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Children's Dental Caries Prevention Program: Do Parents Willing to Pay?

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Abstract: This study aims to determine parents' willingness to pay (WTP) for their children's dental caries prevention program at elementary school using a direct survey—the Contingent Valuation Method. This study collected data from 264 parents of students aged 6-12 years old (the 1st to the 6th grade). Children at this age are at risk of dental caries because they consume more sweets, chocolate, and other sugary products. The survey results showed that the average WTP value for caries prevention was IDR 103,371. Income, education, and self-perceived needs for treatments were variables that positively and significantly affected WTP. Other variables such as parents' age and frequency of visiting a dental healthcare facility were insignificant. Oral and dental health treatments can impact not only health during childhood but also in adulthood. The findings can inform health departments in improving dental health services. Research on preventing oral and dental diseases, especially caries, is still limited in Indonesia. Most studies involve adult respondents, whereas this study involves primary school students.
Keywords: Willingness To Pay; Contingent Valuation Method; Caries Prevention; Dental Health
JEL Classification: I13

Introduction

Health is not only an important indicator of personal wellbeing but also a country's development and environmental change, so it must be improved continuously (WHO, 1948). 'Health for all' assurance is stated in Sustainable Development Goals (SDGs) number three about good health and wellbeing. Oral and dental (orodental) health is an essential indicator of overall physical and psychological health. Its conditions can affect people's performance at school or work. Some issues affecting the conditions include dental and periodontal diseases, oral cancer, HIV infection, and trauma.

WHO recorded that dental problems are the world's most prevalent chronic diseases over the past decade (WHO, 2018). Vos et al. (2017) estimated that oral diseases affect 3.58 billion people or about half of the world's population, with dental caries in permanent teeth becoming the most prevalent problem. Therefore, orodental healthcare ranked the fourth most expensive to treat, higher than the investment for cancer or respiratory diseases (Petersen, Bourgeois, Bratthall, & Ogawa, 2005). In most high-income countries, orodental treatment is costly, with about 5%

of total health expenditure and 20% of out-of-pocket health expenditure. Meanwhile, in low-and middle-income countries (LMICs), orodental healthcare demand is often higher than the capacities of the healthcare systems. Since access to orodental health remains limited, problems are often left untreated. Teeth are often extracted to remove pain or discomfort (WHO, 2018).

In Indonesia, the health concern is regulated in Constitution Number 36 of 2009. Article 93, paragraph one, states that government, regional governments, and/or the community should maintain and improve public health—by improving treatments, preventing diseases, and restoring orodental health—in a united, integrated, and sustainable manner. However, most people's awareness is low, so they do not prioritize orodental health. This is reflected in the high prevalence of orodental problems in Indonesia.

Table 1 Prevalence of orodental problems compared to other diseases in Indonesia

Diseases	Proportion (%)		
	2007	**2013**	**2018**
Orodental diseases	23.4	25.9	57.6
Communicable Diseases			
ARI (Acute Respiratory Infections)	25.5	25	9.3
Pneumonia	2.13	1.8	4.0
Tuberculosis	0.99	0.4	0.42
Non-Communicable Diseases			
Asthma	3.5	4.5	2.4
Cancer	4.3	1.4	1.79
Diabetes Mellitus	1.1	2.1	1.5
Mental disorder (psychosis/schizophrenia)	4.6	1.7	6.7
Nutritional deficiencies	18.4	19.6	17.7

Source: National Institute of Health Research and Development (NIHRD), Ministry of Health Indonesia

The research reported that orodental diseases rank first as the most prevalent disease affecting people in Indonesia. More than half of the population in Indonesia have had orodental problem(s). This proportion exceeds the other health issues assessed in the Basic Health Research (*Riskesdas),* such as communicable diseases (ARI, pneumonia, TB, etc.), non-communicable diseases (asthma, cancer, diabetes, etc.), mental health, congenital disabilities, and nutritional status (Table 1). The proportion of orodental prevalence in 2018 was 57.6%, doubled from the problems in 2007 and 2013 (23.2% and 25.9%, respectively). Out of the total population with dental diseases in 2018, only 10.2% received treatments from medical personnel. This percentage decreased from 29.7% in 2007 and 31.1% in 2013, as shown in Table 1. It could be inferred that orodental diseases are not considered acute and that orodental care is not prioritized.

