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# The possibility of modification and improvement of dental services in Poland for children and adolescents with special emphasis on orthodontic service

## ABSTRACT

**Aim** World Dental Federation reveals that dental caries is one of the most common diseases in the world, and as much as 90% of the population is facing oral cavity problems. About 28% of teenagers aged 10 and 15 absolutely needs orthodontic treatment and about another third of this age group represents very serious cases. The aim of this study is to verify the authorial model which modifies and facilitates the system of dental services in Poland with a special emphasis on orthodontic service.

**Material and method** The research was carried out with the method of diagnostic survey through a survey questionnaire. For this study, 1159 people were questioned for the research. In order to check the reliance between the variables Pearson chi-square test and the test of the Highest Reliability were used. Average market prices and the "prices expected" by the Greater Poland Voivodship Department of National Healthcare System were used to price dental services.

**Results** The research revealed that the highest percentage of people who used only private dental services is between 19 and 64 years of age and the lowest percentage is represented by the elderly, i.e. subjects over 65 years of age. As for the dental

services offered by the National Health Fund, the highest percentage of patients are children and adolescents under 18 and the lowest percentage of patients is represented by people in the working age. The tendency towards private healthcare is in direct proportion to parents' increase in the level of education. The main reason why parents take their children to a private dentist is the long waiting time for the visit offered by the National Health Fund as well as better materials and equipment offered by private dentists. The costs connected with extending the basket of guaranteed services for children and youngsters are combined with the increase in National Health Fund expenditure reaching EUR 7,014,151. The lack of refunding dental services for patients aged 19–64 will generate savings reaching about EUR 34,756,765.

**Conclusion** The reduction of public funds allocated for dental treatment of patients aged 19–64 will generate savings which will satisfy the needs connected with the increase in the range of refunded orthodontic treatment with the use of orthodontic permanent braces for patients under 18 years of age. The solution suggested will only slightly affect people in the working age as they reveal a strong tendency for treatment financed with their private funds.

**Keywords** Oral health of children and adolescents; Orthodontics; Public health; Privatization of dental care.

## Introduction

The World Dental Federation reports that dental caries is one of the most common diseases in the world, and as much as 90% of the population is facing oral cavity problems [FDI, 2017]. The aepidemiological data gathered through researches carried out in 2010–2012 as part of the "Oral Cavity Health Monitoring" programme shows that almost 80% of Polish children aged between 5 and 12 years have caries [Tomaszewski et al., 2016]. A research carried out in 2015 confirms that caries is already a problem for 53.8% of children as young as 3 years [Ministry of Health of Poland, 2015]. The problem gets worse as they grow older. In the group of 12-year-olds the percentage reaches 71.9% [Ministry of Health of Poland, 2014], and in the group of fifteen-year olds is as high as 94.0% [Ministry of Health of Poland, 2015]. The World Health Organisation (WHO) has set a health goal to be realised until 2020, which aims at increasing the percentage of six-year-olds without caries to 80% in all European countries.

Another oral cavity disorder which is escalating

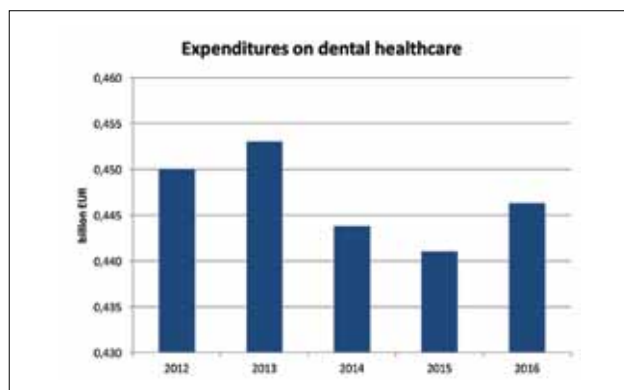


FIG. 1 Expenditures on dental healthcare

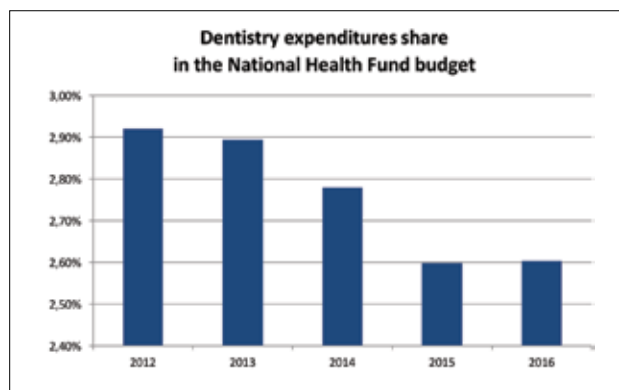


FIG. 1 Dentistry expenditures share in the National Health Fund budget.

