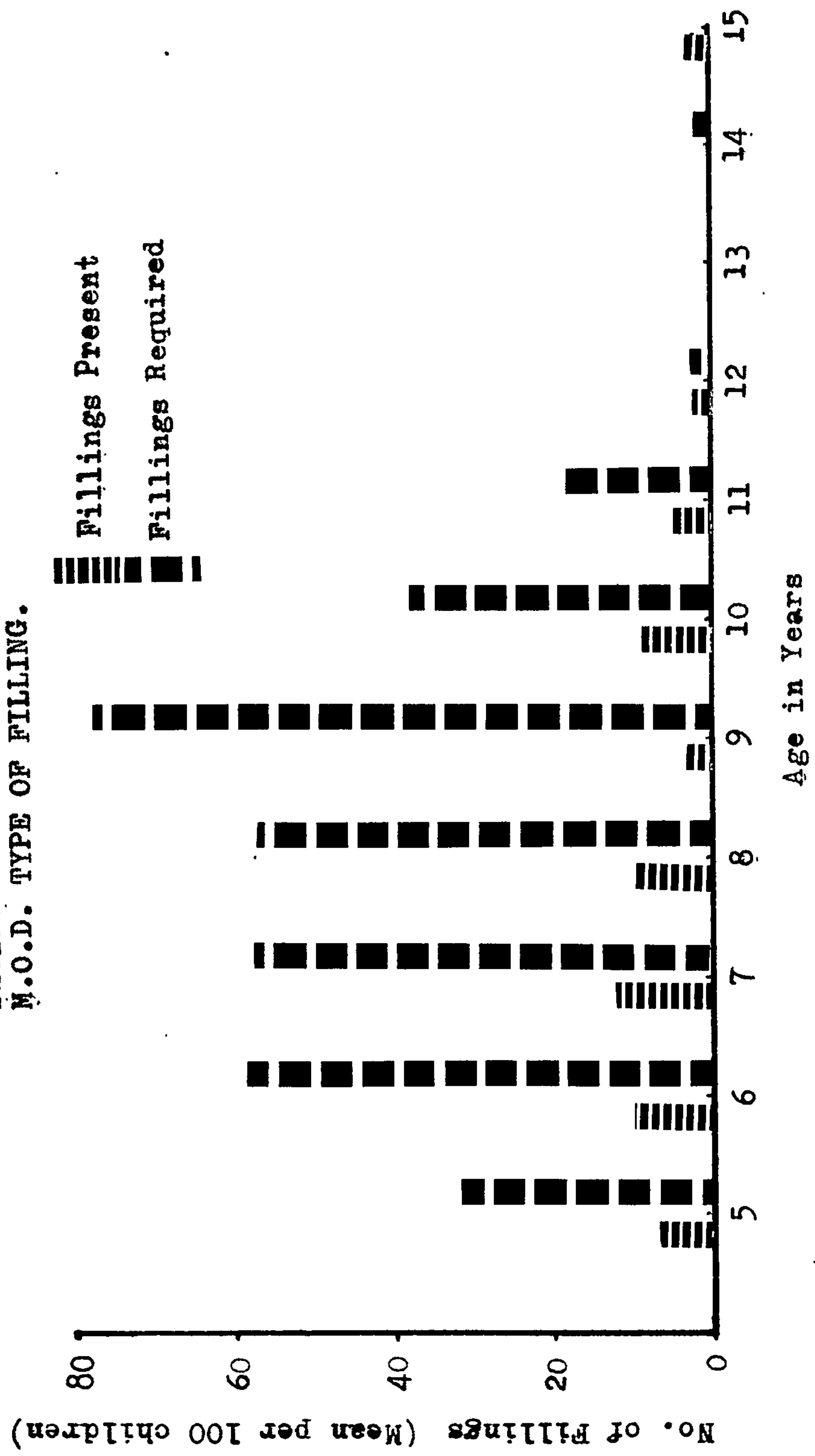


Figure 3. 16.
RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED.
DECIDUOUS TEETH.
M.O.D. TYPE OF FILLING.



(ii) RATIO OF FILLINGS PRESENT TO FILLINGS REQUIRED ACCORDING TO AGE AND TYPE OF FILLINGS FOR PERMANENT TEETH.

Table 3.11. shows the ratio of fillings present to fillings required according to age and type of filling for permanent teeth. Treatment requirements in respect of fillings are better met in permanent teeth than in deciduous teeth. However, these needs are generally met about half way only. For every filling present another needs placement. As well as being present in the highest numbers, occlusal fillings are also required in the largest numbers. The treatment needs for MO/DO fillings are the least attended to. This type of restoration has the lowest ratio of fillings present to fillings required. The reason for this might be that X-ray examination is not used as a routine procedure in diagnosis and hence a high proportion of these filling requirements remains undetected. However, the ratio of the amount of treatment received to that required in respect of MOD fillings is much higher than that for MO/DO fillings. Treatment needs for Class IV restorations in permanent teeth are fully met.

Figures 3.17. to 3.22. show, for particular types of fillings, the numbers present against the numbers required in permanent teeth according to age.

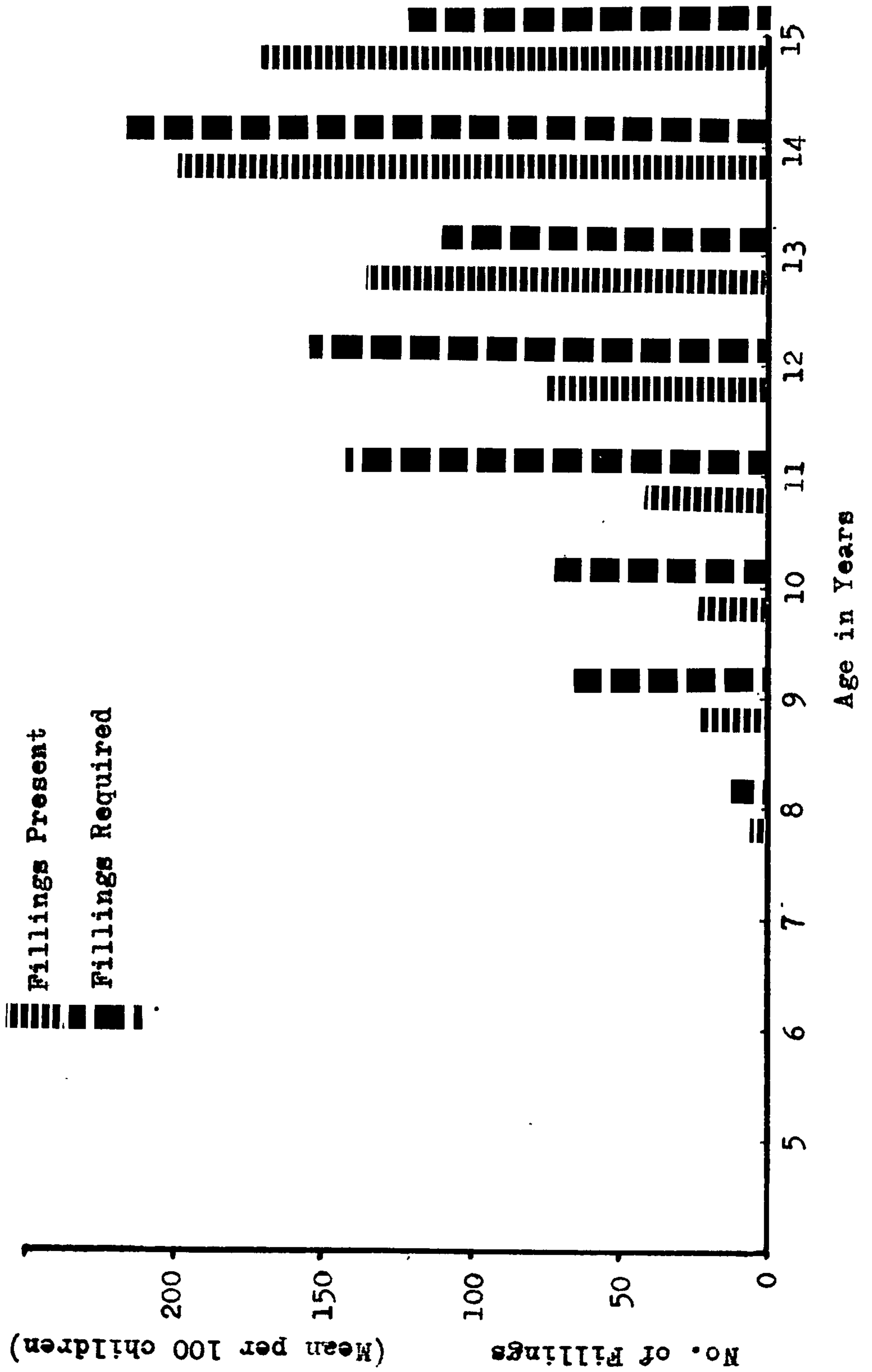
Figure 3.17. shows that the need for proximal/labial ratio of fillings arises at eight years of age. By and large, the ratio of

TABLE 3. 11.
 FILLINGS PRESENT AND FILLINGS REQUIRED BY
 AGE AND TYPE OF FILLING FOR PERMANENT TEETH
 (Mean per 100 Children)

Age (Years)	Anterior teeth								Posterior teeth										
	Type of filling								Type of filling										
	Prox./lab		ling.		Cl. IV		Crown		Occl.		pit/cerv.		MO/DO		MOD		Crown		
	Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		Present Reqd.		
5	-	-	-	-	-	-	-	?	-	17	-	-	-	-	-	-	-	-	?
6	-	-	-	-	-	-	-	?	6	96	11	33	4	4	-	-	-	-	?
7	-	-	-	-	-	-	-	?	49	135	24	59	-	32	-	-	-	-	?
8	4	11	-	-	-	-	-	?	123	168	60	66	4	36	-	6	-	-	?
9	21	65	10	17	-	-	-	?	160	146	56	106	33	92	2	6	-	-	?
10	27	73	15	3	3	-	-	?	185	132	53	105	43	83	2	-	-	-	?
11	40	140	13	13	-	-	-	?	221	215	64	108	45	115	8	8	-	-	?
12	72	153	19	5	-	-	2	?	230	332	123	105	81	132	12	23	-	-	?
13	135	109	35	12	10	-	1	?	301	267	170	88	151	183	46	34	-	-	?
14	198	214	14	16	2	-	2	?	204	288	120	82	139	206	78	35	-	-	?
15	169	119	56	14	6	-	-	?	261	222	144	100	111	242	106	39	-	-	?

Figure 3.17.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
PERMANENT TEETH.
PROXIMAL/LABIAL TYPE OF FILLING (ANTERIOR TEETH).



fillings present to fillings required increases with advancing years. At eight years of age four fillings per 100 children are present while eleven are required. The corresponding values at 12 years are 72 present and 153 required; at 15 years, 169 are present and 119 required. It is seen that although more and more operative work is done as the child gets older the tide of caries still demands 119 proximal/labial fillings per 100 15-year-old children.

Figure 3.18. shows that the need for the lingual type of filling arises at nine years of age when 10 fillings per 100 children are present and 17 are required. In spite of increased incidence of caries, the amount of operative work rendered has effectively checked the filling requirements from exceeding 17 per 100 children for all ages. At 15 years of age 56 fillings per 100 children are present and 14 are required.

Figure 3.19. shows that the need for occlusal fillings arises at five years of age when 17 fillings per 100 children are required but none is present. From then until 10 years of age the ratio of fillings present to that required steadily increases. Through 11 and 12 years of age, although the number of fillings present is greater than that at 10 years, the ratio falls. This is probably because more premolars have erupted and become carious. Ground is gained again at 13 years when there are more fillings present (301 per 100 children) than required (267 per 100 children). At 14 years of age

Figure 3.18.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
PERMANENT TEETH.
LINGUAL TYPE OF FILLING (ANTERIOR TEETH).

No. of Fillings (Mean per 100 children)

Fillings Present
Fillings Required

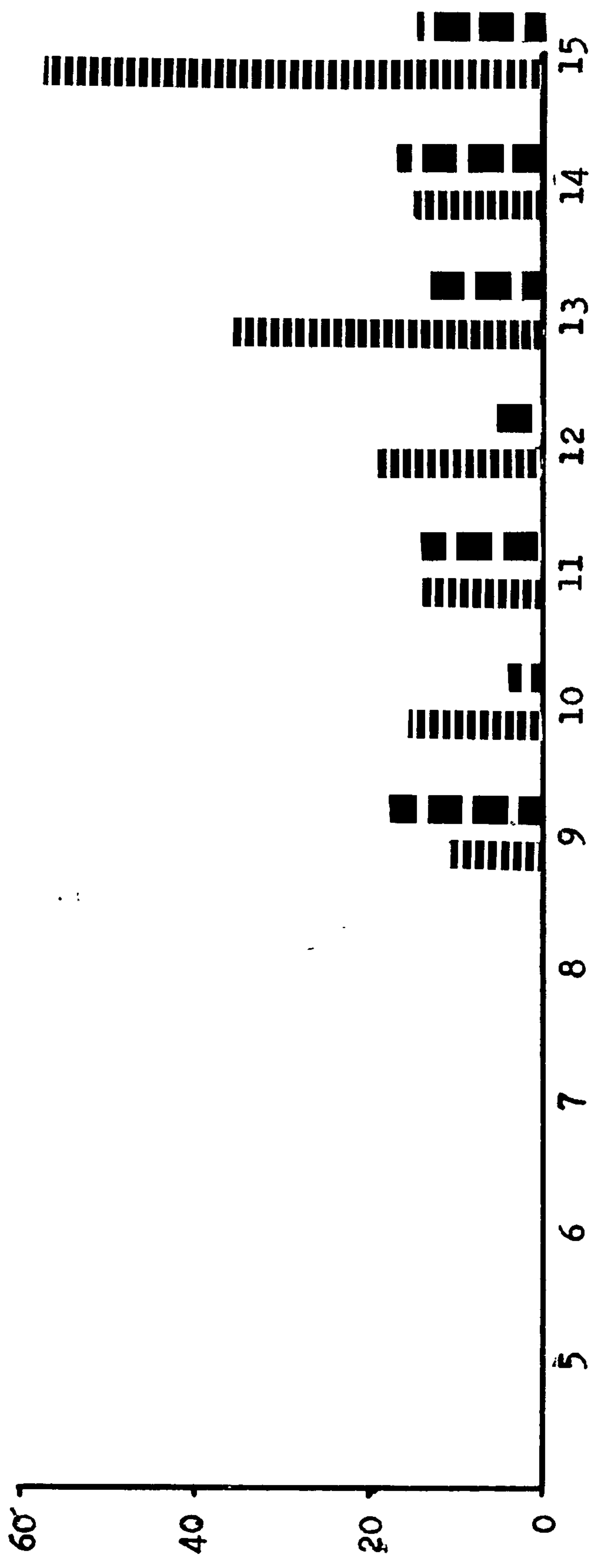
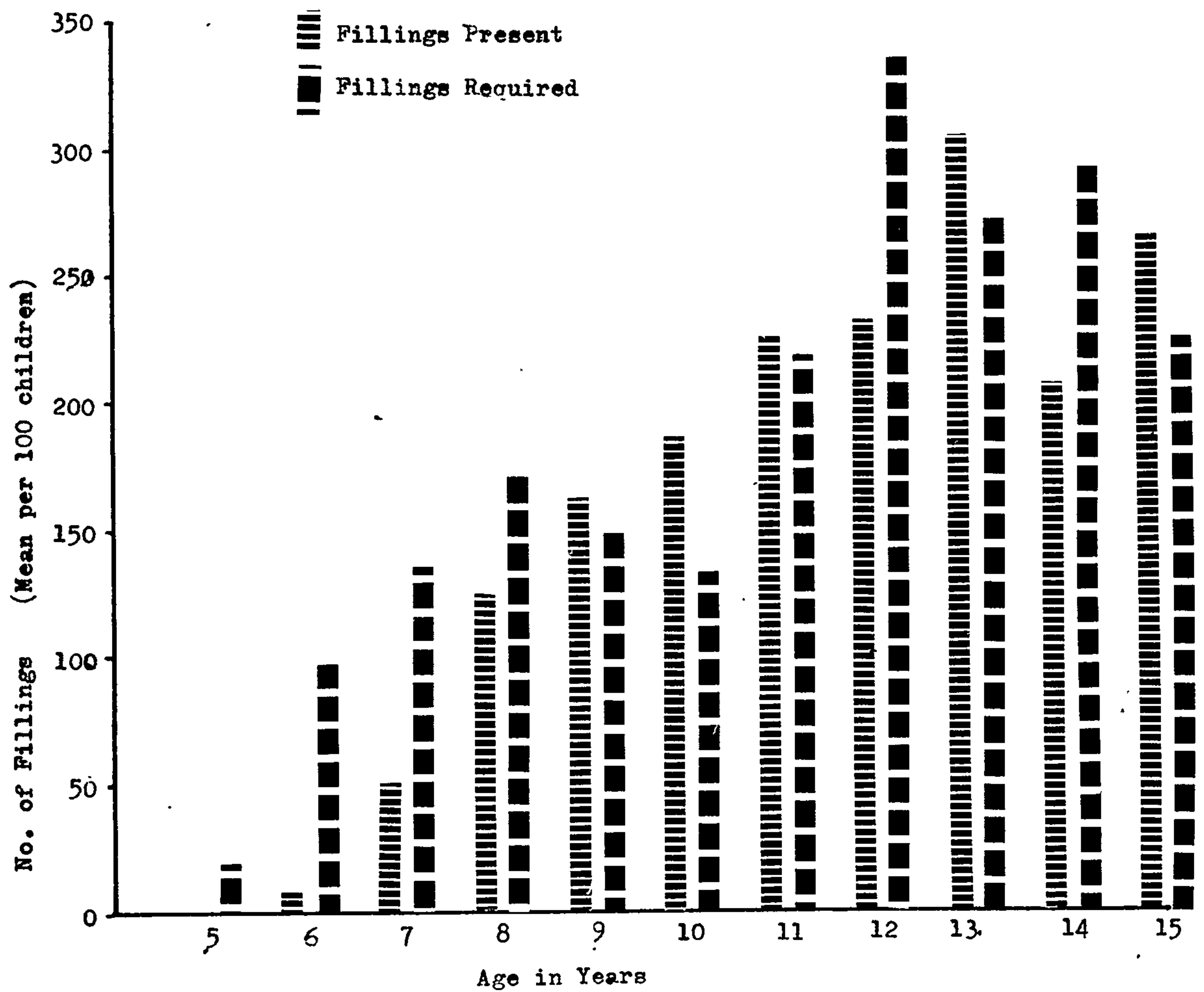


Figure 3.19.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
PERMANENT TEETH.
OCCLUSAL TYPE OF FILLING.



the ratio falls once more, this time carries in the recently erupted second molars being a likely cause. At 15 years of age, 261 occlusal fillings per 100 children are present as against 222 required.