In terms of age, there were 93% of children with a dental problem in 2018. Caries or tooth decay was the most prevalent problem. According to Oral Health Atlas 2015, in 1994-2014, Indonesia had the highest DMF-T (caries index) among Southeast Asian nations, which also means one of the highest globally. Seventy-six percent was due to dental caries with the level of DMF-T of 4.5 (classified as high). The poor in orodental health was due

to low capacity of healthcare resources, poor monitoring and evaluation, inadequate information system, and poor track record and reporting at the regional or national level.

Special Region of Yogyakarta (DIY henceforth) was ranked fourth in the number of orodental cases nationally. The diseases reached 65.6%, above the national average and increasing from year to year. At the same time, the proportion of medical interventions kept decreasing, as shown in Figure 1. This poor status was surprising because only 6% of people in DIY brush their teeth properly (Ministry of Health of the Republic of Indonesia, 2018).
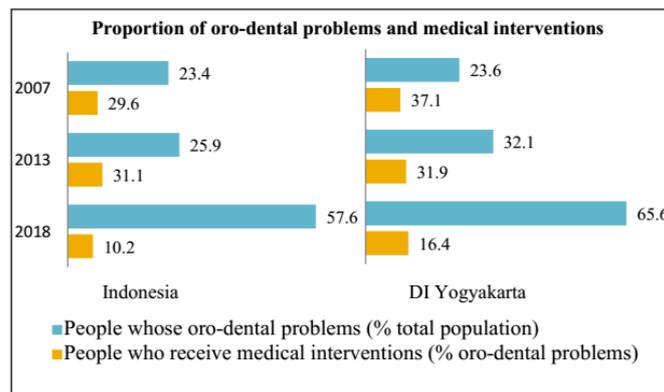

Figure 1 The Proportion of orodental problems and medical interventions in Indonesia and DIY
Source: National Institute of Health Research and Development (NIHRD), Ministry of Health Indonesia

Almost half of the orodental problems were dental caries and toothache. Dental caries is indeed the most prevalent chronic dental disease affecting children (Dawkins et al., 2013). In Yogyakarta Special Region, the dental caries index reached 6.53 (classified as very high), much higher than Indonesia's DMF-T score, which was 4.5. Taking medicines was the most common action to treat the illness, followed by tooth filling and tooth extraction (Ministry of Health of the Republic of Indonesia, 2018). Restorative treatment, i.e., medication when the problem has become serious, was more common than promotive and preventive treatments. It shows that the awareness about the importance of orodental health, especially to prevent dental caries among children, was low.

An unhealthy modern diet could also be a factor. According to FDI World Dental Federation (2017), the worldwide consumption of sugar has increased about triple over the last 50 years, especially in emerging countries. Sugar, acid, and caffeine in food and beverage products can weaken tooth enamel and cause dental caries. This is a major global public health problem affecting individuals, health systems, and economies.

In Yogyakarta Special Region, 41% and 71% of the population consume high-sugar foods and beverages at least one serving a day. Smoking, alcohol, and poor oral hygiene are also the factors causing dental problems. The number of smokers in Indonesia remains high,

especially in Yogyakarta, where 5.4% of smokers started smoking when they were five to nine years old. The number of young smokers was the highest in Yogyakarta than in other provinces in Indonesia. It was even above Indonesia's average rate, which was 2.5% (Ministry of Health of the Republic of Indonesia, 2018).

Nevertheless, medical intervention, parents' awareness, and prioritizing in the policy-making still need some improvement. The government does not prioritize dental health because dental caries is not considered immediately life-threatening (Oscarson, 2006; Peres et al., 2019; Watt et al., 2019). Meanwhile, on an individual level, socio-economic status also impacts dental health (Celeste & Fritzell, 2018; Costa et al., 2018; Matsuyama et al., 2017; Schwendicke et al., 2014). Birch and Listl (2015) stated that the demand for healthcare, including orodental, comes from the consumer's expected health gain and is encouraged by advice and direction from the healthcare providers. Lastly, the common preconception about visiting a dentist also makes people avoid seeking help and leave their teeth untreated.

Health as an outcome is classified into non-market goods. Klose (1999) measured healthcare products in terms of monetary value and postulated that they could be established by using the contingent valuation method (CVM) within the cost-benefit analysis and represented by the value of willingness to pay (WTP). Walraven (1996) defined WTP as the maximum amount of money individuals are willing to pay for the proposed services or goods. WTP provides a realistic price level determined by consumer values and perceptions.