nowadays is occlusal abnormalities among children and youngsters, which need orthodontic treatment. About 28% of teenagers aged 10 to 15 absolutely needs orthodontic treatment and the same proportion of patients represents very serious cases [Ministry of Health of Poland, 2015]. A research carried out in other European countries with the use of IOTN (Index of Orthodontic Treatment Need) has shown a similar percentage of need for orthodontic treatment [Steinmass et al., 2017].

Dental caries is a serious public health problem not only in Poland but in whole Europe. In highly industrialised countries the costs of dental treatment is extremely expensive and accounts for 5-10 per cent of public expenses devoted to health [Petersen et al., 2005]. In Poland, the funds devoted to dental treatment are decreasing year after year and, although in 2016 a slight increase could be noticed, the funds constituted only 2.6% of the total healthcare expenditure (Fig. 1, 2) [Tomaszewski et al., 2016]. Therefore, the question that needs to be asked is whether it is possible to realise all WHO guidelines in Poland taking into account the present situation. It also needs to be reminded that apart from financial constraints there are also huge limits concerning the basket of refunded services. For example, the legislator envisages endodontic treatment only in the teeth from the cuspid to the cuspid in the upper and lower dental arch [Journal of Laws of the Republic of Poland, 2013], and other teeth requiring canal treatment must be paid by the patient or subjected to tooth extraction, being the latter reimbursed by the National Health Fund. There is a similar situation when it comes to orthodontic treatment with fixed braces for children and adolescents. Although the spectrum of reimbursed benefits for this group is relatively broad, the existing restrictions hamper the fight against oral problems for many children. That is why many patients choose private treatment, especially for aesthetic reasons. As a consequence of these and many other activities, Poles spent EUR 2 billion on private dental treatment in 2014, while the National Health Fund allocated EUR

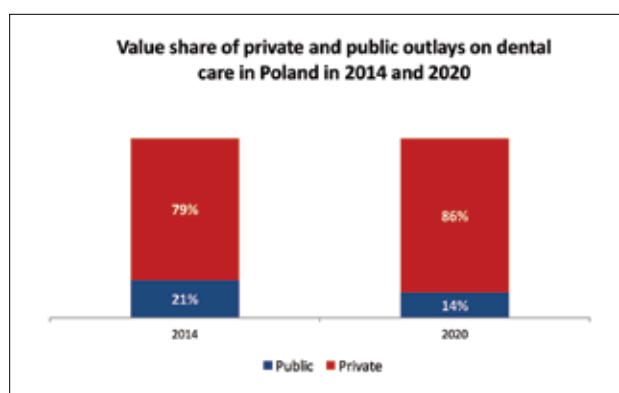


FIG. 3 Value share of private and public outlays on dental care in Poland in 2014 and 2020. Source: Market for dental services in Poland 2015. Development forecasts for 2015-2020", PMR, 2015.

450 million to public treatment [Markowicz, 2016]. This data is corroborated by studies conducted in 2015 by the authors of this publication, which show that the overwhelming majority of Poles treat their teeth only in private dental offices. In the group of people aged 19 to 65, as many as 73% of all respondents pay for their own treatment [Tomaszewski et al., 2017]. The latest study carried out by the PMR research and consulting company, describing the Polish dental care market, identifies it as a growing sector. According to the PMR forecasts for 2015-2020, the market for dental services will continue to grow exponentially. The expected average annual increase in services of about 7% will generate a value of EUR 3.15 billion by the end of 2020 [PMR, 2015 (Dental services market in Poland 2015. Development forecasts for 2015-2020)].

