

THE ORAL HEALTH CARE PROGRAMME OF CARTAXO

Assessment of its Impact

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S U M M A R Y

The Cartaxo Municipality has been developing a Primary Oral Health Care program since 1988. It is based on national programs of oral health promotion and prevention of dental caries (Oral Health Technical Guidelines on Mother & Child Health and Oral Program in Schools) of the Primary Health Care Administration, and includes the application of pit and fissure sealants on the occlusal surface of the first permanent molars of school children aged 6-7 years. The purpose of this study is to divulge the evaluation of the impact of this program on the dental health of the population studied.

INTRODUCTION

At the end of the 1991/92 school year, the Oral Health Care Programme of Cartaxo, based on the activities foreseen in the national programmes for the promotion of oral health and the prevention of tooth decay (Oral Health Guidelines on Maternal and Child Health and Programme for Oral Health in Schools) and also in the application of fissure sealants* to the first permanent molars of children attending primary school, completed its fourth year of existence¹. Resulting from an agreement between the Oral Health Division, the Health Centre and the School Delegation of Cartaxo, the above mentioned programme was implemented and developed with enthusiasm by all those involved, particularly by health and education professionals in charge of field work. It includes all the children of the region and people enrolled at the Health Centre under the age of 10 years. The intermediate assessments which were made, in what concerns the fulfilment of the programme's activities and the durability of the fissure sealants applied², always revealed encouraging results.

* Fissure sealant is a resin which is applied to dental fissures and pits, with the objective of preventing tooth decay. Its effectiveness lies in the capacity to firmly adhere to tooth enamel and isolate the enamel in fissures and pits from the rest of the oral environment.

The different obstacles which arose were, altogether, satisfactorily overcome, thanks to the dedication of the officials, the participants and of the institutions involved. Of these, it is fair to point out the endeavour of the competent services of the Santarem Regional Health Administration and the Cartaxo Municipal Council. With this paper we intend to divulge the alterations which were observed in the levels of oral health of the population attending school in the region, 4 years after the above mentioned programme began.

Purpose – This paper is to assess whether, and to what extent, the levels of tooth decay among the population attending primary school in the region of Cartaxo have changed over the last 4 years, period in which the Health Centre attempted to influence with a series of activities promoting oral health and the prevention of tooth decay.

Population – The study was aimed at the population in the region of Cartaxo which attended kindergarten and primary school between the beginning of the 1988/89 and the end of the 1991/92 school years. In October 1988, for the purpose of acting as a reference, all the children of the region born in 1982 (6 years of age: GROUP A in this study) and a representative sample of the children born in 1978 (10 years of age: GROUP B) were screened. In June 1992, the target population for screening was all the children born in 1986 (group of 6 year olds) who had attended kindergarten and had completed two years of the programme (GROUP A-2)

and all the children born in 1982 (group of 10 year olds) who had attended primary school (GROUP B-4), had completed 4 years of the programme and were present at school on the days in which the data were gathered.

Scope of the study – This study is of the region. Children attending the 3 kindergartens and the 16 state primary schools, of the 13 localities, were observed.

Type of study – This is a study of community intervention with the objective of assessing the impact of an oral health programme, by means of a transverse study of the populations, taken on two occasions, before and after the development of the Oral Health Care Programme of Cartaxo. A comparative study of the condition of its dental health will be made.

OBJECTIVES

- a) To assess the impact on the levels of tooth decay in the temporary teeth of the children of Cartaxo aged 6, resulting from the implementation of the Oral Health Care Programme in Kindergartens over a period of 2 years.
- b) To assess the impact on the levels of tooth decay in the permanent teeth of the children of Cartaxo aged 10, resulting from the implementation of the Oral Health Care Programme in primary schools over a period of 4 years.