Figure 3.20. shows that the number of pit/cervical fillings present increases (with some fluctuations) with increasing age. From nine to 15 years of age the number of fillings required is held around 100 per 100 children. The highest ratio of fillings present to fillings required is at 13 years of age when it is about 2:1 or 170 present in 100 children as against 88 required.

Figure 3.21. shows that the ratio of MO/DO fillings present to fillings required fluctuates with increasing age. From eight years of age, the ratio (as well as the number of fillings present) reaches a peak at 12 years when not even half the filling needs is met. At eight years of age, four fillings per 100 children are present whereas 36 are required. The corresponding values at 11 years are 45 fillings present whereas 115 are required; at 13 years, 151 present while 183 are required; at 15 years, 111 present while 242 are required.

Figure 3.22. shows that the need for MOD fillings arises at 8 years of age when six per 100 children are required but none is present. At 10 years of age, two per 100 children are present and none is required; at 11 years an equal number of eight fillings per 100 children is present as well as required. From 12 years of age about one-third of the filling requirements is met and at 15 years almost three-quarters of the filling needs are done.

Figure 3.20.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED.
PERMANENT TEETH.
PIT/CERVICAL TYPE OF FILLING (POSTERIOR TEETH).

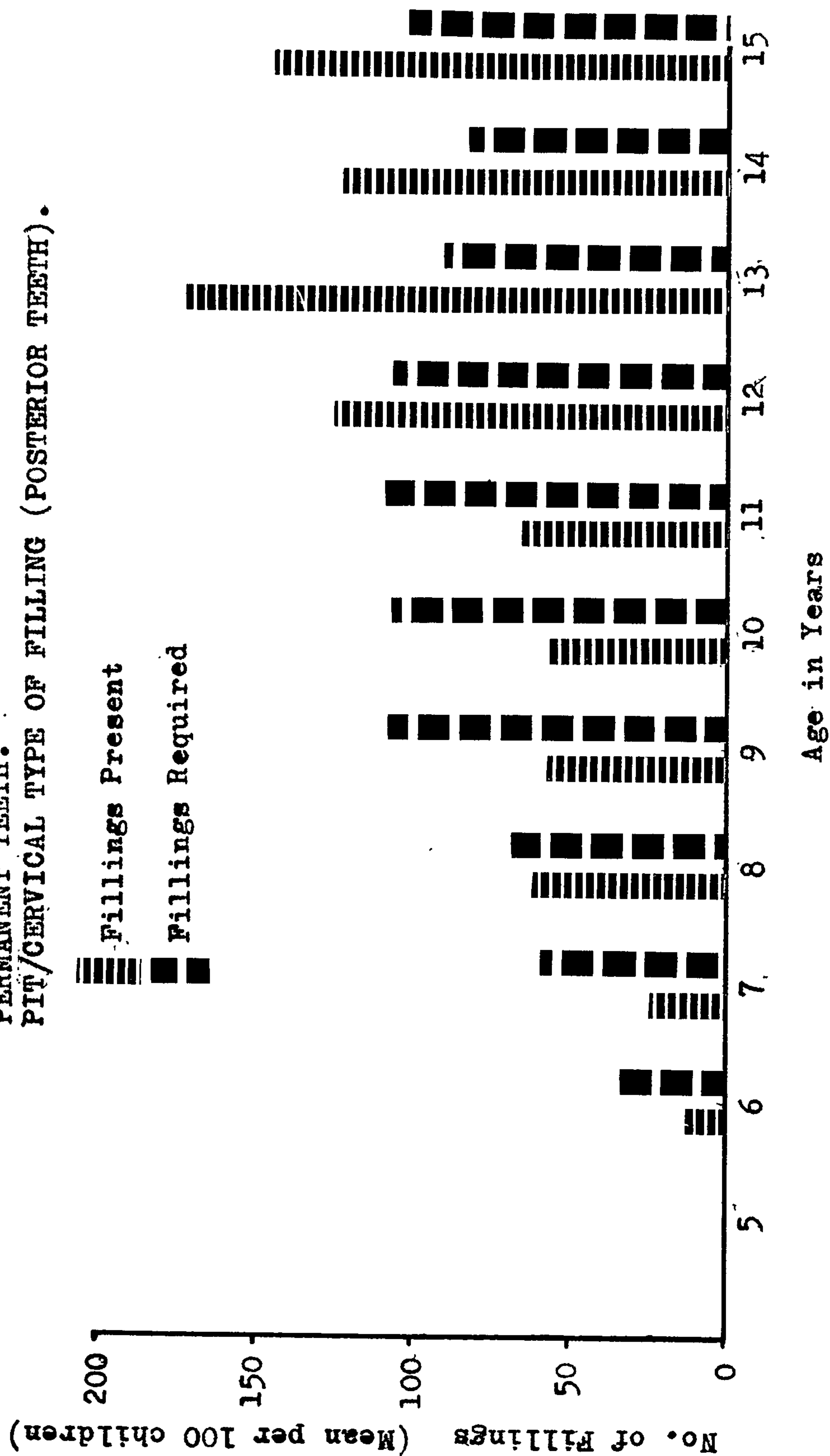


Figure 3.21.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
PERMANENT TEETH.
M.O./D.O. TYPE OF FILLING.

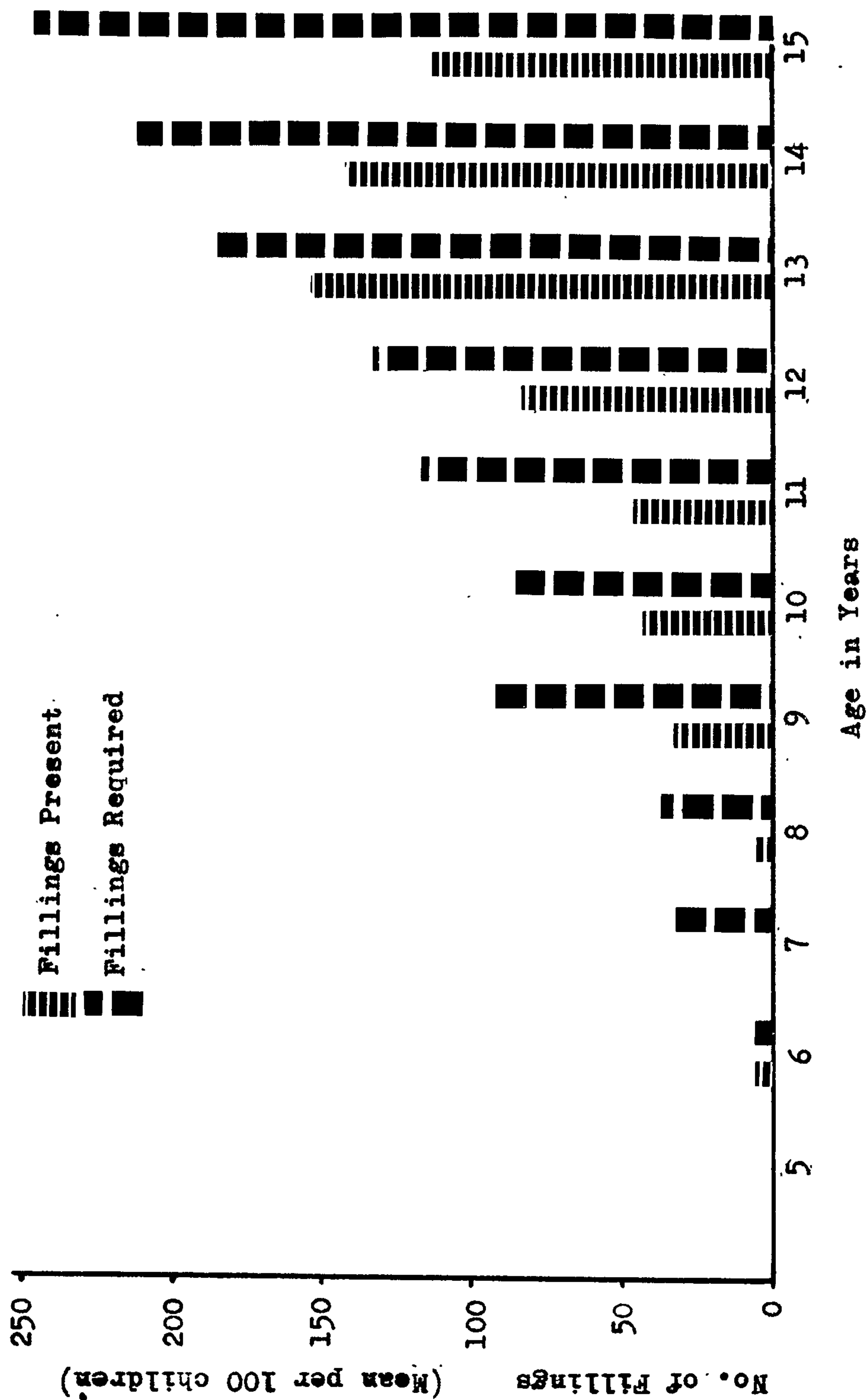
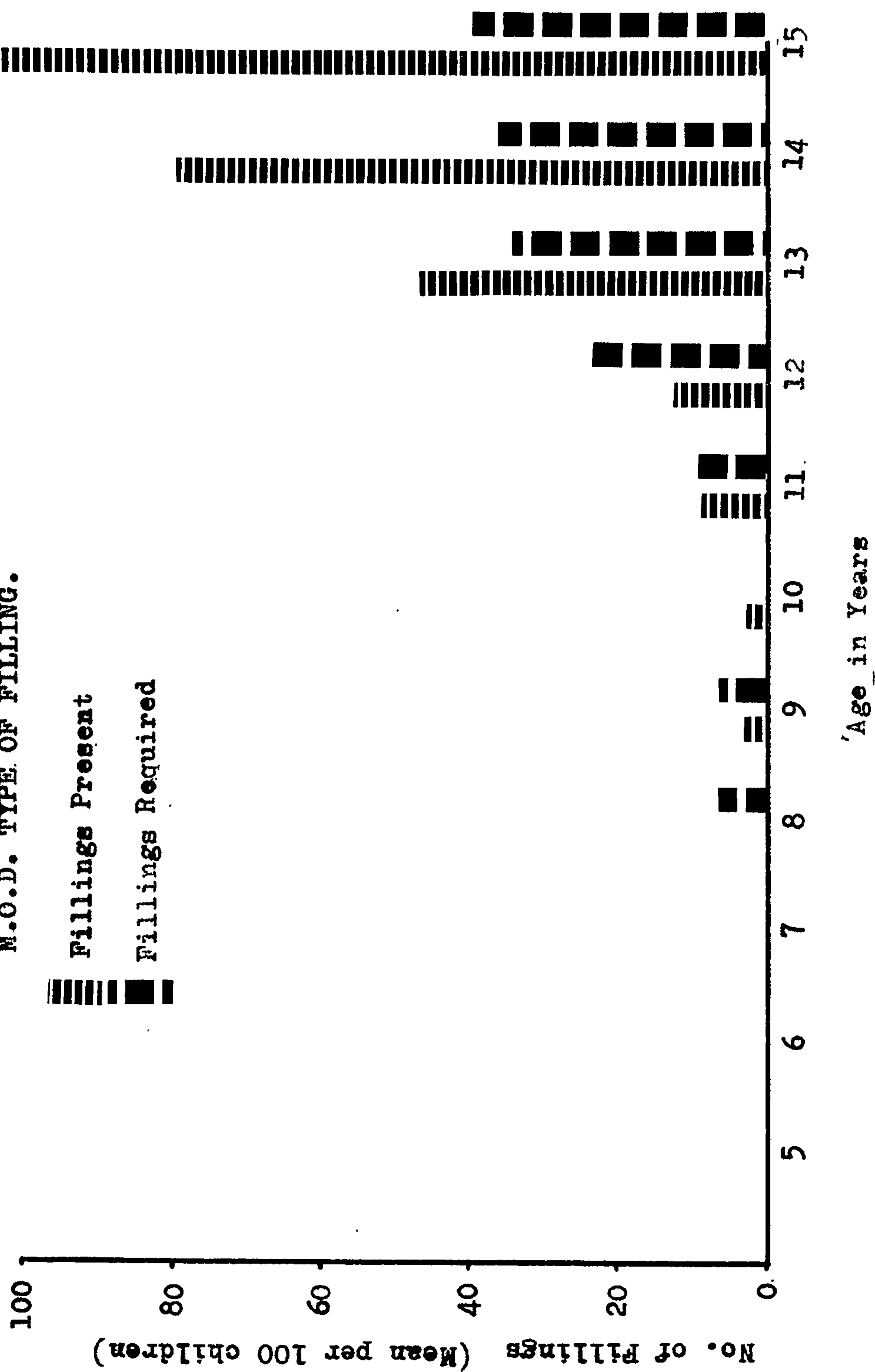


Figure 3.22.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED.
 PERMANENT TEETH.
 M.O.D. TYPE OF FILLING.



(iii) RATIO OF THE VARIOUS TYPES OF FILLINGS PRESENT TO FILLINGS
REQUIRED IN EACH AGE GROUP.

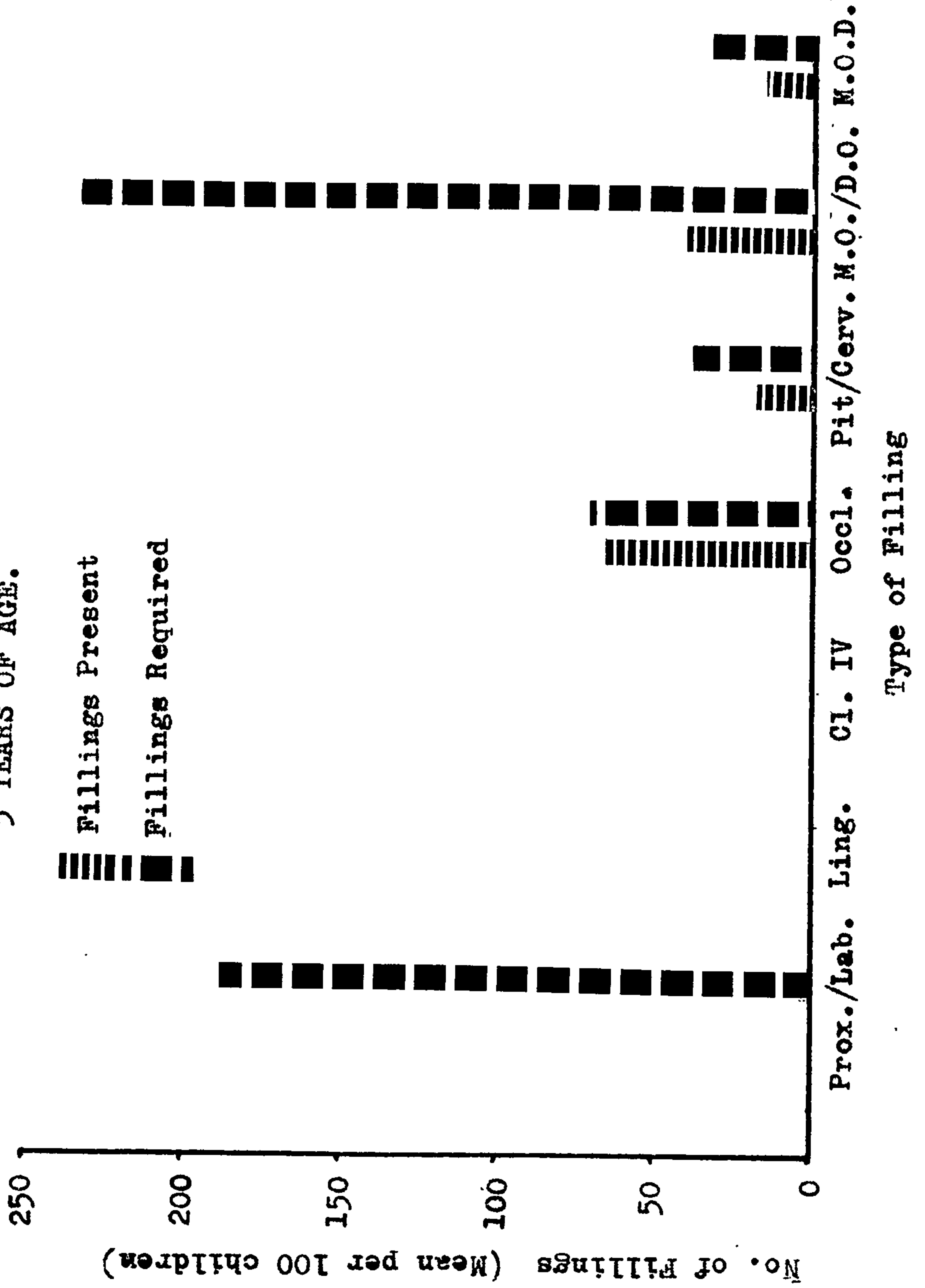
Figures 3.23. to 3.29. show, for each particular age group, the numbers of the various types of fillings present against the numbers required. They illustrate, for each age group, the amount of treatment that has been done and the work-load still to be done, in respect of the various types of fillings. The bar charts were prepared with reference to Tables 3.10. and 3.11. Mindful that "a picture is worth a thousand words" only a brief description of some of the salient features of these charts follows.