The driving force behind these phenomena, as it turns out, is the private dental care sector. According to the chart, the value of private dental care expenditure in Poland will increase from 79% in 2014 to 86% in 2020 (Fig. 3). Several challenges are to be faced, on

the one hand there is the existing problem of limited budgetary resources and the scope of reimbursed dental treatment and, on the other hand, the huge financial need to improve the existing health status in Poland. It is therefore unquestionable to review the redistribution of budget funds for dental treatment within the entire dental treatment system in Poland, and this is the purpose of this publication.

## Material and methods

The study used the diagnostic survey method. The research tool was the survey questionnaire prepared by the authors concerning dental services in the Wielkopolska Region. A total of 1,800 questionnaires were distributed and 1,196 of them were returned. Of those questionnaires, 37 were filled out incorrectly and, therefore, they were rejected. A total of 1,159 questionnaires were included in the statistical analysis. Surveys were addressed to people in three age groups: as follows.

- Children: children up to 18 years of age filled in the questionnaires together with their parents, 285 respondents.
  - Adults: people from 19 to 64 years old, 706 respondents.
  - Elderly: people over 65 years old, 168 respondents.
- Participation in the study was voluntary and anonymous. The study was conducted in rural areas, small and large cities, so that the survey results represent the population of Wielkopolska. Each questionnaire was composed of 3 question blocks. The first block of questions (metric) asked for the respondent's gender, age, place of residence and education. In the second block of questions, the respondents indicated the type of dental care they benefited from in 2015, including services financed privately and reimbursed by the National Health Fund. In the third block the respondents reported the reasons for choosing private or public dental care.

Nominal (gender, type of dentition, place of residence, type of benefit) and ordinal variables (age, education) as well as answers to the questions were described by the numerical amount (n) and frequency (%). Measurable variables were described using basic parameters: arithmetic mean, standard deviation, median, lower and upper quartile, and minimum and maximum values. The Pearson chi-square test and the Highest Reliability test were used to assess the relationship between nominal and sequential variables. Statistical significance was assumed to be  $p < 0.05$ . Statistical calculations were performed using STATISTICA10PL statistical package.

In the chi-square test, a null hypothesis was formulated. This hypothesis assumes no relationship between the variables tested. An alternative hypothesis, which is a

denial of the null hypothesis, presupposes a relationship between the variables tested. The Pearson chi-square test was used to verify the null hypothesis, and in the case where some of the expected (theoretical) numbers in the contingency table were less than 10, the chi-square test of the highest reliability was used. The result of the chi-square test is described by the following parameters: chi-square test value (Pearson, the Highest Reliability) and probability level  $p$ . If the test probability  $p$  exceeded the assumed significance level  $\alpha = 0.05$ , then it was assumed that there were no grounds to reject the null hypothesis. If  $p < \alpha$ , then the null hypothesis is rejected and an alternative hypothesis is assumed. Rejection of the null hypothesis translates into a dependency between the variables.

The research used 12 pricelists of private dentistry offices located in the Wielkopolska province in order to price private dental services in 2015. For each dental service, the lowest and highest price of the service were removed and the average cost of dental care in the Wielkopolska Voivodeship was calculated. In order to evaluate the benefits reimbursed by the National Health Fund, the research used the "expected prices", defined by the Greater Poland Voivodeship Department of National Health Fund for the dental contract in the years 2014–2017. In case of services not refunded by the National Health Fund, an estimated value was adopted. It was calculated proportionally to the corresponding reimbursed services based on market prices.

The research was carried out with consent (Resolution No. 394/16 dated 06.04.2016) of the Bioethics Committee at the Medical University of Karol Marcinkowski in Poznan based on an application submitted in advance. The research was self-financed by the authors, and thus the authors received no subsidy from any funding agency in the public or commercial sector.