Hypotheses to be tested – a) The DMF index* in the 6 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. b) The percentage of children affected by tooth decay in their temporary teeth in the 6 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. c) The DMF(s) index** in the 6 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. d) the DMF index*** in the 10 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. e) The percentage of children affected by tooth decay in their permanent teeth in the 10 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. f) The DMF(s) index**** in

the 10 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme. g) The average decayed, missed and filled first permanent molars in the 10 year old groups studied (before and after the implementation of the programme) is significantly lower at the end of the programme.

METHODS

The equipment required for dental observation included a buccal mirror, curved exploratory probe, disinfection equipment (receptacle, disinfectant and compresses) and protection equipment of the observer (gloves and mask). A card was used to register the surface state of dental health with the help of previously established codes.

The observation of the child's teeth was made in naturally well lit places. The observer was, on both occasions, a dental health professional (oral hygienist) and the registrar a public health professional (doctor). Standard procedures and techniques were used. The diagnostic criteria of the W.H.O. were used³. The tracing was made on 10, 12, 18, 19 and 21 October 1988 and on 8, 9 and 11 June 1992, at the public teaching establishments of the Cartaxo region.

The dental health status of the children included in this study was assessed by means of indexes and percentages which are calculated from the figures of their dependent variables. Of these, mention is made of the teeth and the dental surfaces of the temporary dentition of the group of children aged 6 years and the permanent dentition of the group aged 10 years, with the attributions of healthy, decayed, missed due to decay and filled. The fact that the child has (or has not) been included in the Oral Health Programme in School Health constitutes the main independent variable of this paper.

After the observation and individual recording of the data, a data base was created by computer using DBASE3PL. Lists with the individual data made it possible to use validation procedures for the records made. The children were then characterised through descriptive statistics. Thus, the number of teeth and dental surfaces which were decayed, missed due to decay and filled, by age group, were determined as well as the percentage of children affected by illness (at the age of 6 years in temporary dentition and at 10 in permanent) and the number of first permanent molars decayed, missed due to decay and / or filled in the group aged 10 years.

With the use of analytical statistics, the results obtained in the different groups of observation units were compared and the seven previously formulated hypotheses were tested. Consequently, frequency charts were made with the data from the different groups studied, to determine means, variances and standard deviations. The fact that, in some cases, standard deviations were higher than the means made us think that we were confronted with different distribution curves from those of Gaussian distribution, which was confirmed by making histograms. Therefore, and since

* The DMF index represents the average decayed, missed and filled temporary teeth per child and therefore corresponds to the set of temporary teeth already affected by tooth decay, independently of their circumstances on the date of observation.

** The DMF(s) index represents the average surface decayed, missed and filled temporary teeth per child and therefore corresponds to the set of temporary surfaces already affected by tooth decay, independently of their circumstances on the date of observation.

*** The DMF index represents the average decayed, missed and filled permanent teeth per child and therefore corresponds to the set of permanent teeth already affected by illness, independently of their circumstances on the date of observation.

**** The DMF(s) index represents the average surface decayed, missed and filled permanent teeth per child and therefore corresponds to the set of permanent surfaces already affected by tooth decay, independently of their circumstances on the date of observation.

we wished to compare groups of independent observation units, we used the non parametric Mann-Whitney U Test, for a level of significance lower than 5%, to verify hypotheses 1, 3, 4, 6 and 7⁴. The verification of hypotheses 2 and 5 was done by the Z Test, for a level of significance lower than 5%^{5,6}. The information obtained from these tests allowed us to adopt or reject the hypotheses formulated.

RESULTS

The following results concern the standard decay observed in temporary dentition (Group A) and in permanent dentition (Group B), before and after the Oral Health Care Programme of Cartaxo, in the groups of children below:

Group A – 275 children aged 6 years, observed in 1988, never included in the promotion of decay prevention activities.

Group A-2 – 31 children aged 6 years, observed in 1992, who had been on the programme for 2 years and were attending a public kindergarten.

Group B – 47 children aged 10 (representative sample), observed in 1988, never included in the promotion of decay prevention activities.

Group B-4 – 196 children aged 10 years, observed in 1992, who had been on the programme for 4 years and were attending primary school in the region.