In the health services industry, CVM studies are growing rapidly. This method is considered the most suitable approach for health-related economic valuation (Vo, Tran, & Vo, 2018). A critical review by Tan, Vernazza, and Nair (2017) on WTP for dental treatments found that CVM was used in most publications in PubMed and Web of Science databases. Thus far, none of the studies mentioned above assess WTP for dental care in Indonesia. To the best of our knowledge, only Karyadi (2011) conducted research in Surakarta, Indonesia, but it was not designed based on CVM.

On health risk mitigation, Saptutyningsih and Sujud (2020) assessed tobacco farmers' WTP to obtain health insurance for Green Tobacco Sickness (GTS) and analyzed its relationship with the socioeconomic and demographic factors. Socioeconomic characteristic is a major factor associated with WTP and health product preference (Jennifer & Saptutyningsih, 2015; Birhane et al., 2016; Sever, Verbič, & Sever, 2017; Nyamuryekung'e, Lahti, & Tuominen, 2018; Harapan et al., 2019). Tan et al. (2017) extracted relevant publications and found that income, education, and age influence WTP for clinical orodental interventions. These variables are the socioeconomic factors that have thus been used in most economic valuation studies in the health sector.

Vernazza et al. (2015) found a large and unpredictable variance in caries prevention values, but neither socioeconomic nor dental history factors became a significant WTP predictor. Unlike these findings, Walshaw et al. (2019) found that WTP for caries prevention could be associated with parents' income and children's dental history.

According to Mubaraki et al. (2017), parents with higher education and higher income showed higher WTP for their children's interceptive dental health. These findings align with Berendsen et al. (2018), which analyzed parents' willingness to invest financially (WTP), make a dentist appointment, and commit to toothbrushing minutes. Meanwhile, a study by Walshaw et al. (2019) aims to elicit WTP for caries prevention in the UK and Brazil. They recruited 200 participants from public dental care facilities. The WTP data were analyzed using linear regression modeling and Tobit regression for accounting for the data left censoring where appropriate. The findings indicated that in Brazil, there was a positive and significant correlation between a higher WTP, infrequent attendance and a moderate income. In the UK, the higher WTP was correlated with frequent visits, a higher perceived need for treatment, a recent history of oral diseases, having a child with recent dental restorations, being female, and a higher income.

Several past studies have found that attention to children's dental health is still low, while other past studies have examined the role of pediatric anesthesia parent satisfaction (PAPs) in mitigating health risks. In Indonesia, some elementary schools have dental care programs. However, dental caries remains prevalent, and there has not been a structured intervention or a program that aims to prevent dental caries. Empirical findings on parents' WTP for their children's caries prevention could be a point of reference for policymakers. Therefore, the current study aims to determine the WTP using the contingent valuation method (CVM). We chose Yogyakarta City as the setting of this study, with three elementary schools (SD) as case studies—SD Muhammadiyah Suronatan, SD Muhammadiyah Wirobrajan 3, and SD Muhammadiyah Notoprajan. We selected these schools due to the high prevalence of dental caries—more than half of the students, according to the public health center's examination in 2019. The sample population was the students' parents.

Table 2 The Relation between the dependent and independent variables

Dependent Variable	Independent Variables	Relation	References
WTP for caries prevention	Income	+	Mckenna et al. (2016); Mubaraki et al. (2017), Tan et al. (2017), Berendsen et al. (2018), Nyamuryekung'e et al. (2018), Srivastava et al. (2019), Walshaw et al. (2019)
	Education level	+	Vermaire, van Exel, van Loveren, & Brouwer (2012), Mubaraki et al. (2017), Tan et al. (2017), Berendsen et al. (2018), Sever et al. (2017), Nyamuryekung'e et al. (2018)
	Age	-	Augusti, Augusti and Re (2014), Tan et al. (2017), Nyamuryekung'e et al. (2018), Sever et al. (2017)
	Frequency of visits to dental health facilities	+	Vernazza et al. (2015), Walshaw et al. (2019)
	Perceived need for treatment	+	Vernazza et al. (2015), Nyamuryekung'e et al. (2018)

In collaboration with school staff and parents, medical interventions could be encouraged based on the estimation of parents' WTP for their children to prevent dental caries. On a more theoretical side, the current study's finding is important for evaluating the factors associated with the value of parents' willingness to pay. The Relation between the dependent and independent variables is shown in Table 2.