## Results

The analysis of the research carried out with the Pearson chi-square test showed a statistically significant relationship between the age groups of the examined subjects and dental services ( $p = 0.00000$ ). The results of this dependence are shown in Figure 4. Among those who used dental services only privately, most were adults (19 to 64 years), and the lowest percentage was represented by the elderly (65+). Dental treatment exclusively within the National Health Fund has been mostly used by children and adolescents up to 18 years and least by subjects in the working age (19 to 64 years). The highest percentage of children (up to 18 years old) and the lowest proportion of elderly people (over 65 years old) are those who use dental services both privately and within the NHF. Among those who did not use dental services at all, the highest

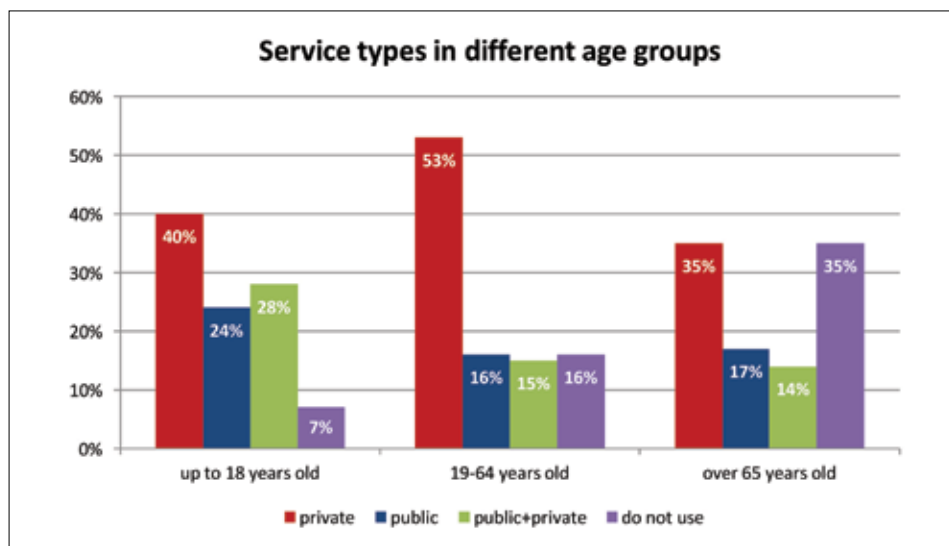


FIG. 4 Age groups and dental services in 2015 among the people researched.