Temporary dentition - The children in Group A-2 presented 35.8% less temporary teeth affected by decay than those in Group A (Figure 1). After 2 years of the programme the inexistence of missed or filled temporary teeth in this age group is also observed (Table 1).

In Group A-2, 44.5% less dental surfaces affected by decay than in Group A were observed (Figure 2).

The number of children without any decay in this dentition improved by 21% (Figure 3). Among those already affected by illness, the condition of dental health observed in 1988 and '92 is that represented in Table 2.

Permanent dentition - The children in Group B-4 presented 78.1% less permanent teeth affected by decay than those in Group B (Figure 4). After 4 years of the programme a reduction in the number of permanent teeth

missed and an increase in those filled is also observed in this age group (Table 3).

In Group B-4, 82.1% less dental surfaces affected by decay than in Group B were observed (Figure 5).

Table 1 - Health condition in temporary dentition of children aged 6 years (mean)

Condition	Group A (275) (without programme)	A-2 (31) (2 yrs of programme)
Decayed	5.44	3.68
Missed	0.28	0
Filled	0.02	0
DMF index	5.74	3.68

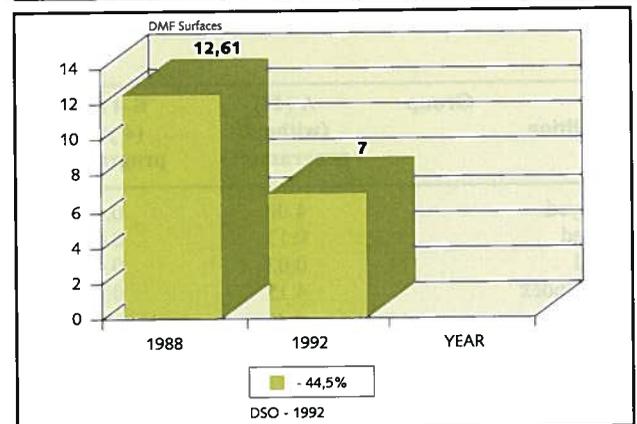


Fig. 2 – DMF surfaces at 6 years of age. Condition observed in 1988 and '92.

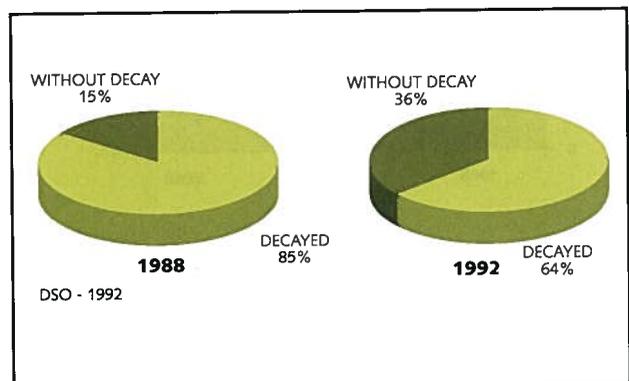


Fig. 3 – Temporary dentition at 6 years of age. Condition of the children observed.

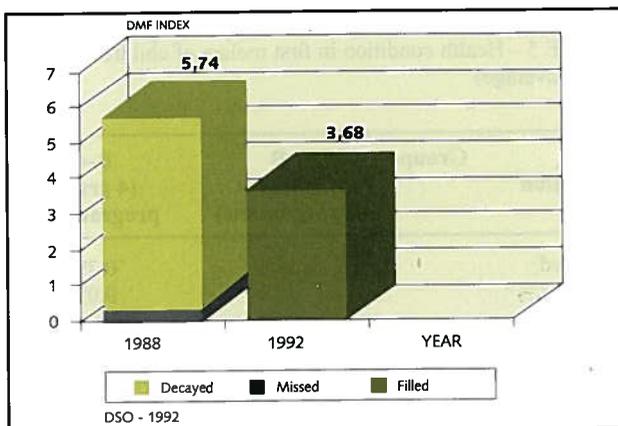


Fig. 1 – DMF index at 6 years of age. Condition observed in 1988 and 92.