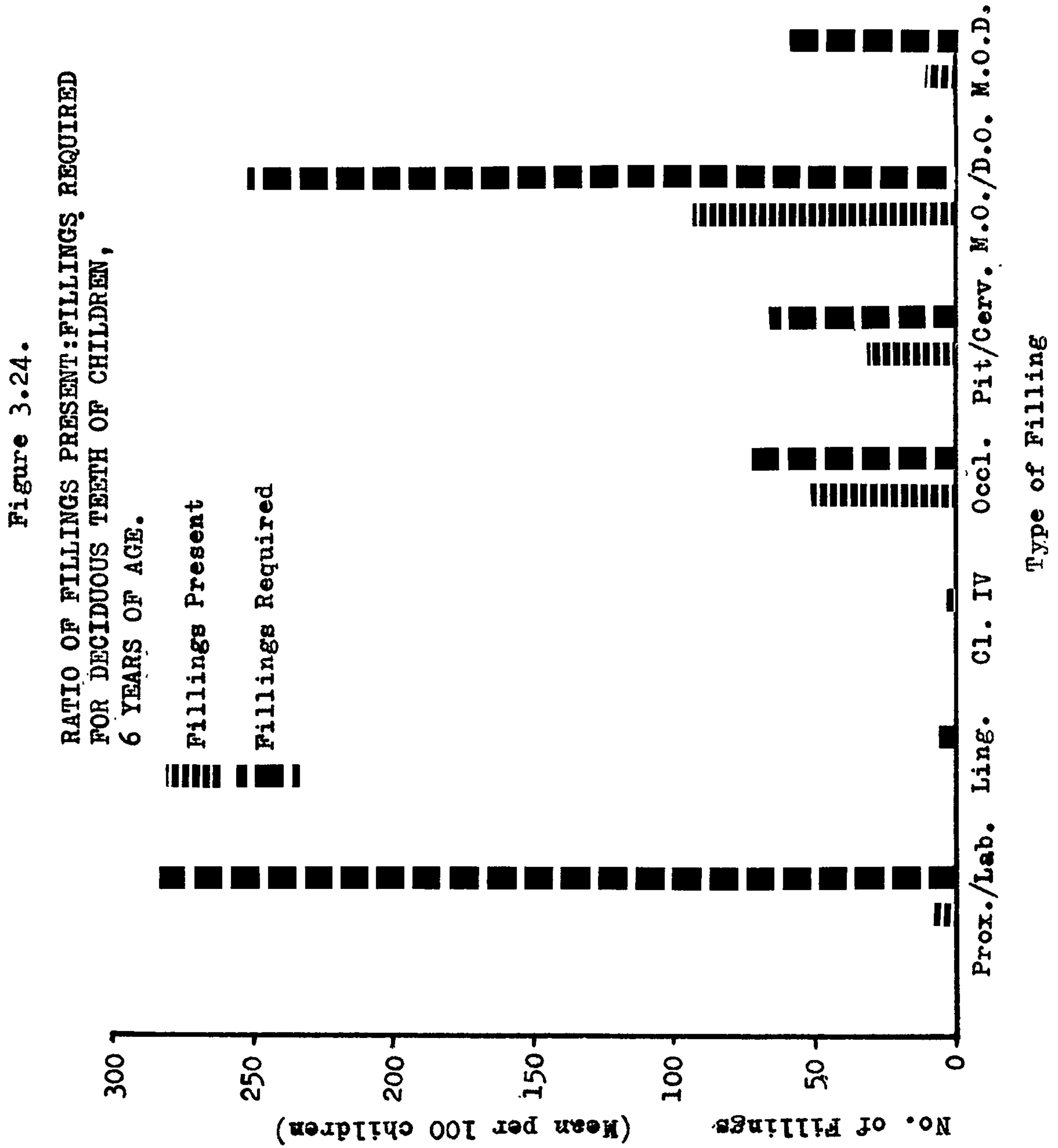
At five years of age, for deciduous teeth (Fig. 3.23), the type of filling present mostly is the occlusal (66 per 100 children) followed by MO/DO, pit/cervical, and MOD fillings. The type of filling required mostly is the MO/DO (229 per 100 children). 186 proximal/labial fillings are needed per 100 children, but none is present.

At six years of age, for deciduous teeth (Fig. 3.24.), MO/DO fillings are present in most numbers, the value being 93 per 100 children. Treatment needs are greatest for proximal/labial and MO/DO fillings, the requirements per 100 children being 282 and 249 fillings respectively. The needs for occlusal, pit/cervical, and MOD fillings are about the same.

Figure 3.23.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED
FOR DECIDUOUS TEETH OF CHILDREN,
5 YEARS OF AGE.





In permanent teeth (Fig. 3.25), only three types of fillings are involved. For every 100 children, six occlusal fillings are present and 33 are required, and four MO/DO fillings are present as well as required.

At seven years of age, for deciduous teeth (Fig. 3.26.), the greatest work-load is for MO/DO fillings although these fillings are present in the highest numbers. With shedding of the incisors the proximal/labial filling requirements are now 138 per 100 children.

For permanent teeth (Fig. 3.27), the numbers of fillings present and the numbers required per 100 children are: occlusal, 49 present and 135 required; pit/cervical, 24 present and 59 required; MO/DO, none present and 32 required.

At eight years of age, for deciduous teeth (Fig. 3.28), although there are 168 MO/DO fillings per 100 children present another 211 are required. More than two-thirds of the occlusal filling requirements are met. More MOD fillings (57 per 100 children) are required than occlusal fillings.

For permanent teeth (Fig. 3.29), the bulk of the operative work done has been on occlusal fillings. 123 per 100 children are present but yet another 168 fillings are required. The treatment needs for pit/cervical fillings are met about half way. The need for proximal/labial and MOD fillings is beginning to occur.

Figure 3.25.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
6 YEARS OF AGE.

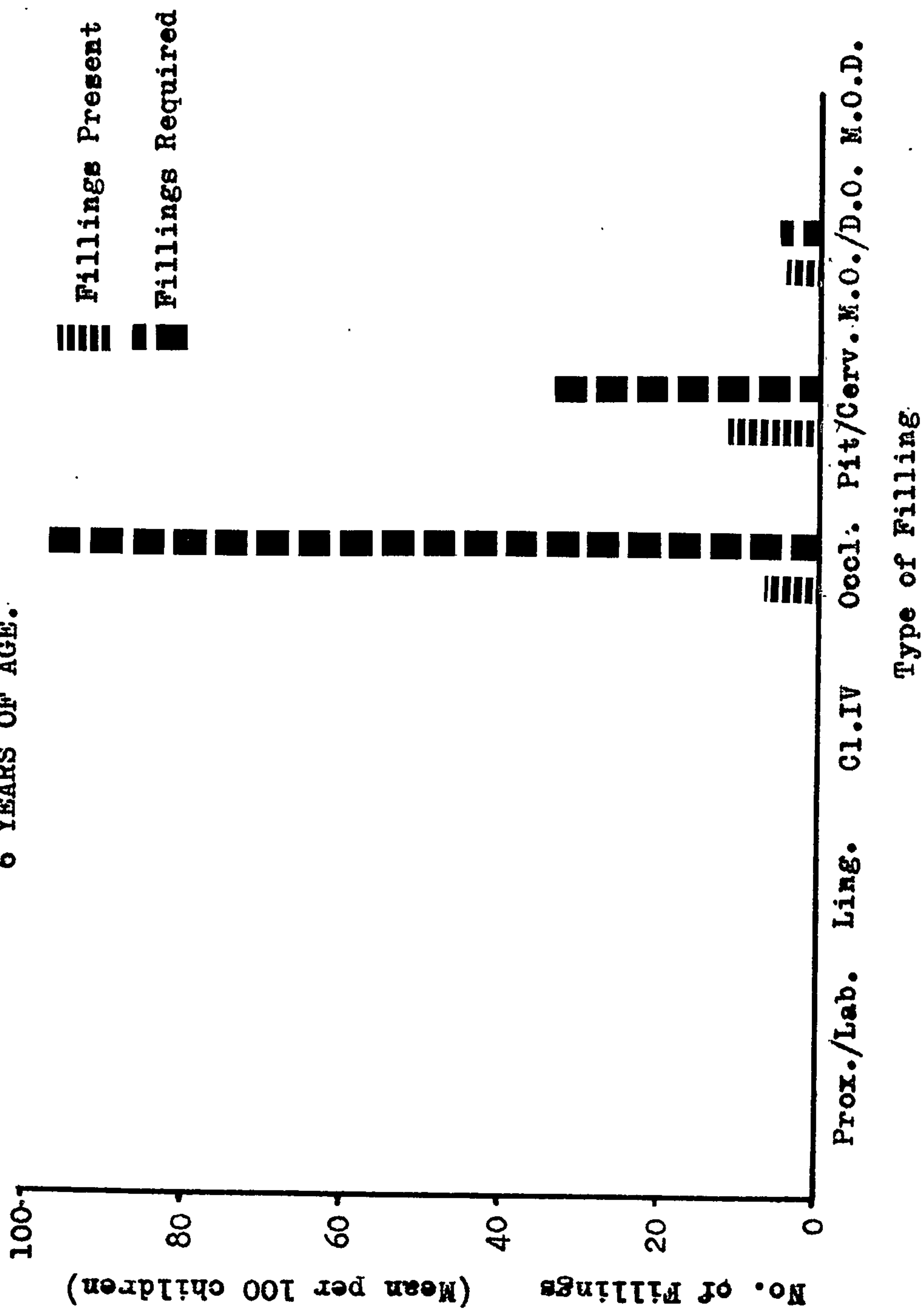


Figure 3. 26.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR DECIDUOUS TEETH OF CHILDREN,
7 YEARS OF AGE.

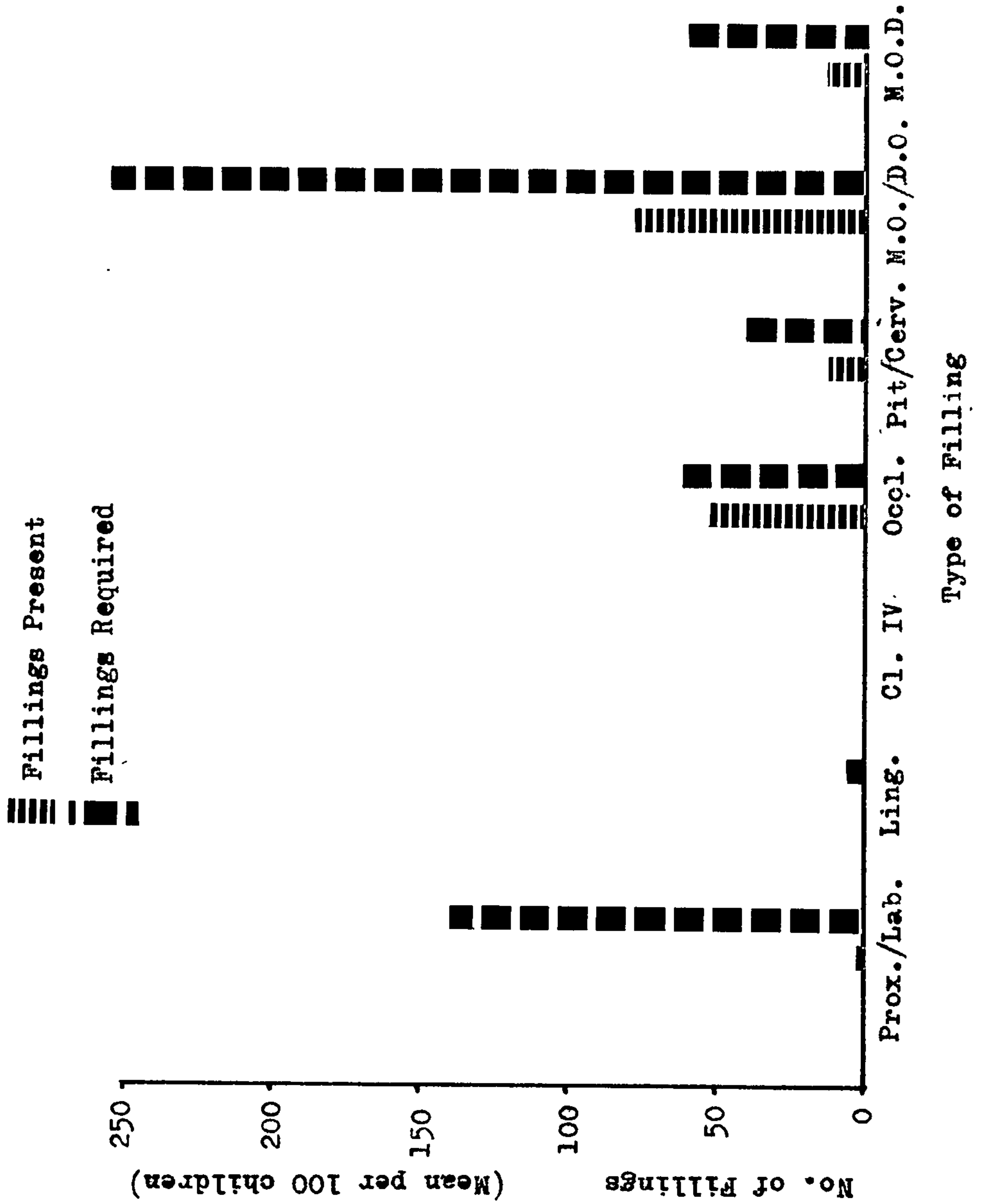
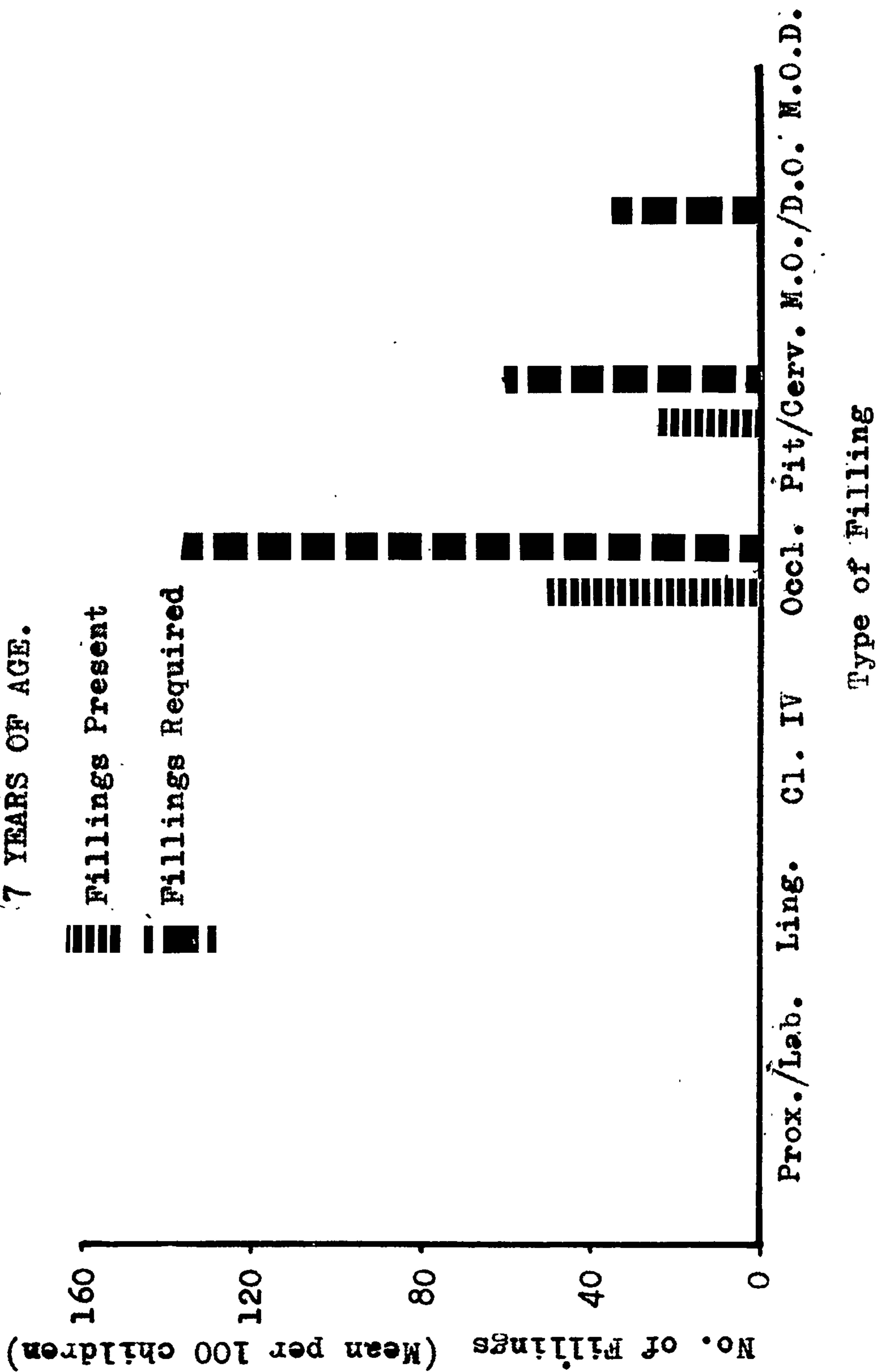


Figure 3.27.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
7 YEARS OF AGE.