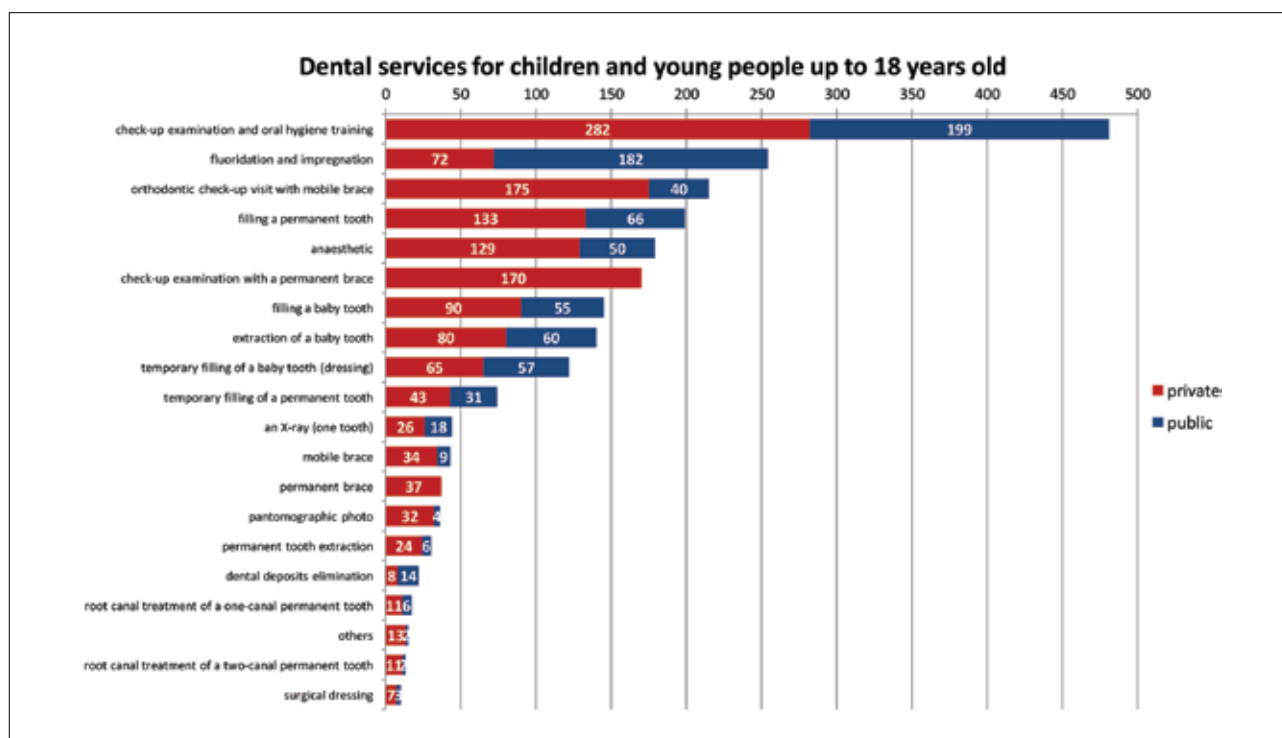


FIG. 5 Dental services for children and adolescents up to 18 in 2015.

percentage was patients over 65 and the smallest was the proportion of children (up to 18 years old).

The types of dentistry services used by youngsters, broken down by type of funding, are presented in Figure 5. The figure shows that the most frequent service among people under the age of 18 was oral examinations with oral hygiene instructions: 481 services, 282 of which were performed privately and 199 within National Health Fund. The least frequent treatment (74 services) used by the patients was temporary filling of a permanent tooth (43 commercial

treatments, and 31 reimbursed). In case of all services, except for fluoridation/impregnation, the dominance of treatment financed from patient's own funds can be observed. A fully privately financed treatment indicated by the respondents is orthodontic treatment using a permanent brace and visits related to the treatment.

The study examined the correlation between the level of education of the parents of a child aged under 18 and the choice of the form of funding for dental treatment. The chi-square test of the Highest Reliability

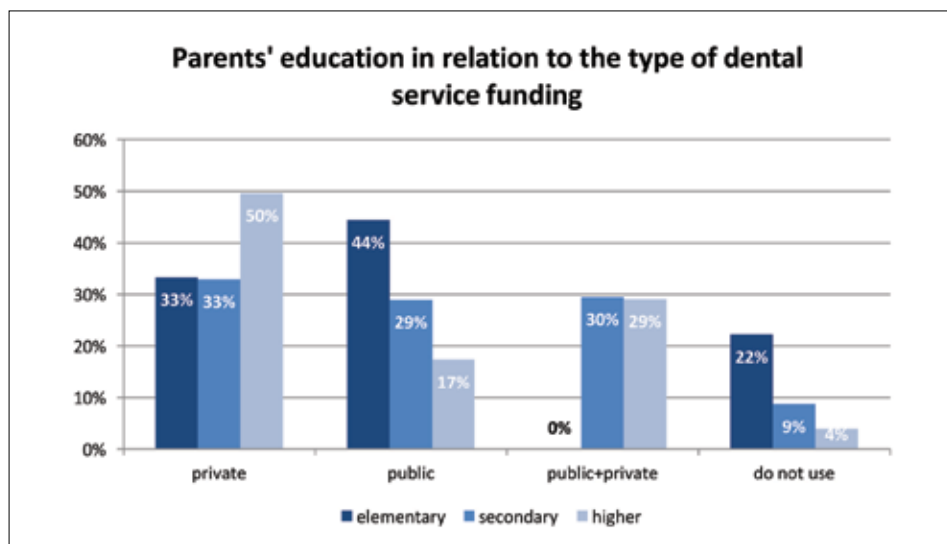


FIG. 6 Parents' education in relation to the type of dental service funding in 2015.