Table 2 – Health condition in temporary dentition of children with 6 years of age already affected by decay (mean)

Condition	Group A (234) (without programme)	A-2 (20) (2 yrs of programme)
D+M+F (teeth)	6.7	5.7
D+M+F (surfaces)	14.8	10.8

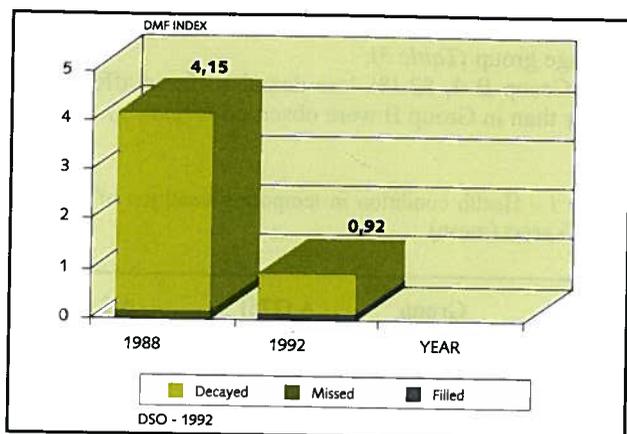


Fig. 4 – DMF index at the age of 10 years. Condition observed in 1988 and '92.

Table 3 – Health condition in permanent dentition of children aged 10 years (mean)

Condition	Group A (47) (without programme)	B-4 (196) (4 yrs of programme)
Decayed	4.00	0.83
Missed	0.13	0.02
Filled	0.02	0.07
DMF index	4.15	0.92

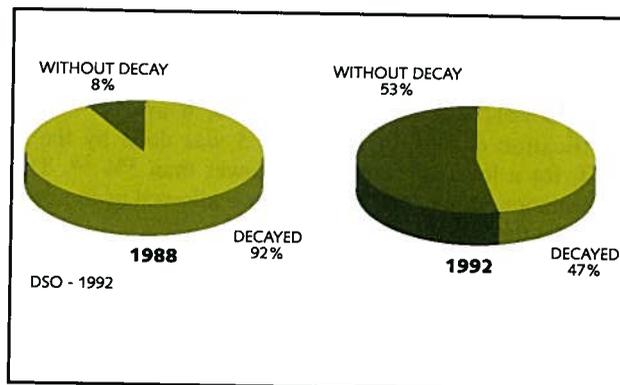


Fig. 6 – Permanent dentition at 10 years of age. Condition of the children observed.

First permanent molars - 4 years ago, 80% of all first permanent molars studied in the mouths of children aged 10 were affected by decay⁷. This figure is now 22%. The children in Group B-4 presented 72.7% less first permanent molars affected by decay than those in Group B (Figure 7). After 4 years of the programme, it was observed that the reduction of missed and filled permanent molars in this age group was entirely due to alterations made to the first permanent molars (Table 5).

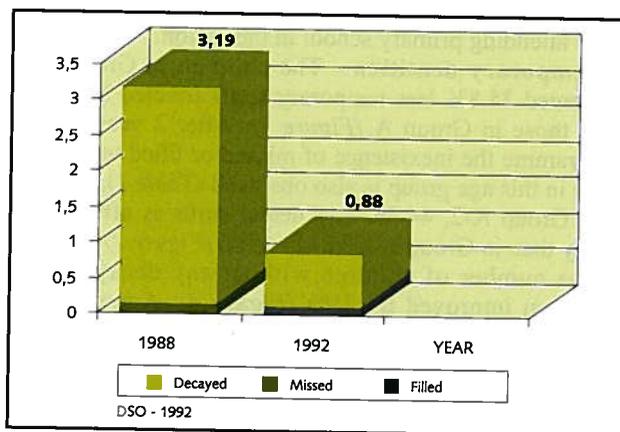


Fig. 5 – DMF surfaces at 10 years of age. Condition observed in 1988 and '92

Fig. 7 – DMF molars at 10 years of age. Situation observed in 1988 and '92

The number of children without any decay in this dentition improved by 45% (Figure 6). Among those already affected by illness, the dental health condition observed in 1988 and '92 is that represented in Table 4.