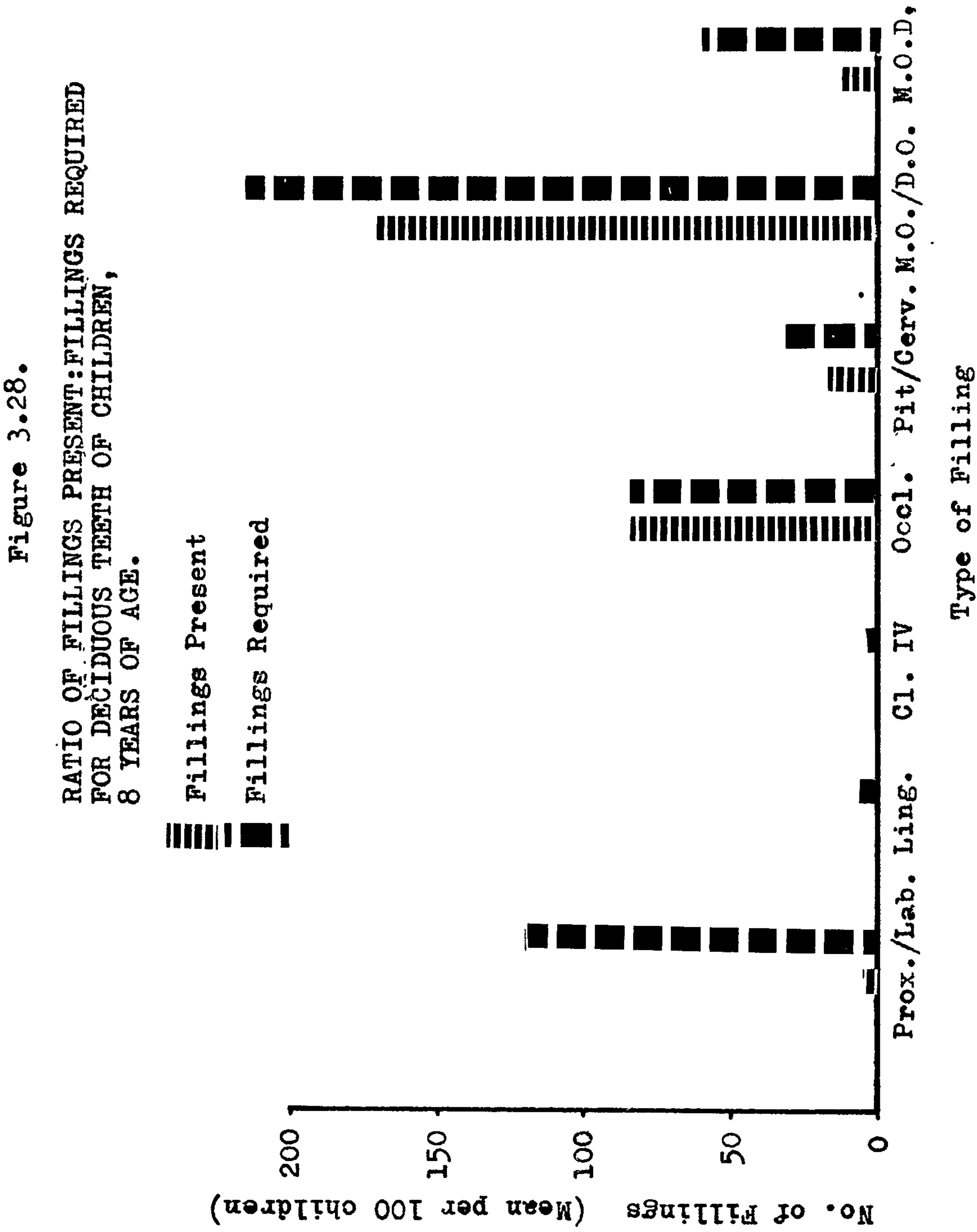
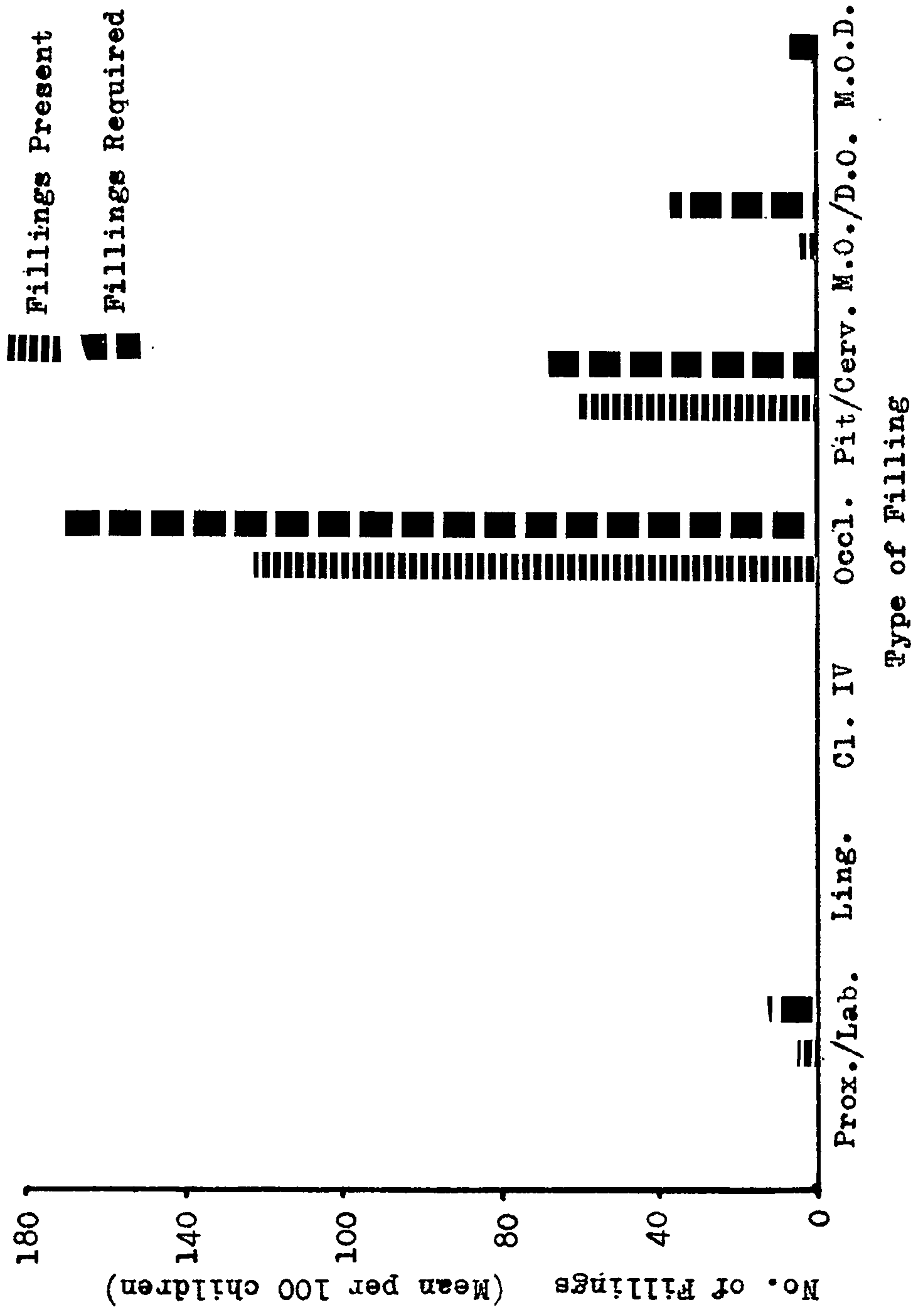


Figure 3.29.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
8 YEARS OF AGE.



At nine years of age, for deciduous teeth (Fig. 3.30), the work-load for MOD fillings increases to 77 per 100 children. About one-third of the MO/DO filling needs is met with 67 fillings present per 100 children and 127 required. 31 occlusal fillings are present per 100 children and 29 required.

For permanent teeth (Fig. 3.31), nine years is the earliest age in which the number of occlusal fillings present exceeds that which is required. The number of fillings present as well as the work-load for proximal/labial and MO/DO fillings have increased considerably. 21 proximal/labial fillings per 100 children are present while 65 are required; 33 MO/DO fillings per 100 children are present while 92 are required.

At 10 years of age, for deciduous teeth (Fig. 3.32), the greatest amount of operative work done as well as required is in the form of MO/DO fillings: 43 per 100 children are present and 133 fillings are needed. More than half of the occlusal filling requirements are met. Two proximal/labial fillings per 100 children are present and 60 are needed. 8 MOD fillings per 100 children are present while 37 are required.

For permanent teeth (Fig. 3.33), 185 occlusal fillings per 100 children are present as against 132 needed. The ratio of fillings present to fillings required in respect of pit/cervical and MO/DO types is about 1:2. For every 100 children 27 proximal/labial

Figure 3.30.

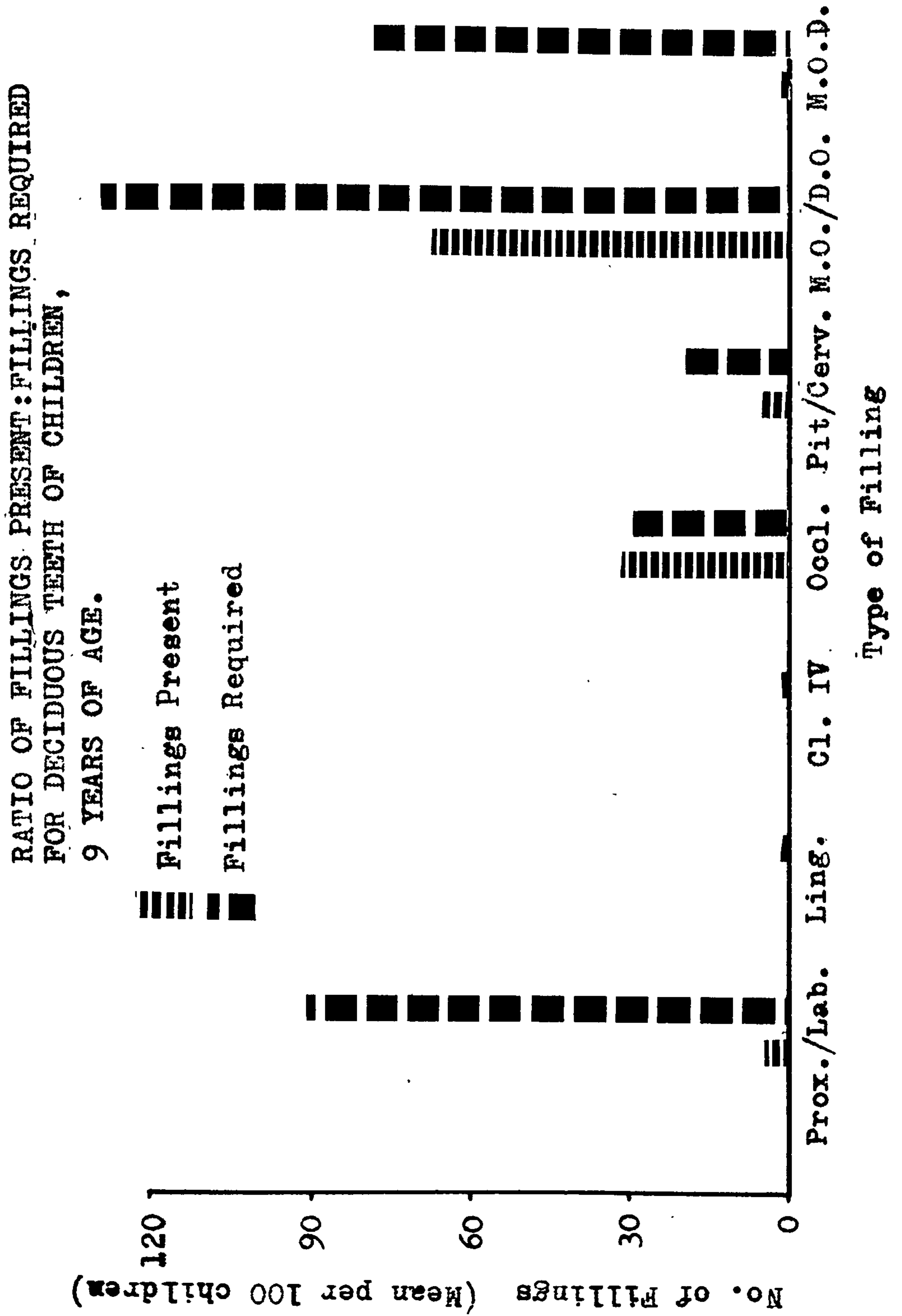


Figure 3.31.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
9 YEARS OF AGE.

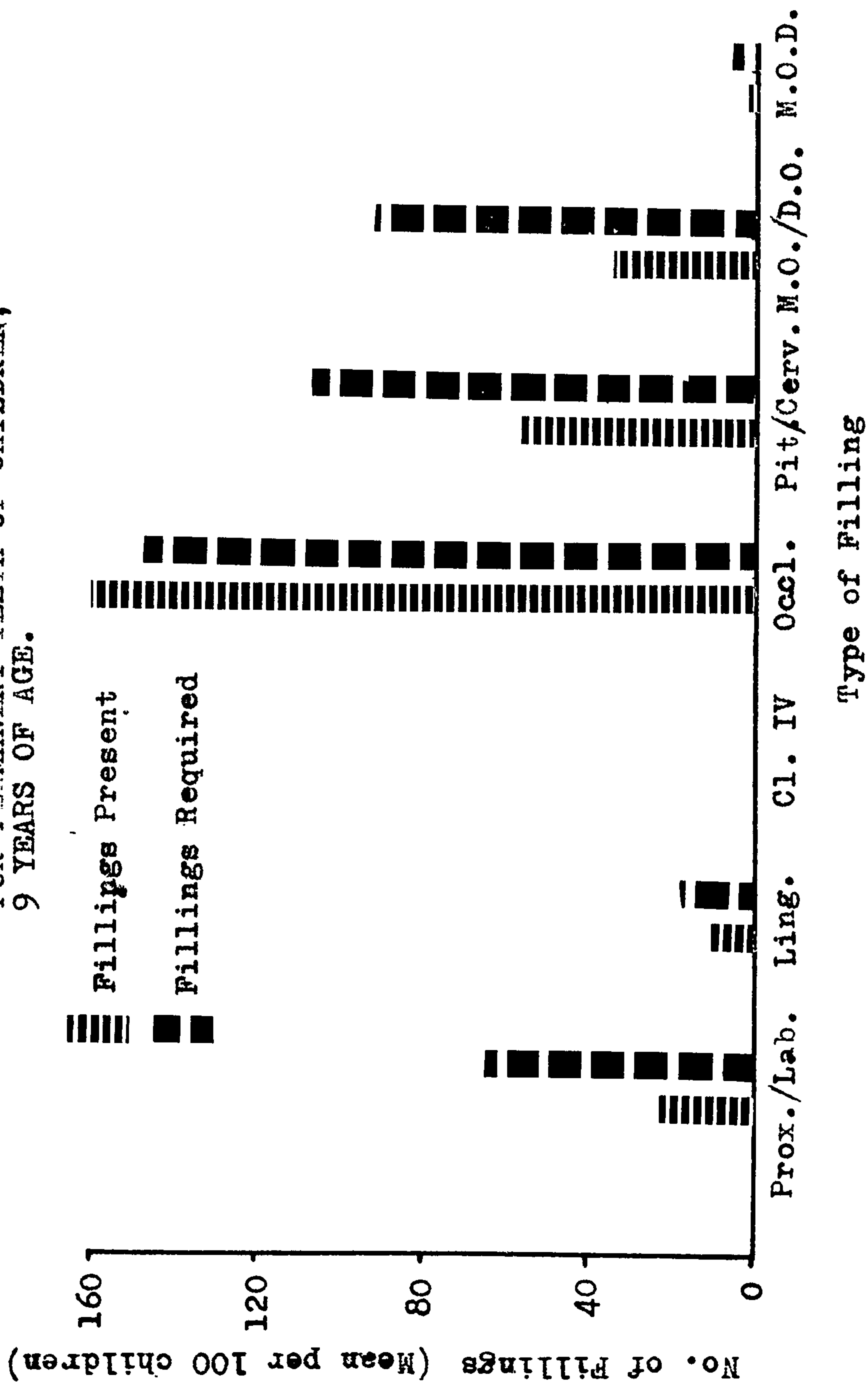


Figure 3.32.

RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED
FOR DECIDUOUS TEETH OF CHILDREN,
10 YEARS OF AGE.