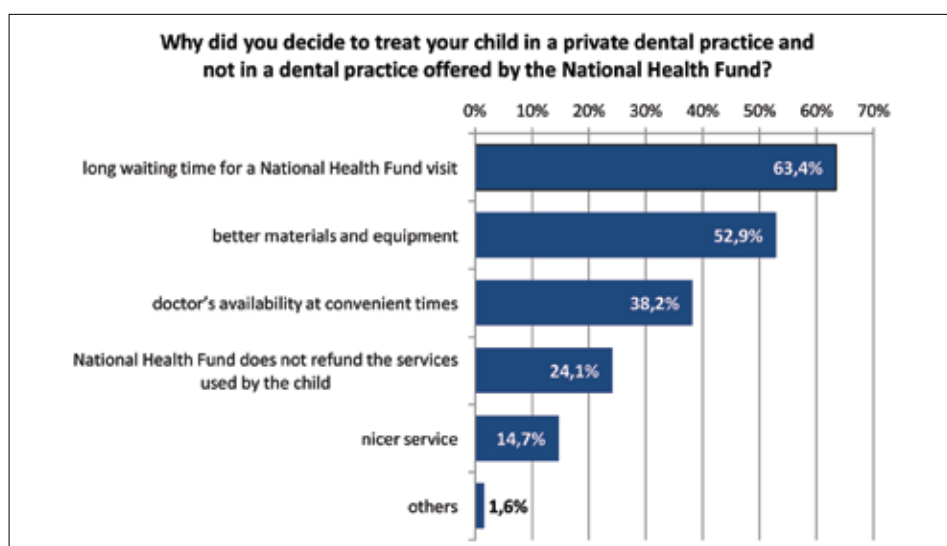


FIG. 7 Parents' answers to the question "Why did you decide to treat your child in a private dental practice and not in a dental practice offered by the National Health Fund?"

showed a statistically significant relationship between parent education and dental care ( $p = 0.00306$ ), and the results are illustrated in Figure 6. Among children who used dental services only privately the largest is the proportion of children whose parents have a higher education. Among the children who used dental services only within the National Health Fund, the highest is the percentage of children whose parents have primary education. The parents of the children who used dental services both privately and within the National Health Fund all had secondary or higher education. Among the children who did not use dentistry at all, the highest is the percentage of children whose parents have primary education and the lowest is the proportion of children whose parents have completed higher education.

191 parents whose child was treated in a private dental surgery responded to the question "Why did you decide to treat your child in a private dental practice and not in a dental surgery contracted by the

National Health Fund?", 5 parents did not respond to that question. The 191 parents gave a total of 372 responses as the questionnaire allowed them to give maximum two reasons for their decision. Parents often treated their child in a private dental practice due to: long waiting times for National Health Fund visits (63.4%); better materials and equipment (52.9%); availability of a doctor at convenient times (38.2%). As "other reasons" parents pointed out "sudden pain" and "confidence in the private doctor". A graphical analysis of the question is presented in Figure 7.

Most of children and adolescents under 18 in the study group are not treated orthodontically: 78% of people. As many as 53 children (82.5%) out of the 63 orthodontically treated, finance their treatment from private funds. One person benefits from both reimbursed and commercial services. The remaining 10 children (15.9%) are treated orthodontically only within the costs reimbursement by the National Health Fund.

	Fixing permanent brace (arch)	Check-up visit with a permanent brace
The number of respondents	285	285
The number of people treated orthodontically	21	23
The percentage of people treated orthodontically	7,4%	8,1%
The number of people treated orthodontically and willing to resign from private treatment in favour of refunded treatment	12	13
The percentage of people willing to resign from private and willing to resign from private treatment in favour of refunded treatment	57,1%	56,5%
The total amount of dental services among the studied group of people	37	170
The average individual cost of a dental service in market prices	555 EUR	32 EUR
The average individual cost of a dental service in National Health Fund prices	398 EUR	11 EUR
<b>The total cost of orthodontic treatment of the people studied in market prices</b>	<b>20 535 EUR</b>	<b>5 355 EUR</b>
<b>Total</b>	<b>25 890 EUR</b>	
<b>The total cost of orthodontic treatment of the people studied in National Health Fund prices</b>	<b>14 726 EUR</b>	<b>1 870 EUR</b>
<b>Total</b>	<b>16 596 EUR</b>	
The average yearly cost of an individual's treatment in market prices	978 EUR	233 EUR
The average yearly cost of an individual's treatment in National Health Fund prices	701 EUR	81 EUR
The population of young people under 18 in Greater Poland Voivodship	703 514	703 514
The estimated number of people treated orthodontically in Greater Poland Voivodship	51 837	56 774
The estimated number of people treated orthodontically in Greater Poland Voivodship and willing to resign from private treatment in favour of refunded treatment	29 621	32 090
<b>The total cost of orthodontic treatment of people in Greater Poland Voivodship in market prices</b>	<b>28 965 246 EUR</b>	<b>7 471 308 EUR</b>
<b>Total</b>	<b>36 436 554 EUR</b>	
<b>the total cost of orthodontic treatment of people in Greater Poland Voivodship in National Health Fund prices</b>	<b>20 771 474 EUR</b>	<b>2 609 028 EUR</b>
<b>Total</b>	<b>23 380 502 EUR</b>	
<b>The total cost of orthodontic treatment of people with medical indication</b>	<b>7 014 151 EUR</b>	