Research Method

Data

This study uses survey results as primary data. The respondents were parents whose children attended one of the selected elementary schools in Yogyakarta City, namely SD Muhammadiyah Suronatan, SD Muhammadiyah Wirobrajan 3, and SD Muhammadiyah Notoprajan. The parents were selected from the 1st to the 6th grade (whose children were between 6-12 years old). Children in this age range are at risk of dental caries as they eat more sweets, chocolate, or other sugary products (Andini, Indriati, & Sabrian, 2018). The survey period of this study was in January-March 2020.

Sampling Technique

The sampling technique used in this study was cluster random sampling. The sample was divided into groups or clusters based on the schools. Then, the same number of participants were chosen randomly from each cluster, determined with a percentage error of 10%. The population in this study was based on the number of students at the Muhammadiyah elementary schools in Yogyakarta City, calculated based on the Isaac and Michael formula in Wilmoth (1982):

$$s = \frac{\lambda^2 NPQ}{d^2(N-1)+\lambda^2 PQ} \qquad (1)$$

where s = number of samples; λ^2 = Chi square with the value based on the degree of freedom (df) and the probability of exceeding the critical value (α).

For df=1 and α=0.1, chi-square = 2.706; N = number of populations; P = probability of correct (0.5); Q = probability of incorrect (1-P=0.5); d = difference between mean sample and mean population (different biases 0.01; 0.05; and 0.1).

In this study, the total population was 10.323 persons with the 10% statistical tolerance limit, and the value d was set to 0,05. Therefore, the sample size recruited was:

$$s = \frac{(2.706)(10{,}323)(0.5)(0.5)}{0.05^2(10{,}323 - 1) + (2.706)(0.5)(0.5)}$$

$$s = \frac{6{,}983.5095}{26.4815}$$

$$s = 263.7 \approx 264$$

Based on the calculation, the respondents recruited for this research were 264. Each school contributed one-third of the total sample or 88 parents.

Data Collection Technique

The data were obtained primarily using a written questionnaire sent directly to the respondents to be answered. This questionnaire consists of questions and written statements related to information needed for the research.

Data Analysis

This study used the contingent valuation method (CVM) as a direct survey-based method to ask parents about their WTP for caries prevention. CVM can determine the maximum WTP and its relevant information. According to Fauzi (2004), there are five stages to elicit the value of WTP using CVM:

Establishing a market hypothesis

In the first stage, the questionnaire for WTP elicitation introduced a hypothetical scenario to the respondents: "Orodental health problems affect more than half of the world's population. About 93% of children in Indonesia experience dental caries that can affect their performance at school. To overcome this, the school plans to conduct routine dental care every semester for students to prevent caries. The program consists of 1) mouth, teeth, gums, and other supporting tissues check-ups; 2) food and lifestyle consultations that affect children's orodental health; 3) fluoride varnish treatment."

The scenario aims to provide an overview of the importance of orodental health maintenance to prevent caries. The WTP values were subsequently elicited through questions given to the respondents.

Obtaining the bidding value of WTP

The initial bid price was based on the market price of dental treatment for caries prevention, namely a fluoride varnish application from public health facilities (IDR 30.000). The initial bid price was offered to the respondents. Using a bidding game, the amount would be increased if the respondents agreed to pay the offered price until the maximum amount they were willing to pay for caries prevention.

Estimating the mean of WTP

To calculate the mean value of the bidding value obtained, willingness to pay can be estimated by dividing the sum of the overall value of WTP by the number of respondents. The formula used to calculate the mean value is as follows:

$$EWTP = \sum_{i=1}^{n} WiPfi \qquad (2)$$

where EWTP = estimated mean of WTP; Wi= the value of WTP to-I; n = total respondent; I = respondent to-I that willing to pay (= 1,2,….n)

Estimating the bid curve

The estimated supply curve of the WTP was obtained by regressing the value of WTP as the dependent variable with the independent variables, which include parents' income, education, age, frequency of visits to dental health facilities, and the perceived need for treatment.

Aggregating data (total WTP)

The last step was to sum the average value of the bid obtained. The conversion of the average sample data to the overall population's mean resulted in switching the sample's mean with the total population's mean.
The formula is:

$$TWTP = \sum_{i=1}^{n} WTPi \ ni \qquad (3)$$

where TWTP= total WTP; ∑WTPi = WTP individual sample to-I; ni = total sample to-I; I = respondent to-i who is willing to pay (= 1,2,….n)

The primary data in this study were processed using SPSS version 16. The associations of WTP as a dependent variable with its independent variables were analyzed using a multiple linear regression model analysis. In this study, the WTP for maintaining dental health was assessed by the parents with the function:

$$WTP = f(Inc, Edu, Age, Freq, Need) \qquad (4)$$

Meanwhile, the function expressed in the form of the WTP relationship with independent variables is:

$$WTP = \beta_0 + \beta_1 \, Inc + \beta_2 \, Edu + \beta_3 \, Age + \beta_4 \, Freq + \beta_5 \, Need + e \qquad (5)$$

where WTP = willingness to pay for caries prevention in children; Inc= parents' income; Edu = parents' education level; Age = parents' age; Freq = frequency of visits to dental health facilities; Need = perceived need for treatment; *e*= error term.