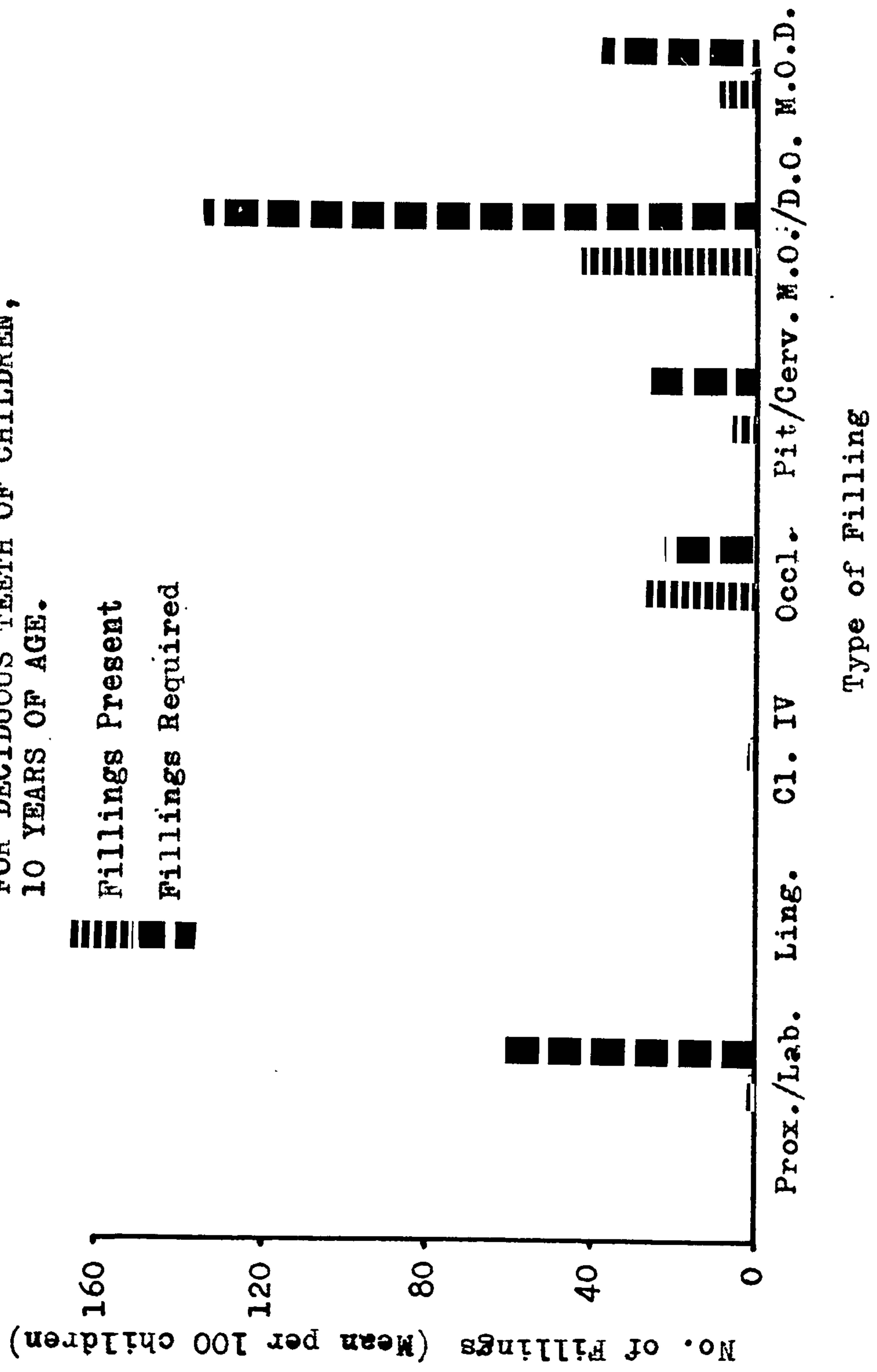
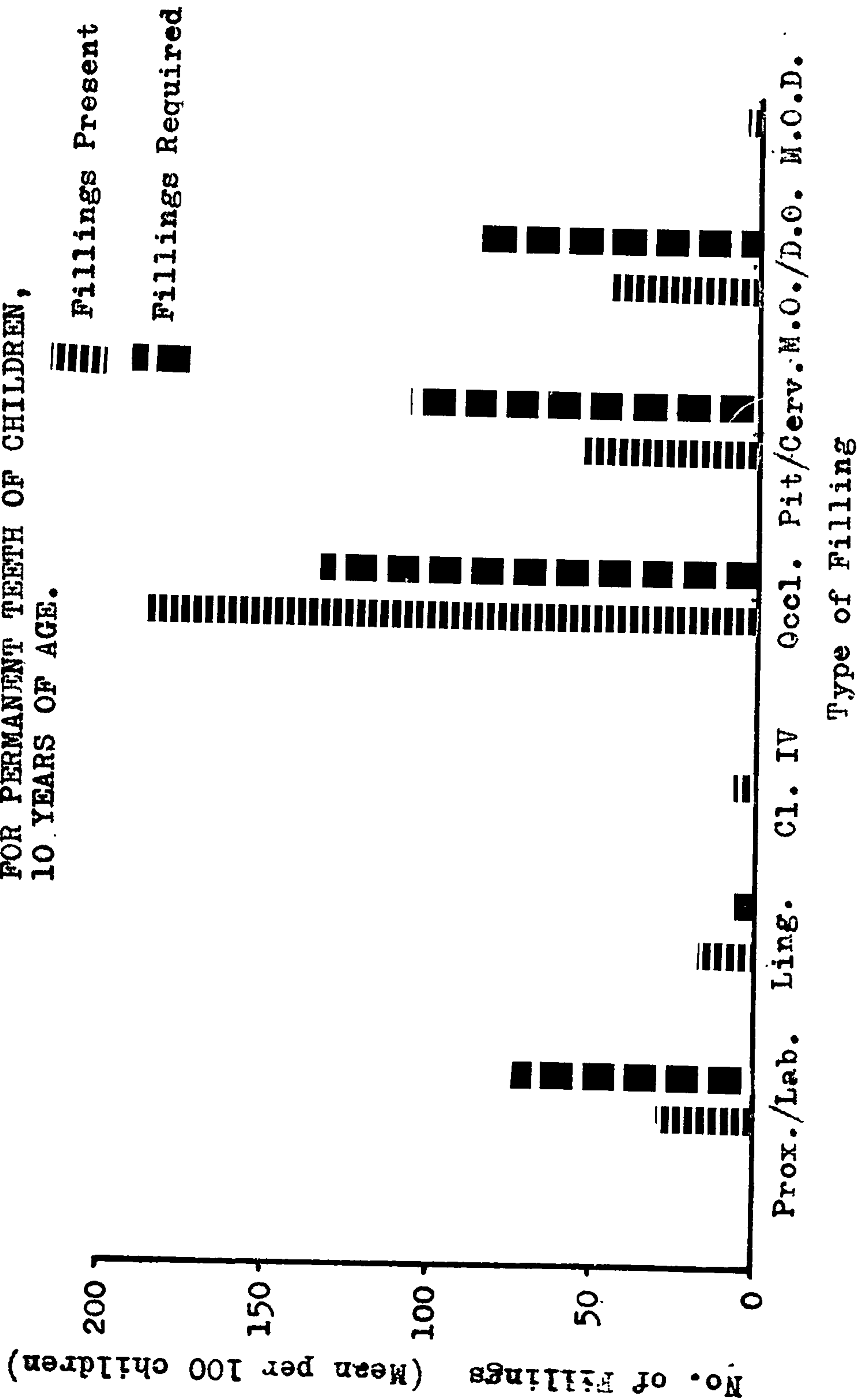


Figure 3.33.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
10 YEARS OF AGE.



fillings are present and 73 required. Treatment needs for MOD and Class IV fillings are fully met.

At 11 years of age, for deciduous teeth (Fig. 3.34), overall treatment needs have dropped considerably. This is because many deciduous teeth are missing from the dentition either from exfoliation or loss due to caries. Only occlusal fillings are present in greater numbers than are required. One-third of MO/DO and one-fifth of MOD fillings requirements have been met.

For permanent teeth (Fig. 3.35), while occlusal fillings show the best ratio of fillings present to that required, they also are needed in the highest numbers. The proximal/labial type is the next most needed filling with 40 present per 100 children and 140 required. The number of fillings present to the number required per 100 children in respect of the pit/cervical type is 64:108, and for the MO/DO type, 45:115.

At 12 years of age, for permanent teeth (Fig. 3.36), there are 230 occlusal fillings present per 100 children while another 333 are required. With 72 proximal/labial fillings present per 100 children about one-third of the need for this type of filling is met. Pit/cervical filling requirements are met more than half way. 81 MO/DO fillings are present per 100 children whereas 132 are required.

Figure 3.34.
RATIO OF FILLINGS PRESENT:FILLINGS REQUIRED
FOR DECIDUOUS TEETH OF CHILDREN,
11 YEARS OF AGE.

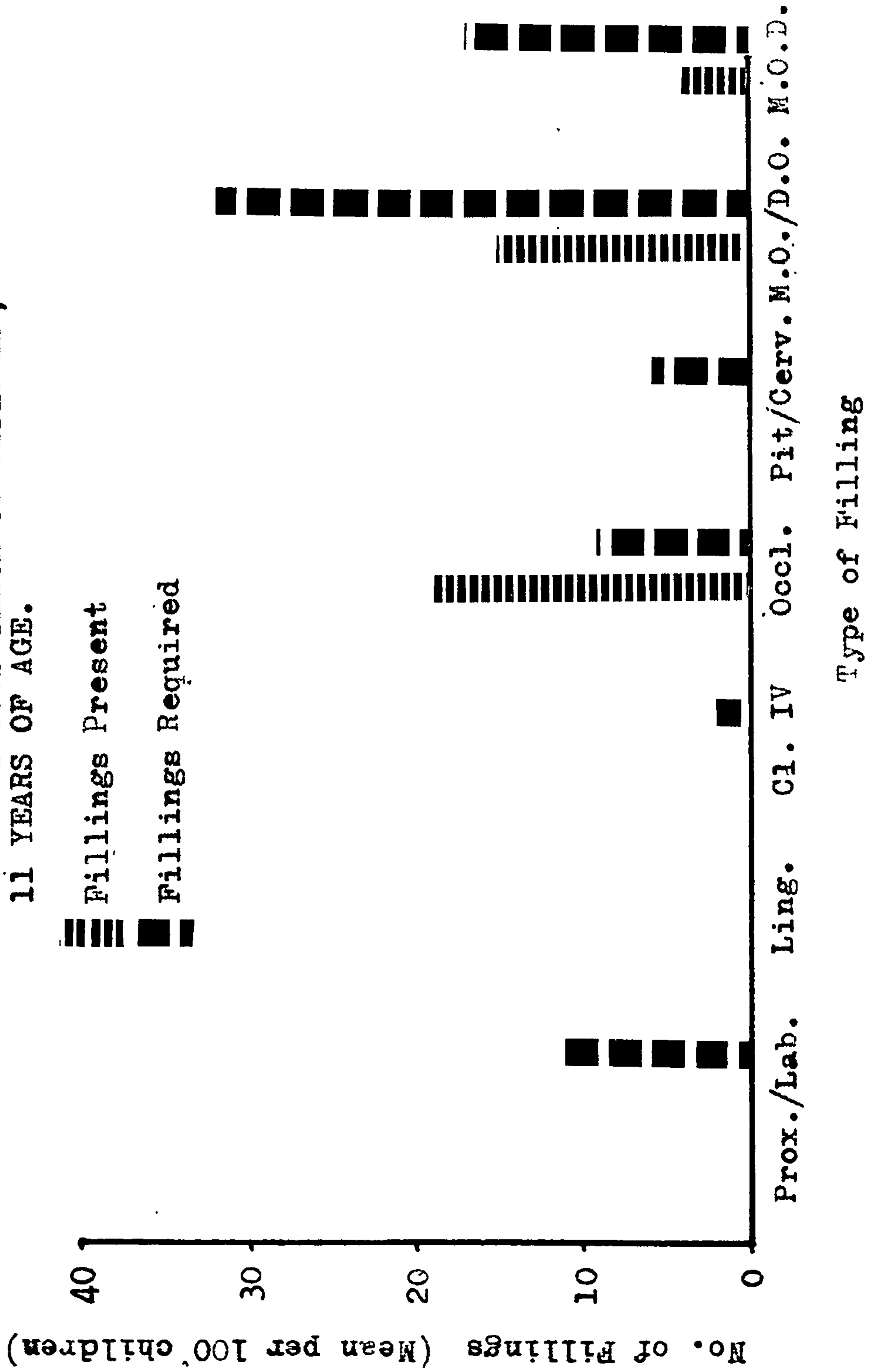


Figure 3.35.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
11 YEARS OF AGE.

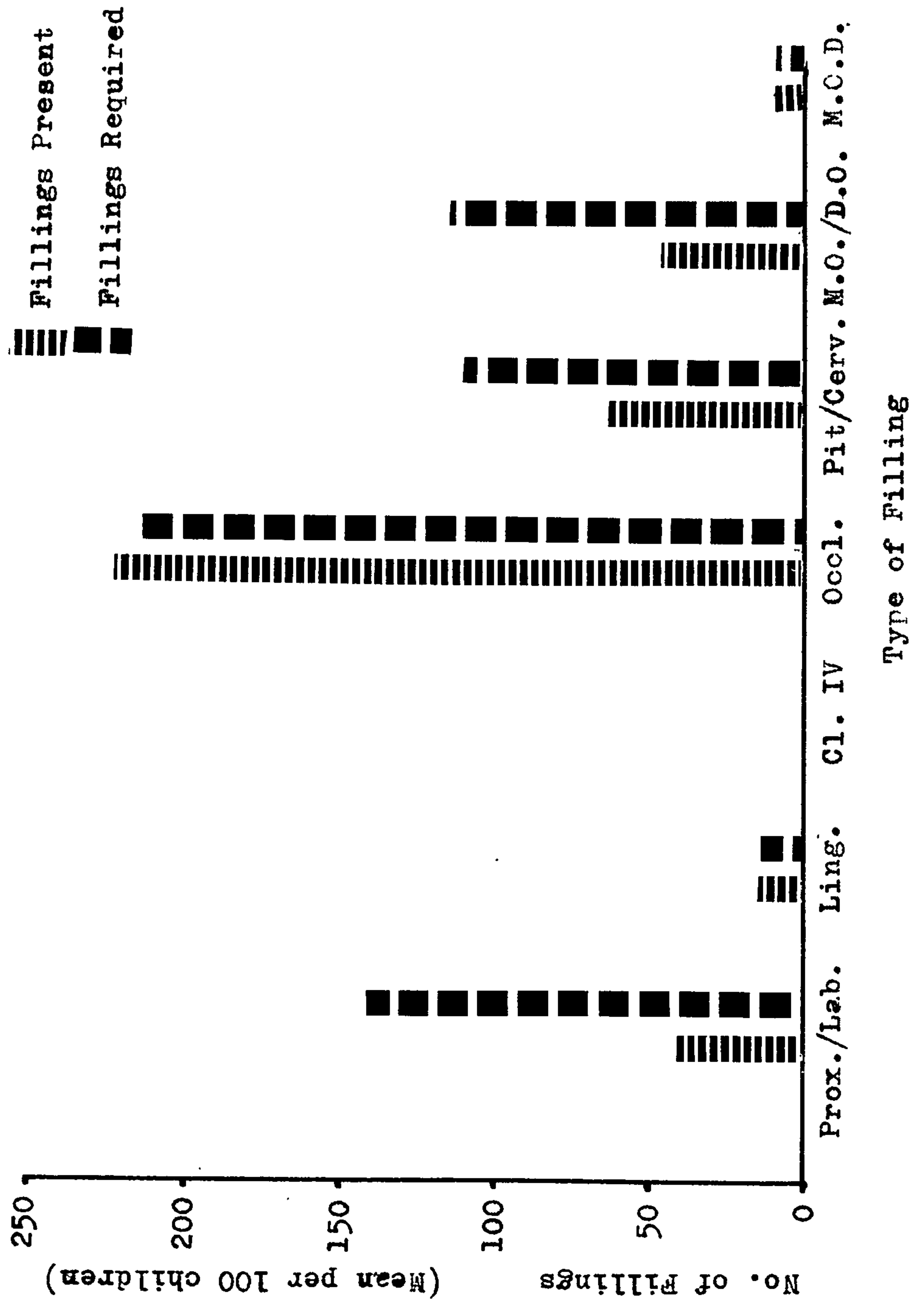
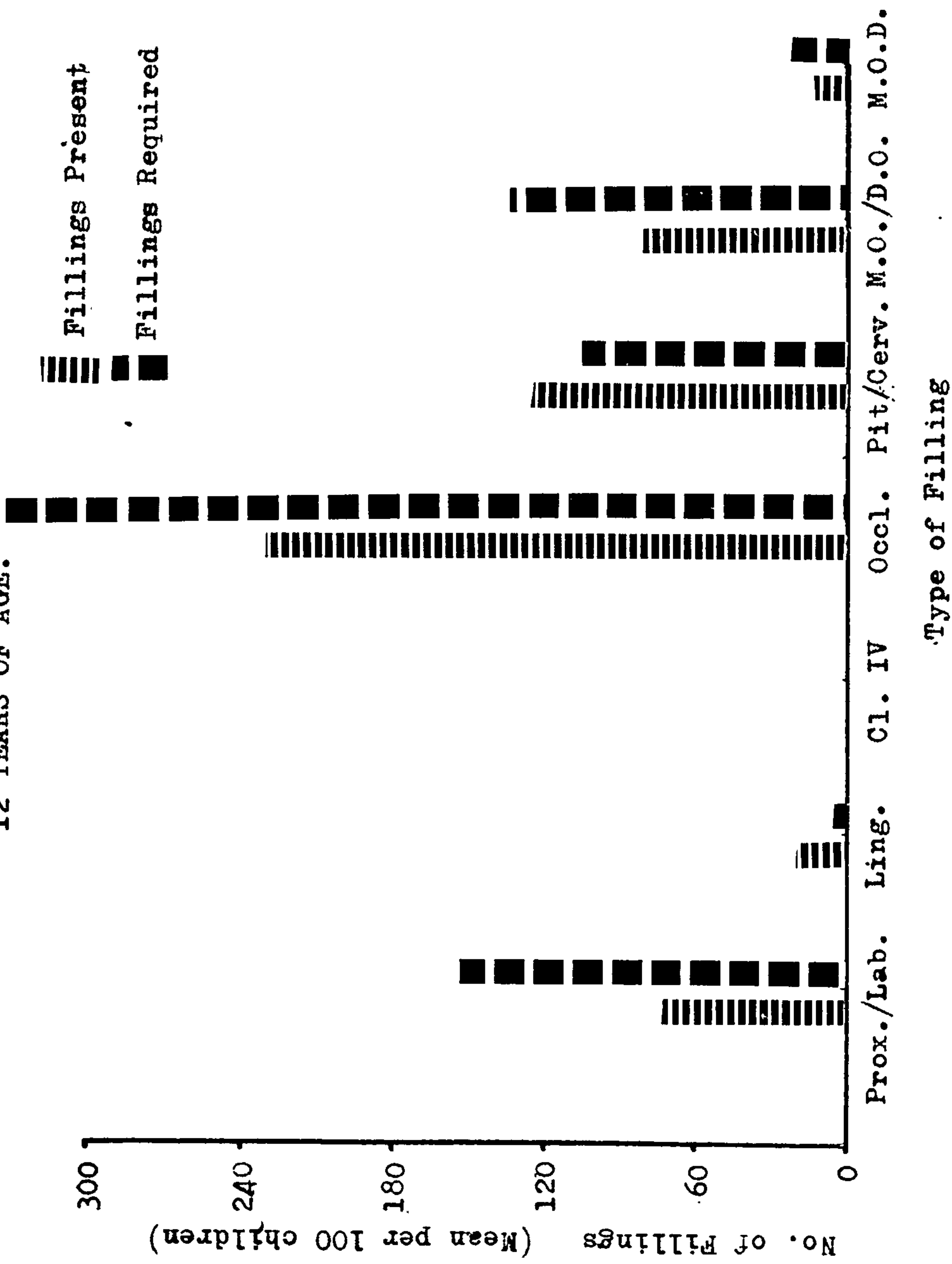


Figure 3.36.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
12 YEARS OF AGE.