Table 4 – Health condition in permanent dentition of children with 10 years of age already affected by decay (mean)

Condition	Group B (43) (without programme)	B-4 (93) (4 yrs of programme)
D+M+F (teeth)	4.5	1.9
D+M+F (surfaces)	8.5	2.9

TABLE 5 - Health condition in first molars of children aged 10 years (average)

Condition	Group B (without programme)	B-4 (4 yrs of programme)
Decayed	3.04	0.79
Missed	0.13	0.02
Filled	0.02	0.07

Verification of the hypotheses - a) The DMF index in the groups studied (before and after the programme) aged 6 years is significantly lower at the end of the programme.

	Group A (without programme)	Group A-2 (2 yrs of programme)
DMF index		
Mean	5.74	3.68
Variance	18.51	14.78
Standard deviation	4.30	3.84
Mann-Whitney U test		
U (the lowest)	3089	
Z calculation	2.51	
P<0.006	Hypothesis a) accepted	

A statistically significant difference between these indexes was observed in the means, the DMF index being significantly lower in the group on the programme.
b) The percentage of children, in the group studied aged 6 years, affected by tooth decay in their temporary dentition (before and after the programme) is significantly lower at the end of the programme.

	Group A (without programme)	Group A-2 (2 yrs of programme)
Children with decay	85.1% (234)	64.5% (20)
Children without decay	14.9% (41)	35.5% (11)
Combined standard deviation	8.86	
Z calculation	2.33	
P<0.02	Hypothesis b) accepted	

A statistically significant difference between these indicators was observed in the means, the percentage of children affected by decay in their temporary dentition being significantly lower in the group on the programme.
c) The DMF(s) index in the group studied aged 6 years (before and after the programme) is significantly lower at the end of the programme.

	Group A (without programme)	Group A-2 (2 yrs of programme)
DMF surfaces		
Mean	12.61	7.00
Variance	178.72	78.30
Standard deviation	13.37	8.80
Mann-Whitney U test		
U (the lowest)	2982.5	
Z calculation	2.74	
P<0.003	Hypothesis c) accepted	

A statistically significant difference between these indicators was observed in the means, the average number of DMF surfaces being significantly lower in the group on the programme.
d) The DMF index in the group studied aged 10 years (before and after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-4 (4 yrs of programme)
DMF index		
Mean	4.51	0.91
Variance	4.55	1.54
Standard deviation	2.13	1.24
Mann-Whitney U test		
U (the lowest)	996	
Z calculation	8.34	
P<0.0001	Hypothesis d) accepted	

A statistically significant difference between these indexes was observed in the means, the DMF index being significantly lower in the group on the programme.
e) The percentage of children, in the group studied aged 10 years, affected by tooth decay in their permanent dentition (before and after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-4 (4 yrs of programme)
Children with decay	91.5% (43)	47.5% (93)
Children without decay	8.5% (4)	52.6% (103)
Combined standard deviation	5.4	
Z calculation	8.2	
P<0.001	Hypothesis e) accepted	

A statistically significant difference between these indicators was observed in the means, the percentage of children affected by decay in their permanent dentition being significantly lower in the group on the programme.
f) The DMF(s) index in the group studied aged 10 years (before and after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-4 (4 yrs of programme)
DMF surfaces		
Mean	7.79	1.39
Variance	34.72	4.92
Standard deviation	5.89	2.22
Mann-Whitney U test		
U (the lowest)	1147.5	
Z calculation	7.99	
P<0.0001	Hypothesis f) accepted	

A statistically significant difference between these indicators was observed in the means, the average number of DMF surfaces being significantly lower in the group on the programme.
g) The average of first permanent molars decayed, missed or filled, in the group studied aged 10 years (before and

after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-4 (4 yrs of programme)
DMF molars		
Mean	3.19	0.87
Variance	1.65	1.29
Standard deviation	1.28	1.14
Mann-Whitney U test		
U (the lowest)		1051
Z calculation		8.21
P<0.0001		Hypothesis g) accepted

A statistically significant difference between these indicators was observed in the means, the average number of DMF molars being significantly lower in the group on the programme.