The model in this study used standardized regression coefficients or beta weights (β) because the variables are primary data measured in different units (Menard, 2011). Interpreting standardized coefficients for a causal relationship between independent and dependent variables needs the standard deviation information. A standard deviation increases the value of the independent variable. It is associated with a beta coefficient of standard deviation change in the value of the dependent variable (Freedman, 2009; Gignac, 2019). Therefore, to calculate the change in WTP because of a standard deviation

change in the independent variable, the standardized coefficient of the independent variable should be multiplied by the WTP's standard deviation.

Result and Discussion

There were 264 respondents participating in the valuation of caries prevention. In this study, the WTP value from each respondent was obtained by CVM conducted in the following five stages.

Establishing a market hypothesis

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Estimating the Mean of WTP (EWTP)

The WTP can be estimated by summing up the overall value of WTP, divided by the number of respondents. The total sample was 264 persons, and the WTP from each respondent is provided in the Appendix. Based on the calculation, the estimated mean of WTP for caries prevention obtained using the bidding game technique was IDR 103,371.

Estimating the Bid Curve

The respondents' WTP curve was calculated based on the WTP value and the number of respondents who chose the WTP value. Figure 2 describes the distribution of WTP for caries prevention. The lowest value was IDR 30,000, and the highest value was IDR 500,000 from 264 respondents.

Aggregating Data or the Value of Total WTP (TWTP)

The total WTP (TWTP) value was calculated based on the WTP data distribution using the TWTP formula. Based on the calculation, the total WTP for caries prevention was IDR 27,290,000.
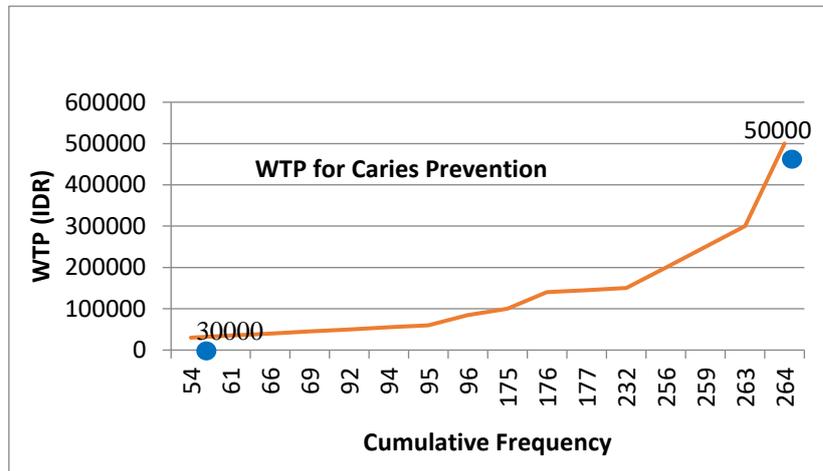

Figure 2 Willingness to Pay for Caries Prevention

The descriptive statistics are presented in Table 3, providing information about the mean, minimum, maximum, and standard deviation values for each variable from 264 samples.

Table 3 Descriptive Statistics

Variable	N	Mean	Min.	Max.	Std. Deviation
WTP	264	103,371	30,000	500,000	66,133
Inc	264	4,234,090	200,000	85,000,000	5,752,536
Edu	264	14	6	18	2.2
Age	264	40	26	63	6
Freq	264	2	0	48	4
Need	264	2	1	4	0.9

The WTP from 264 respondents was, on average, IDR 103,371. The lowest value that the respondents were willing to pay was IDR 30,000, and the highest was IDR 500,000. The standard deviation was IDR 66,133 or lower than the average value; therefore, the distribution of respondents' answers to the WTP was good.

Of the 264 respondents who worked as an entrepreneur and an employee, the average income level was IDR 4,234,090. The lowest income was IDR 200,000, and the highest income was IDR 85,000,000. The standard deviation was IDR 5,752,536, exceeding the average income value and showing that the distribution of respondents' income was not good.