At 13 years of age, for permanent teeth (Fig. 3.37), the greatest need for fillings is still for the occlusal type. Except for the MO/DO type, all filling requirements are met more than half way at least. The number of MO/DO fillings present per 100 children is 151 and the number required is 183.

At 14 years of age, for permanent teeth (Fig. 3.38), the number of proximal/labial and occlusal fillings present is about the same. However, 288 occlusal fillings per 100 children are required while the value for proximal/labial fillings is 214. For MO/DO fillings 139 per 100 children are present and 206 are required; for MOD fillings, 78 are present and 35 required.

At 15 years of age, for permanent teeth (Fig. 3.39), the striking feature is the increased work-load for MO/DO fillings. While 111 fillings per 100 children are present 242 are required. This is the only age at which the need for MO/DO fillings is greater than for any other type. All the other filling requirements are met more than half way. For MOD restorations, 106 per 100 children are present and 39 are required.

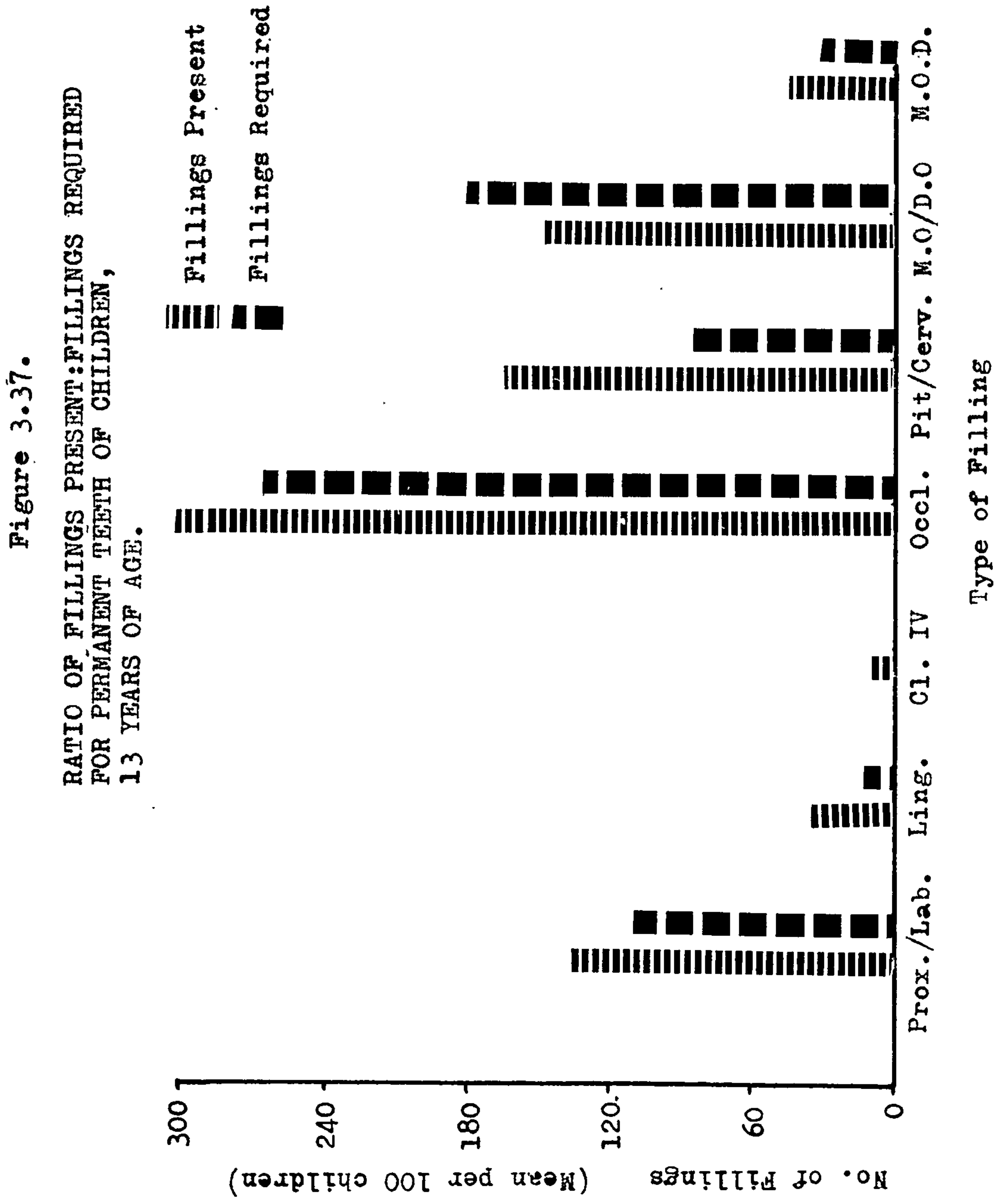


Figure 3.38.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
14 YEARS OF AGE.

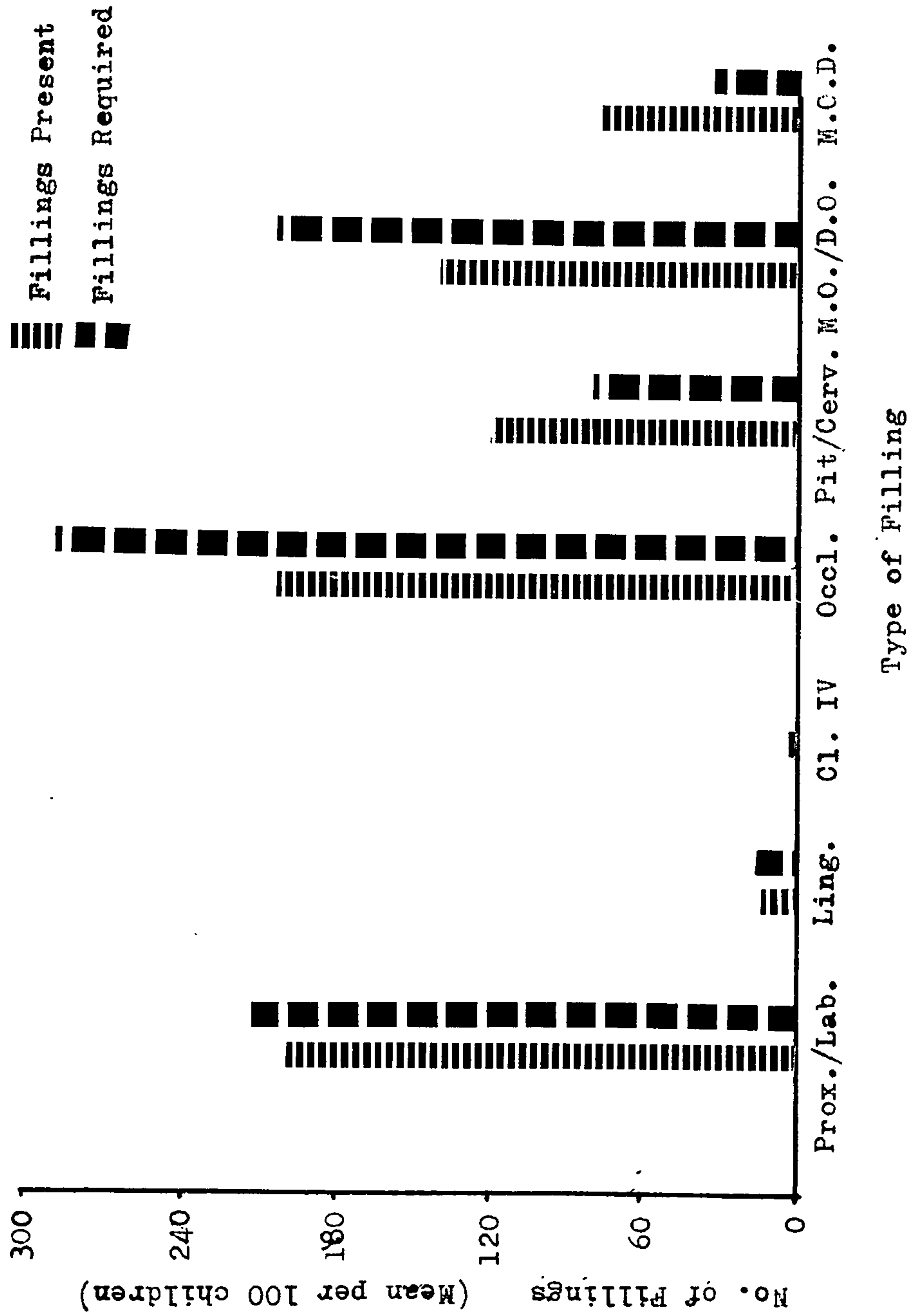
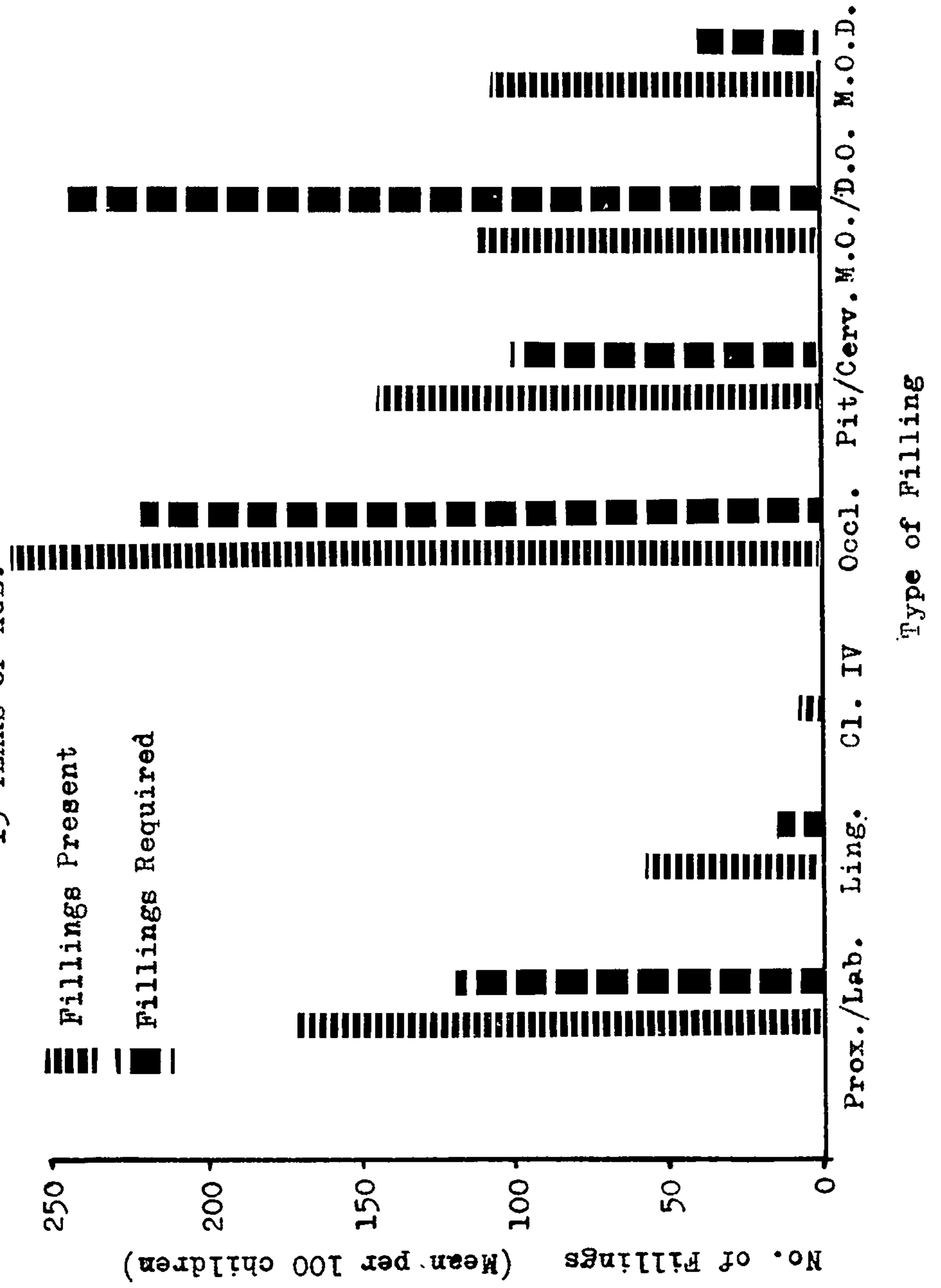


Figure 3.39.

RATIO OF FILLINGS PRESENT: FILLINGS REQUIRED
FOR PERMANENT TEETH OF CHILDREN,
15 YEARS OF AGE.



IV. EXTRACTION NEEDS
DECIDUOUS TEETH

Table 3.12. shows the number of deciduous teeth indicated for extraction in each age group. The highest number of extractions required is at six years of age when the value is 93 teeth per 100 children. Extraction needs for the ages of five, seven, eight, and nine years are about the same. The number of teeth indicated for extraction drops from 12 years of age when it is 16 teeth per 100 children; the number of teeth due for extraction (per 100 children) is 10 at 13 years of age, and two at 14 years.

Figures 3.40 compares, by age, the number of deciduous teeth due for extraction with the number that is missing because of caries. The number of missing teeth indicates the amount of previous treatment rendered in respect of extractions. At five years of age, more teeth are due for extraction than are missing. From then on (except for the 13-year-olds) this relationship is reversed. While the maximum work-load is for six-year-old children the highest number of teeth missing is at nine years of age when the value is 187 teeth per 100 children. The number of missing teeth increases from 46 per 100 children at five years of age to a peak at nine years and then falls away through 10, 11, 12, 13, and 14 years to reach a value of zero at 15 years of age.

TABLE 3.12.
NUMBER OF DECIDUOUS TEETH INDICATED
FOR EXTRACTION ACCORDING TO AGE
(Mean per 100 children)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
No. of teeth	63	93	70	66	66	38	47	16	10	2	-

Figure 3.40.

RATIO OF TEETH INDICATED FOR EXTRACTION:MISSING TEETH.
DECIDUOUS TEETH.