DISCUSSION

The alterations in the levels of oral health observed in the population of scholars of the Cartaxo region in the last 4 years, coinciding with the Oral Health Care Programme, were so evident that we are led to assume that these results, identical to those we had previously obtained in a small urban community of schoolchildren⁸, were almost exclusively due to the efficacy of the above mentioned programme. The observations we made of the development of the programme over its 4 years leads us to think that the influence of possible obliquities, such as the opening or closing of shops where the children may easily obtain cariogenics or an alteration in the influence of television on their oral hygiene habits, may be considered insignificant.

It may be stated that the strategy of intervention, despite using little manpower from the health services, proved to be highly effective. It was essentially based on three elements:

Information/ training/ motivation, in oral health, of professionals in education; the teachers promoting health; the effective use of technicians with specific aptitudes (for example, the oral hygienist was exclusively devoted to the application of fissure sealants).

The professionals from the Cartaxo Health Centre worked mainly as informers-trainers and in facilitating the planned activities, also being in charge of monitoring.

The results obtained in temporary dentition are particularly due to the activities in support of oral health done in kindergartens. The teachers administered the daily supplements of fluoride, promoted tooth brushing in the kindergarten and spoke to parents and children about the inconveniences of the undisciplined ingestion of sugary foods. The levels of illness in this dentition may lower even more, in the near future, since doctors in infant health outpatient clinics in Cartaxo are promoting the administration of fluoride supplements to children, as from the first weeks of life⁹. The modifications of oral

flora, with the reduction of the number of Streptococcus Mutans, resulting from the reduction of the number of decays in temporary teeth, will be another factor which will contribute towards the improvement of dental health in temporary dentition as well as permanent dentition.

The results obtained in permanent dentition are particularly due to behaviour in favour of oral health of primary school teachers. They administer fluoride mouthrinses¹⁰ every fortnight, promote tooth brushing in many schools and also speak to parents and children about the dangers of undisciplined ingestion of sugars¹¹.

The oral hygienists, who collaborated in the programme by applying fissure sealants to permanent molars, with notable rigor, should also be recognised as being responsible for the results obtained. The task lasting 2,5 months/ year, allowed the complete inversion of the health condition of these children's most vulnerable teeth (the first molars) and proved that professionals qualified in applying fissure sealants can play an important role in the fight against dental decay in Portugal. The costs of this activity are very often invoked as an obstacle to its use in a community. In Cartaxo, the application of each sealant was less than PTE 400 (including equipment and the technician's services). Knowing that the average number of sealants applied was 3.3 per child and that the results obtained indicate a reduction of 2.3 decays in permanent molars per person, it may be stated that, with a very narrow margin of possible error, for each of the decays avoided PTE 500 was spent. The comparison of these costs with those of dental treatment, to which should be added the cost of antibiotics, analgesics, parental absenteeism, transport, not to mention the costs which can not be assessed, such as suffering, pain and the degradation of one's image, give this technique a great advantage when compared with curative strategies.

The statistical validation of the results observed in temporary dentition, only in children already affected by decay (Table 2), which may be found in the appendix, reveals that the difference between the means of their teeth and/ or surfaces affected by decay, are not statistically significant. Thus, we may think that the results obtained in temporary dentition are mainly due to the increase in the number of children without decay (increase in zeros) and not to the expected concomitant reduction in the number and size of the lesions among the children already affected by decay.