**TABLE 5** Costs of orthodontic treatment in 2015.

## Discussion and conclusions

An economic cost analysis for the state budget related to the extension of the reimbursed benefit package to



orthodontic treatment with fixed braces and follow-up visits to this type of treatment revealed the need to increase spending for the studied group on the level of EUR 25,890 (volume estimated using average private market prices). Using estimated National Health Fund prices (that currently do not exist as this service is only available privately) the volume amounts to EUR 16,596 on the scale of the examined group. The calculated volumes for the whole province (Greater Poland Voivodeship) would amount to EUR 36,436,554, calculated at private market prices, and EUR 23,380,502 in National Health Fund prices (Table 1). Considering the medical indications for orthodontic treatment in Poland at 30% of the population, the cost is EUR 7,014,151 (30%\*23,380,502 EUR).

Research has shown that a possible non-refund of dental benefits for people of working age (19 to 64 years) and, thus, full privatisation of dentistry in this age range will generate savings of about EUR 34,756,765. Based on the data obtained from the Greater Poland Voivodeship Department of National Health Fund, this value would be EUR 21,017,628.

The high tendency of patients to choose treatment in private dental clinics, shown in the research, results primarily from the limitations of public funds. This results in a long waiting time for a visit to a dentist contracted by the National Health Fund and the standard of equipment and materials, as noticed by the respondents. The problem is escalated by the narrow range of benefits guaranteed under the National Health Fund, which prompts patients to choose treatment funded with their own cash. The vast majority of Greater Poland inhabitants in working age are treated in private dentistry. They also often visit private dental surgeries with their children rather than those contracted by the National Health Fund, although the rate of reimbursement for this age group is relatively high. Parents' education plays a major role here. The propensity for private treatment is directly proportional to the increase in the level of parental education. Unfortunately, some dental treatment, including orthodontic treatment with fixed braces, is not reimbursed [Regulation of the Minister of Health, 2004] and the only solution is to be treated in the private market, which not all parents can afford. In every fourth respondent the decision for private treatment is conditioned by the lack of refund for certain services.

The proposed solution does not generate additional costs for the National Health Fund, but only suggests a transfer of funds within the pool for dental treatment in Poland. Improving the current state of oral health among children and adolescents while preserving the available resources is possible by altering their redistribution. Based on the results of the studies, it can be concluded that even a partial reduction of public funding for dental treatment for people aged between 19 and 64 will

generate savings that will meet the need to expand the scope of reimbursed benefits for orthodontic treatment using fixed braces, for people under 18. Such a solution will only slightly affect people of working age because of the very high propensity of these individuals for treatment financed with their own cash. This solution will help to meet the demand for specialist treatment of children and adolescents. Familiarity of the child with regular visits to the dental office, emphasis on treatment from an early age will create a habit for the future. The advantage of "free" treatment at the age of 18 over fully paid or even reduced treatment during adulthood, will convince those who nowadays tend to neglect to give up the care of oral health.

### *Compliance with ethical standards*

The research was carried out with consent (Resolution No. 394/16 dated 06.04.2016) of the Bioethics Committee at the Medical University of Karol Marcinkowski in Poznań.

### *Conflict of Interest*

The authors declares that there is no conflict of interest regarding the publication of this article.

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