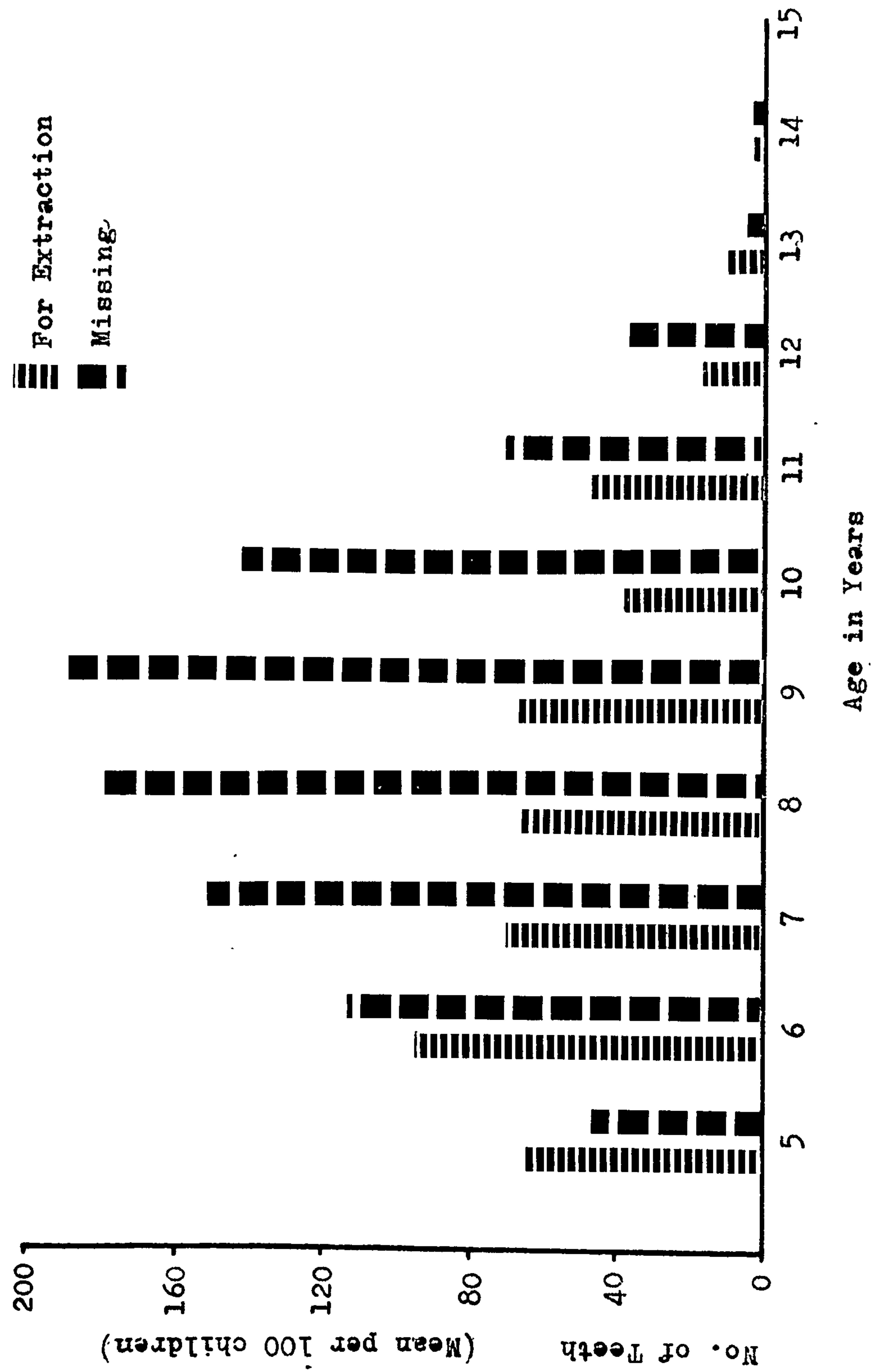
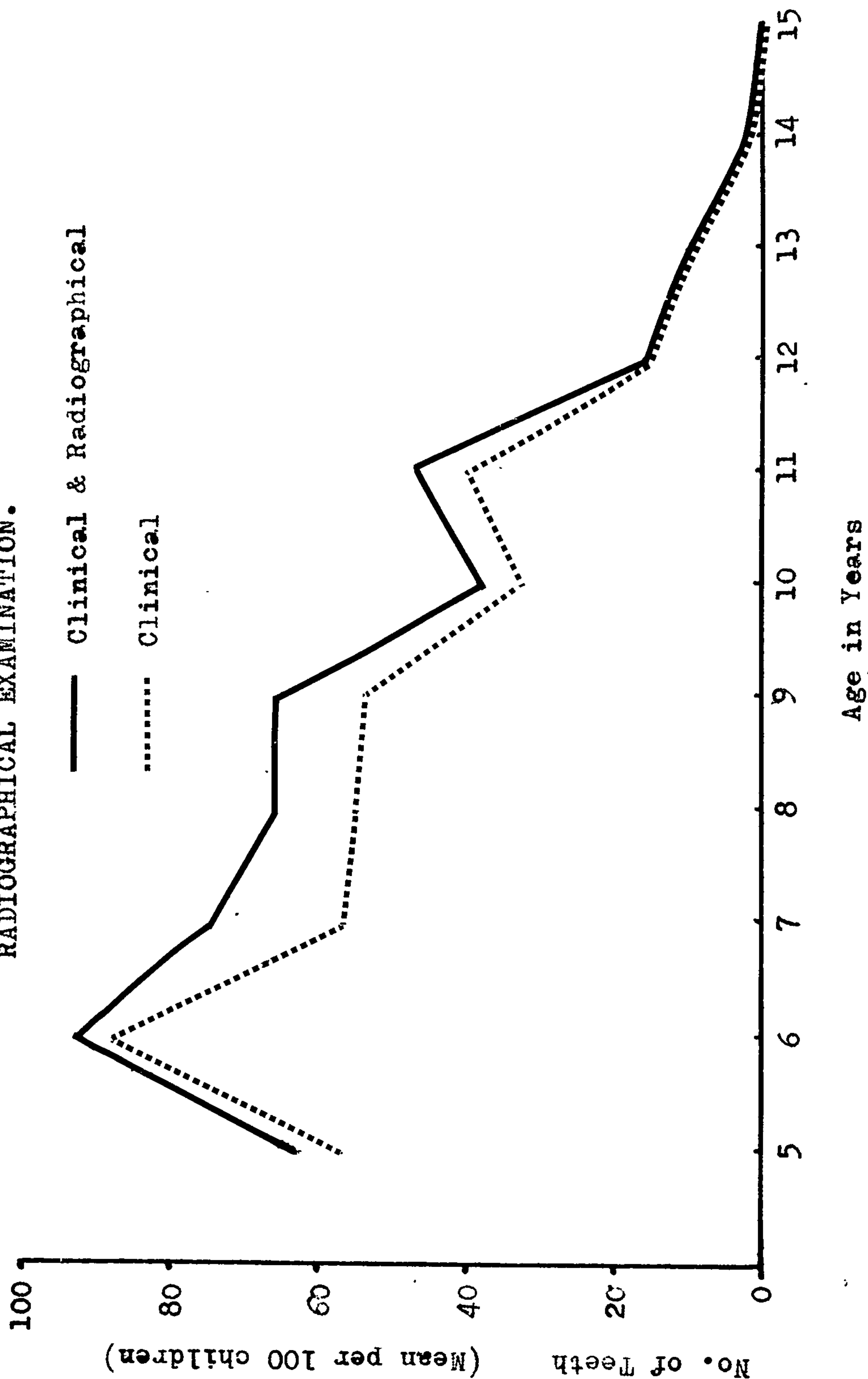


Figure 3.41 shows, according to age, the difference in extraction needs for deciduous teeth as determined by clinical examination only and by combined clinical and radiographical examination. The greatest difference is at the ages of seven, eight, and nine years. At seven years of age, 13 out of 70 teeth indicated for extraction (per 100 children) are detected by further X-ray examination. The corresponding values for eight years of age is 11 out of 66 teeth, and for nine years, 12 out of 66 teeth. From 12 years of age, supplementary X-ray examination did not add to the numbers found by clinical examination only.

Figure 3.41.

EXTRACTION NEEDS FOR DECIDUOUS TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.



PERMANENT TEETH

TABLE 3.13.

NUMBER OF PERMANENT TEETH INDICATED
FOR EXTRACTION ACCORDING TO AGE
(Mean per 100 children)

Age (Years)	5	6	7	8	9	10	11	12	13	14	15
No. of teeth	-	-	-	-	19	10	23	23	21	45	6

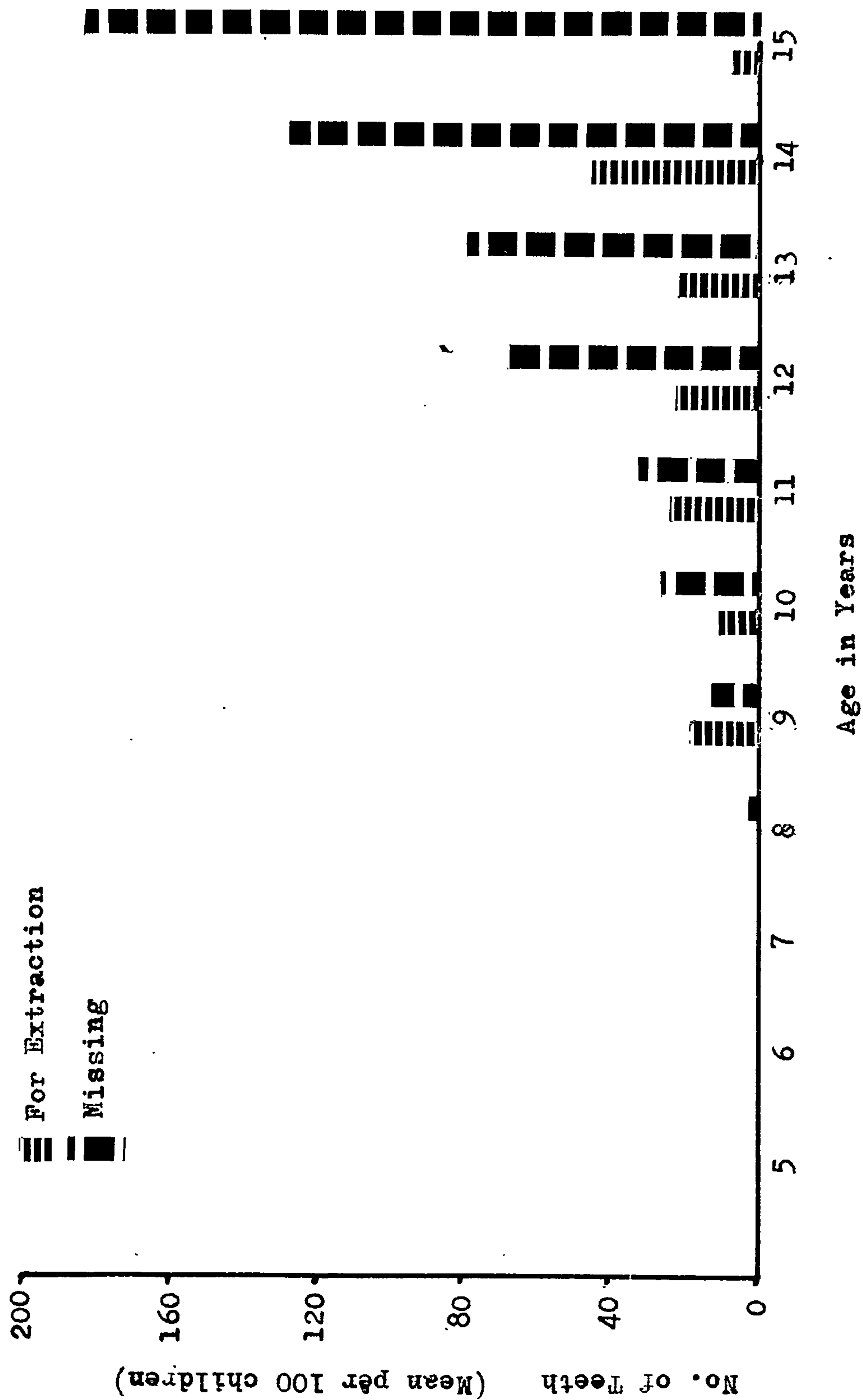
Table 3.13. shows the number of permanent teeth indicated for extraction for each age group. No extractions are required until the age of nine years when the number of teeth indicated for extraction per 100 children is 19. At 10 years of age the value is 10 teeth per 100 children. Extraction needs at the ages of 11, 12, and 13 years are about the same. The highest number of extractions required is at 14 years of age with the value of 45 teeth per 100 children. This drops sharply to a minimum at 15 years of age when only six teeth per 100 children need to be extracted.

Figure 3.42 and 3.43 were prepared with reference to Appendix VI.

Figure 3.42 compares, by age, the number of permanent teeth due for extraction with the number that is missing because of caries.

Figure 3.42.

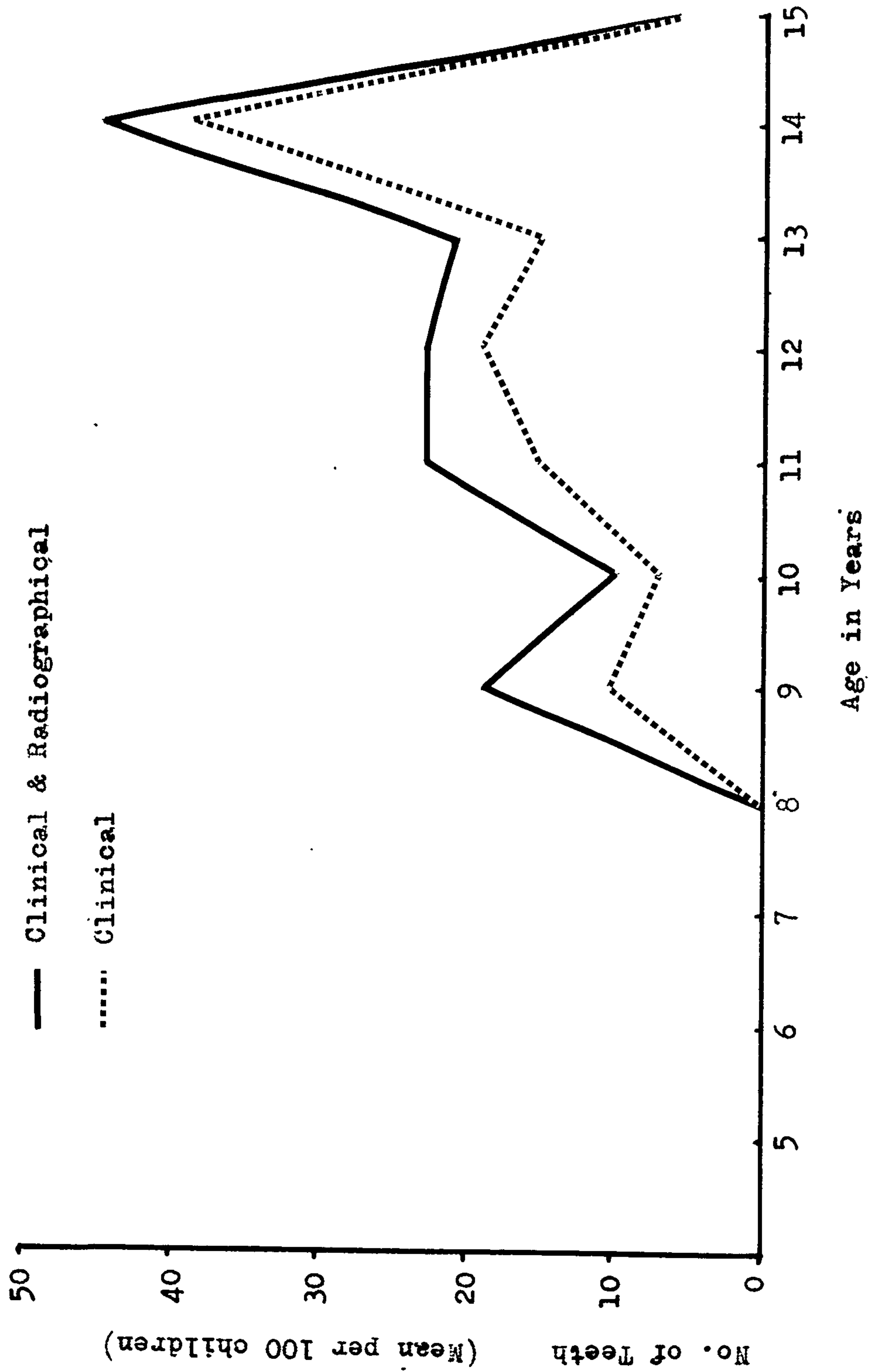
RATIO OF TEETH INDICATED FOR EXTRACTION:MISSING TEETH.
PERMANENT TEETH.



Even though the tooth mortality increases from two teeth per 100 children at eight years of age to 189 teeth at 15 years of age, extraction needs at all ages are kept down to a relatively low level. The amount of treatment done in respect of extractions tends to keep pace with the rising tooth mortality. At 15 years of age, out of a tooth mortality of 189 teeth per 100 children, only six teeth per 100 children require extraction.

Figure 3.43 shows, according to age, the difference in extraction needs for permanent teeth as determined by clinical examination only and by combined clinical and radiographical examination. The greatest difference is at 11 years of age when 35 per cent. of the extraction needs is found by further X-ray examination. Supplementary radiographical examination determines 21 per cent. of the extraction needs at nine years of age, 30 per cent. at 10 years, 17 per cent. at 12 years, 29 per cent. at 13 years, and 13 per cent. at 14 years. At 15 years of age, supplementary X-ray examination did not add to the numbers found by clinical examination only.

Figure 3.43.
EXTRACTION NEEDS FOR PERMANENT TEETH AS DETERMINED
BY CLINICAL EXAMINATION ONLY, AND BY CLINICAL AND
RADIOGRAPHICAL EXAMINATION.



4. S U M M A R Y

1. An attempt has been made to determine the dental treatment needs of a group of New South Wales school children in terms of various types of fillings and extractions.

For deciduous teeth, it was children about five, six, and seven years of age that generally required the most treatment. The greatest need was for proximal/labial fillings in anterior teeth, and for MO/DO fillings in posterior teeth.

For the permanent dentition, fillings in anterior teeth were required from eight years of age and onwards, while posterior teeth needed fillings from the age of five years - the lowest age group studied. The greatest need for fillings, according to the order of magnitude, was for occlusal, MO/DO, and proximal/labial restorations. No Class IV type of filling was found to be required in permanent teeth since treatment needs for this type of restoration had been fully met.

2. Radiographical examination, supplementing the standardised clinical examination, revealed varying degrees of added needs for different types of fillings. For deciduous teeth, additional X-ray examination disclosed more than half of the total MO/DO and MOD filling requirements, and 16 per cent. of the proximal/labial filling requirements.

For permanent teeth, 85 per cent. of the total MOD filling requirements, 80 per cent. of the total MO/DO filling requirements, and 31 per cent. of the total proximal/labial filling requirements was revealed by supplementary radiographical examination.

3. The numbers of sound fillings present in the children were compared with numbers that were found to be required. Treatment needs were better met in permanent teeth than in deciduous teeth.