The statistical validation of the results observed in permanent dentition, among the children already affected by decay (Table 4), which may be found in the same appendix, reveals that the difference between the means of their teeth and/ or surfaces affected by decay, are statistically significant. The results obtained in permanent dentition are mainly due to the increase in the number of children without decay (increase in zeros) as well as the expected concomitant reduction in the number and size of the lesions among the children already affected by decay.

Finally, it seems proved that, with the few human resources and the little equipment available at the

services for primary health care, it is possible to form simple, feasible and effective programmes ¹².

CONCLUSIONS

The Cartaxo Oral Health Care Programme proved adequate and highly effective in the fight against tooth decay.

The methodology used to effectively employ human resources made it possible to include a large number of children, without a loss of efficacy.

The fissure sealants proved to be an excellent complement to the programmes on a national scale (Oral Health Guidelines on Mother and Child Health and Oral Health Programme in Schools) which may well be successfully used in community programmes.

RECOMMENDATIONS

This paper gave rise to the following recommendations:

The Oral Health Care Programme of the Cartaxo region, as it is structured, can and should be maintained.

At about 12 years of age, the second permanent molars burst forth. It is necessary to consider extending the Cartaxo Oral Health Care Programme so that these teeth, which are as vulnerable to decay as the first molars, may be targeted for specific protection.

It is important to know the impact of the Cartaxo Oral Health Care Programme in the middle-term. A process should therefore be developed to assess the dental health condition of the children included in the programme when they are 12 and 15 years old, respectively.

The reduction of the levels of decay in the population of schoolchildren in the Cartaxo region, observed in the last 4 years, is so distinct that the development of similar programmes in other regions is recommended.

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APPENDIX

IMPLEMENTATION OF THE NON-PARAMETRIC STATISTICAL MANN-WHITNEY U TEST ONLY ON THE RESULTS OBTAINED FROM CHILDREN ALREADY AFFECTED BY DECAY

h) The average number of decayed, missed and filled teeth in the temporary dentition in the group studied aged 6 years, already affected by tooth decay (before and after the programme) is significantly lower at the end of the programme.

	Group A (without programme)	Group A-2(20) (2 yrs of programme)
D+M+F mean		
Mean	6.7	5.7
U (the lowest)		2191.5
Z calculation		0.47
P<0.319		Hypothesis h) rejected

No statistically significant difference was observed between means, since the means of teeth decayed, missed and filled are not significantly lower in the group on the programme.

i) The average of surfaces decayed, missed and filled in the temporary dentition in the group studied aged 6 years, already affected by tooth decay (before and after the programme) is significantly lower at the end of the programme.

	Group A (without programme)	Group A-2 (2 yrs of programme)
D+M+F(s) mean		
Mean	14.8	10.8
U (the lowest)		1937
Z calculation		1.28
P<0.1003		Hypothesis i) rejected

No statistically significant difference was observed between these means, since the mean of decayed, missed

and filled surfaces are not significantly lower in the group on the programme.

j) The average of decayed, missed and filled teeth in the permanent dentition in the group studied aged 10 years, already affected by decay (before and after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-2(93) (4 yrs of programme)
D+M+F mean		
Mean	4.5	1.9
U (the lowest)		413
Z calculation		7.42
P#0.0001		Hypothesis j) accepted

A statistically significant difference was observed between these means, since the averages of decayed, missed and filled teeth are significantly lower in the group on the programme.

k) The average of decayed, missed and filled surfaces in the permanent dentition in the group studied aged 10 years, already affected by decay (before and after the programme) is significantly lower at the end of the programme.

	Group B (without programme)	Group B-4(93) (4 yrs of programme)
D+M+F(s) mean		
Mean	8.5	2.9
U (the lowest)		569.5
Z calculation		6.69
P<0.0001		Hypothesis k) accepted

A statistically significant difference was observed between these means, since the mean of surfaces decayed, missed and filled are significantly lower in the group on the programme.