For deciduous teeth, the pattern of treatment has been to concentrate on posterior teeth. The occlusal fillings showed the highest ratio of fillings present to fillings required, and yet for this type of restoration only about half the treatment needs had been met. Proximal/labial filling requirements of anterior teeth have been almost completely neglected.

For permanent teeth, filling requirements were generally met about half way only. For every filling present another needed placement. Treatment needs for MO/DO fillings were the least attended to.

4. The extraction needs for this group of children were ascertained and compared with the extent of previous treatment it had received in this respect.

For deciduous teeth, the six-year-olds required the most number of extractions: 93 teeth per 100 children. For the whole

group, 67 per cent. of tooth mortality had already been cleared by extraction. X-ray examination as an aid in determining extraction needs was more effective at the ages of seven, eight, and nine years than at other ages.

No extractions of permanent teeth were required until the age of nine years. The highest number of extractions required was at 14 years of age, the value being 45 teeth per 100 children. Extraction needs at all ages are kept down to a relatively low level. For the whole group, 78 per cent. of tooth mortality had already been cleared by treatment. Supplementary X-ray examination added comparatively more to the extraction needs between the ages of nine and 13 years than at other ages.

5. Several studies of dental caries experience in Australian children have been reviewed and their results with special emphasis on filling and extraction needs presented and discussed.

5. C O N C L U S I O N

The expression of filling requirements in terms of numbers of the various types of restorations allows a realistic estimation of costs that would be entailed in a programme designed to treat these needs. It is particularly valuable in public dental care schemes involving private dental practitioners since costs can be estimated by relating treatment requirements to existing fee schedules. The number of man-hours of treatment-time required can also be calculated with reasonable accuracy.

The amount of treatment rendered falls far short of that which is required for the children. More extensive, ~~incremental~~ treatment programmes as well as preventive measures are obviously needed so that more care would be given to children posing a diminished workload. While markedly lowering the incidence of dental caries, fluoridation and fluoridisation must also reduce substantially the needs ~~for~~ dental treatment.

The dental caries experienced by the sample of Tamworth school children in each age group was similar to that of the average New South Wales school child, but slightly lower than that of the Sydney Metropolitan High School children. The amount of dental care received by the group was slightly more than that received by the average New South Wales school child, but less than the amount of dental care received by the Metropolitan High School children.⁽⁴⁾

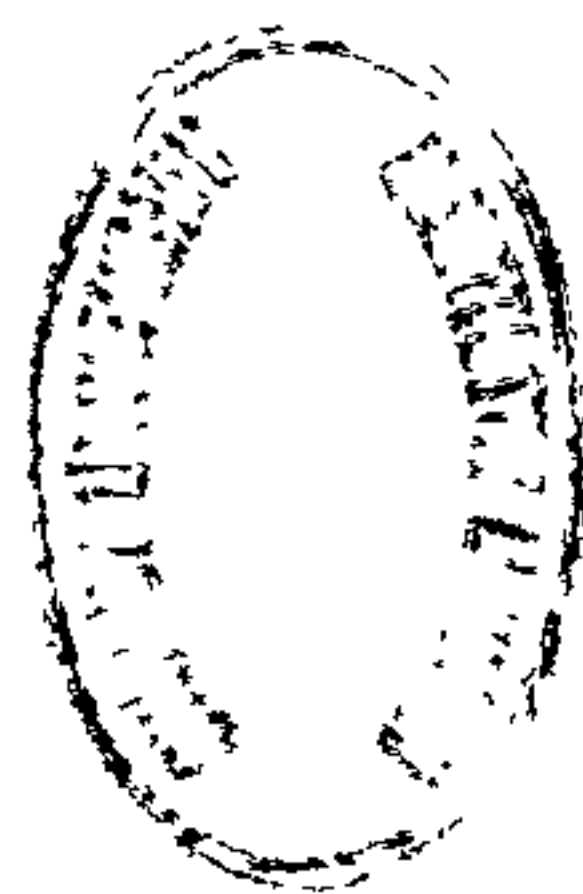
I submit that this study could be used as a frame of reference to estimate filling requirements by age, number and type of restoration, for school children of New South Wales.

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APPENDIX I

UNIVERSITY OF SYDNEY
DEPARTMENT OF PREVENTIVE DENTISTRY

210550

EXAMINATION CHART - (DMF AND FLUOROSIS AND PERIODONTAL INDEX)

Town or Area: TAMWORTH

Case No.

Date 30 MAY 1983

Surname EVERSON

Christian
Names GuySex: M ☒ F ☐

Address

Date of Birth 23/6/55

Age 7

Parents

Class

School 11

Last visit to Dentist

Months

Continuous Resident

Part Resident

Non-Resident

Town ☒
SupplyPart ☐Tank ☐Supp ☐Town ☐Part ☐Tank ☐Supp ☐

F. Exposure

Cont. ☐Part ☐Nil ☐

Water Source:

Cooking:

Town ☒Tank ☐Mixed ☐

Other

Drinking:

Town ☒Tank ☐Mixed ☐

Other

	C.Incisor	L.Incisor	CUSPID	D.MOLAR 1 BICUSPID 1	D.MOLAR 2 BICUSPID 2	MOLAR 1	MOLAR 2	MOLAR 3
U. LEFT	S	O	D 6w			S ₄ X 1		
U. RIGHT	S	O	D			S 1		
L. LEFT	S 1	S 1	D ₄ 1			S 1		
L. RIGHT	S 1	S 1	D ₃ D ₄ 3	D ₄ X D ₄ X	D ₉ X ₀ 3	S 1		

Fluorosis: Norm. ☐ Quest. ☐ V.Mild ☐ Mild ☐ Med. ☐ Severe ☐Opacity: White ☐ Brown ☐ Hypoplasia ☐ Gross Hypoplasia ☐ Hyp. & Mottling ☐Angle: C1.1 ☒ C1.11 Div. 1 ☐ C1.11 Div. 2 ☐ C11.111 ☐ Examiner: 2Orthodontic: Normal ☐ Mild ☐ Mod. ☒ Severe ☐ X-rays: Yes ☐ 536

Massler 11

Photograph Yes ☐ 536

Periodontal Index: 8/10

Other Exam.

SUMMARY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

REMARKS:

957



APPENDIX II

DEPARTMENT OF PREVENTIVE DENTISTRY.

INSTRUCTIONS FOR CODING DENTAL EXAMINATION.

(Code for left hand column of space provided for each of thirty-two teeth positions).

- D Deciduous tooth present.
 - S Permanent tooth present.
 - 0 No tooth present (D exfoliated and S not erupted, (zero).
 - ① No tooth present (D has been extracted and S not erupted).
 - ② Congenitally missing S tooth.
 - 1 No tooth present because permanent tooth has been extracted for caries.
 - ① No tooth present because permanent tooth has been extracted for reasons other than caries; explain under remarks.
 - 2 No tooth present because D has not erupted.
- Whenever D or S are coded in the left hand column, one or more of the following must accompany it:
- 3 Tooth present is free of caries.
 - 4 Tooth has active caries.
 - 5 Tooth has been filled.
 - 6W Tooth shows evidence of opacity - white.
 - 6B Tooth shows evidence of opacity - brown.
 - ⑥ Tooth shows evidence of hypoplasia.
 - △ Tooth shows evidence of gross hypoplasia.
 - 7 Tooth has pit or fissure or smooth surface with questionable caries but there is no objective evidence of caries.
 - 8 Tooth has arrested caries.
 - 9 Tooth has caries involving pulp.

SURFACES OF TEETH.

(Code for right hand portion of the space provided for each of thirty-two tooth positions)
Place one or more of the following when D₄, D₈, D₉, S₄, S₈, S₉, are in the left hand column)

S₄ or D₄ (Caries only):

- X Tooth has caries on occlusal surface.
 - 0 Tooth has caries on lingual surface.
 - 1 Tooth has caries on buccal or labial surface.
 - 2 Tooth has caries on mesial surface.
 - 3 Tooth has caries on distal surface.
 - V Root or roots remaining (whole crown of tooth missing)
(do not call S₄ or D₄ V - only S₉V or D₉V).
- The above surface code is also used to indicate D₇ or S₇ surfaces but the the surface designation is encircled.
The surface code is also used to indicate 6W, 6B, ⑥, or △ surfaces but the surface designation is enclosed in a triangle.

S₅ or D₅ (Restorations only):

- Place one or more of the following when D₅ or S₅ appear in left column.
- 4 Tooth has a crown restoration.
 - 5 Tooth has a filling on occlusal surface.
 - 6 Tooth has a filling on lingual surface.
 - 7 Tooth has a filling on buccal or labial surface (originates on smooth surface).
 - 8 Tooth has a filling on mesial surface.
 - 9 Tooth has a filling on distal surface.

APPENDIX II (cont.)

CRITERIA AND CODING FOR DENTAL EXAMINATIONS

NO ABNORMALITY WILL BE RECORDED POSITIVELY UNLESS IT IS DEMONSTRABLE, OBJECTIVELY, BEYOND THE POSSIBILITY OF A DOUBT.

In dental caries, a deep pit or fissure will not be recorded as carious unless there is more evidence than a catch of the explorer. Such other evidence might be the detection of a softened cavity floor on light explorer pressure, visual evidence of backward decay of the enamel, or visual evidence of deterioration of the pit or fissure wall. "Catches" will be tested by rocking the explorer after it enters the pit or fissure. Deep pits or fissures per se are not to be considered carious or questionably carious. There must be an actual break of surface continuity demonstrable with the explorer; for example, visual evidence of undermining under a marginal ridge is not acceptable evidence of a proximal lesion unless a surface break can be entered with the explorer.

Do not hesitate; record your first impression. If the lesion is doubtful, record it as questionable caries. In this examination the D7 or S7 calls will be used to indicate any questionable carious lesion, smooth surface as well as pit or fissure. Do not fail to call all questionable lesions you see.

A proximal cavity is a ONE-SURFACE LESION if the occlusal is intact (even though its restoration will eventually require an occlusal extension).

A PERMANENT TOOTH IS IN ERUPTION IF ANY PORTION PROJECTS THROUGH THE GUM.

This is an attempt at an objective definition of an erupted tooth.

Under this definition, both a permanent and a deciduous tooth may occupy the same tooth space. When this is seen, direct your recorder to "split" the tooth cell on the examination card (with a horizontal line) and record the status of both teeth.

SMOOTH SURFACE AND PIT-FISSURE LESIONS ON THE SAME SURFACE.

Call pit-fissure lesions ON THE LINGUAL, LABIAL OR BUCCAL SURFACES in the usual way - i.e., 0 or 1, 6 or 7.

Add a STAR FOR A SMOOTH SURFACE lesion - i.e., 0* or 1*, 6* or 7*. No footnote necessary.

Where BOTH TYPES OCCUR on the same surface, RECORD BOTH - e.g., a lower second molar with a buccal pit filling and a gingival third filling should be entered:

S5 7
7*

WHEN IN DOUBT presume that the lesion started as a pit-fissure lesion.

TEETH "INDICATED FOR EXTRACTION" BECAUSE OF DENTAL CARIES.

Always use the D9 or the S9 call for a tooth with a pulp exposure due to dental caries. Add the number of surfaces on which caries has penetrated the enamel. If only roots remain (defined as a state where no enamel projects above the gingival line), record as S9-V. This will facilitate tracing the deterioration of a neglected tooth through several successive examinations.

Whenever you call D4 or S4 it will be assumed that you considered the tooth restorable, regardless of the number of surfaces affected.

In the case of a RETAINED DECIDUOUS ROOT, "split" the cell, recording the status of the permanent tooth in one section and that of the root (as D9-V) in the other. No footnote is required.

NUMBER AND TYPE OF FILLINGS REQUIRED, BY AGE, FOR DECIDUOUS AND PERMANENT TEETH
AS DETERMINED BY CLINICAL EXAMINATION, AND BY FURTHER RADIOGRAPHICAL EXAMINATION

Age (Years)	No.	Anterior teeth										Posterior teeth									
		Type of filling										Type of filling									
		Prox./lab.		ling.				Cl. IV				Occl.		pit/cerv.		MO/DO		MOD			
		Decid.		Perm.		Decid.		Perm.		Decid.		Perm.		Decid.		Perm.		Decid.		Perm.	
		Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray
5	35	53	12	-	-	-	-	-	-	-	-	24	-	6	-	13	-	36	44	-	-
6	57	131	30	-	-	2	-	-	-	1	-	39	2	55	-	37	-	76	66	-	2
7	37	46	5	-	-	2	-	-	-	-	-	23	-	49	1	14	-	48	45	2	10
8	53	51	12	3	3	3	-	-	-	1	-	17	1	88	1	16	-	42	70	6	13
9	48	38	5	9	22	1	-	8	-	1	-	14	-	70	-	9	-	34	27	13	31
10	60	29	7	26	18	-	-	2	-	-	-	12	1	78	1	14	1	40	40	10	40
11	53	6	-	52	22	-	-	7	-	1	-	5	-	112	2	3	-	10	7	16	45
12	57	5	1	70	17	1	-	3	-	-	-	4	-	186	3	-	-	6	6	15	60
13	82	1	-	66	23	-	-	10	-	-	-	2	-	218	1	3	-	2	2	19	131
14	49	-	-	79	26	-	-	8	-	-	-	1	-	141	-	-	-	3	-	22	79
15	36	1	-	30	13	-	-	5	-	-	-	-	-	80	-	1	-	-	1	14	73

APPENDIX IV

DATA SHEET

NUMBER AND TYPE OF FILLINGS PRESENT, BY AGE, FOR DECIDUOUS AND PERMANENT TEETH
AS DETERMINED BY CLINICAL EXAMINATION, AND BY FURTHER RADIOGRAPHICAL EXAMINATION

Age (years)	No.	Anterior teeth										Posterior teeth																			
		Type of filling										Type of filling																			
		Prox./lab.		ling.		Cl. IV		Crown.		Occl.		pit/cerv.		M.O./D.O.		M.O.D.		Crown													
		Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.												
		Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray	Clin.	x-ray										
5	35	-	-	-	-	-	-	-	-	-	-	-	-	22	1	-	-	6	-	-	-	12	2	-	-	-	-	-	-	-	-
6	57	2	-	-	-	-	-	-	-	-	-	-	-	29	-	2	-	18	-	6	-	52	1	2	-	5	-	-	-	-	-
7	37	-	1	-	-	-	-	-	-	-	-	-	-	19	-	18	-	4	-	9	-	28	-	-	-	4	-	-	-	1	-
8	53	1	1	2	-	-	-	-	-	-	-	-	-	43	-	65	-	8	-	31	1	88	1	2	-	5	-	-	-	-	-
9	48	2	-	10	-	-	-	5	-	-	-	-	-	15	-	77	-	2	-	27	-	32	-	16	-	-	1	-	1	-	-
10	60	1	-	14	2	-	-	9	-	1	-	2	-	15	1	111	-	3	-	32	-	26	-	25	1	5	-	11	-	-	-
11	53	-	-	18	3	-	-	7	-	-	-	-	-	10	-	115	2	-	-	34	-	8	-	23	1	2	-	4	-	-	-
12	57	-	-	38	3	-	-	11	-	-	-	1	-	3	-	130	2	-	-	70	-	5	-	45	1	1	-	7	-	-	-
13	82	-	-	107	4	-	-	29	-	-	-	8	-	1	-	246	1	-	-	139	-	-	-	124	-	-	-	38	-	-	-
14	49	-	-	94	3	-	-	7	-	-	-	1	-	-	-	100	-	-	-	59	-	1	-	65	3	-	-	36	2	-	-
15	36	-	-	59	2	-	-	20	-	-	-	2	-	-	-	94	-	-	-	52	-	1	-	39	1	1	-	36	2	-	-

APPENDIX V

DATA SHEET

NUMBER OF CHILDREN NEEDING EXTRACTION AND NO. OF TEETH INDICATED FOR EXTRACTION
AS DETERMINED BY CLINICAL EXAMINATION AND BY FURTHER RADIOGRAPHICAL EXAMINATION

Age (in years)	5		6		7		8		9		10		11		12		13		14		15	
Type of Dentition	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.
By Clinical examination	-	20	-	50	-	21	-	29	7	26	4	20	8	21	11	9	12	8	19	1	2	-
By further X-ray examination	-	2	-	3	-	5	-	6	2	6	2	3	4	4	2	-	5	-	3	-	-	-
Total No. of teeth indicated for extraction	-	22	-	53	-	26	-	35	9	32	6	23	12	25	13	9	17	8	22	1	2	-
No. of children needing extraction	10		24		14		14		22		19		21		11		15		10		2	
No. of children examined	35		57		37		53		48		60		53		57		82		49		36	

APPENDIX VI

DATA SHEET

NUMBER OF DECIDUOUS AND PERMANENT TEETH INDICATED FOR EXTRACTION
 AS DETERMINED BY CLINICAL EXAMINATION, AND ADDITIONAL EXTRACTIONS
 INDICATED BY RADIOGRAPHICAL EXAMINATION; NUMBER OF PREVIOUS EXTRACTIONS
 (Mean per 100 children)

Age (Years)	5		6		7		8		9		10		11		12		13		14		15	
Type of Dentition	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.	Decid.	Perm.
By clinical examination	57	-	88	-	57	-	55	-	54	19	33	7	40	15	16	19	10	15	2	39	-	6
By further X-ray examination	6	-	5	-	13	-	11	-	12	4	5	3	7	8	-	4	-	6	-	6	-	-
Clinical + X-ray	63	-	93	-	70	-	66	-	66	19	38	10	47	23	16	23	10	21	2	45	-	6
Previous Extractions (mt or MT)	46	-	113	-	151	-	180	2	187	11	142	26	70	32	39	69	5	79	4	127	-	183