The highest education attained by the respondents was a master's degree with a study duration of 18 years, while the lowest education was a primary school with a duration of

6 years. Of 100 respondents, the average education level was 14, equivalent to the undergraduate level. The standard deviation value of the education variable was 2.2, so the average value of the education was higher than the standard deviation. It could be concluded that the data distribution of respondents' answers about education was good. The oldest respondent was 63 years old, and the youngest age was 26 years old at the time of the study. The average age was 40 years old, with a standard deviation of 6. Since the standard deviation was lower than the average age, the age data distribution was good.

The findings found that, on average, the respondents took their children to visit a dental health facility twice a year. The least frequency of visits was 0, or the respondents never visited a dental health facility with their children. The highest frequency of visits was 48 times a year, which was claimed by the respondents who visited a dental health facility about once a week. The high frequency of visits could be for routine dental treatments. The data distribution of the visit frequency was not good because the standard deviation showed a value of 4, which is higher than the mean value.

The perceived need for treatment showed a mean value of 2. This means the average self-perceived need for treatment from 264 respondents is less than 50%. The minimum value was 1, representing zero perceived need for treatments or very low. The maximum value was 4, representing a perceived need for treatments higher than 50%. The standard deviation was 0.9 or less than the average, so the data distribution about the perceived need for treatment was good.

From the normality test based on Kolmogorov-Smirnov, the data passed the normality test. The VIF value for each independent variable showed no multicollinearity problems in this model. Therefore, the independent variables in this study passed the multicollinearity test. Using the Glejser test, no heteroscedasticity problem was found in this model. In other words, this model passed all classical assumption tests and could fit the subsequent analysis for the regression model.

Table 4 Regression Model

Variable	Coefficients
Inc	0.364***
	(34037.553)
Edu	0.176***
	(1698.825)
Age	0.014
	(570.499)
Freq	0.013
	(804.513)
Need	0.182***
	(4031.008)
Adj. R-Square	0.238
Prob. F-Stat	0.000

Dependent variable: WTP for caries prevention; ( ) is standard error; *significance at level 10%; **significance at level 5%; ***significance at level 1%

This study was analyzed using multiple linear regression to discover the associated factors and the model of parents' WTP to prevent caries among their children. The model observed the respondents' demographics, socio-economic characteristics, and the children's dental healthcare to evaluate how much the influence of each variable on the value of WTP.

This study shows that income has a significant and positive influence on WTP at a 1% level. Therefore, when the income increases by IDR 5,752,536 and the other factors are held constant, the WTP for caries prevention will increase by IDR 24,072. Education is significant at a 1% level, so the H_0 was rejected, and H_a was accepted. The standardized coefficient for the education variable was 0.176, hence education had a positive influence on WTP. Therefore, when a parent's education level increases by 2.2 years and the other factors are held constant, the WTP will increase by IDR 11,639. The age variable had a coefficient of 0.014, which gave a positive influence. However, the t-test result showed that age was insignificant at all levels, so H_0 was accepted, and H_a was rejected. Therefore, a parent's age did not significantly influence WTP. The dental visit frequency variable had a coefficient of 0.013, so it gave a positive influence. However, the t-test result shows that the frequency of visits to a dental health facility did not significantly impact WTP. Finally, the perceived need for treatment had a positive impact on WTP. With a higher perceived need for treatment, WTP could rise by IDR 12,036, given that the other factors are held constant.

The regression results showed that the income variable significantly affects WTP positively. It means the value of WTP increases as the income level increases, and vice versa, which is reasonable because parents tend to consider their spending carefully, including maintaining children's dental health. It is also possible that the high-income receivers' WTP is higher to get more benefits from goods or services. On the other hand, the low-income receivers may face budget constraints, so they spend less on certain needs, such as dental care. A previous study by Naavaal and Kelekar (2018) observed a link between socioeconomic status and students' school hour loss due to emergency dental care. Students with high-income parents were 31% less likely to lose school hours due to acute dental care than students with low-income parents. Further, students from low-income families consider that the priority is to purchase food and clothing (Banovcinova, Mydlikova, & Vodicková, 2018). The result from this study is in line with past studies analyzing economic valuation for dental health, stating that monthly income is a determining factor that influences WTP positively (Mubaraki et al., 2017; Srivastava et al., 2019; Walshaw et al., 2019).

Parent's education level and WTP were found to have a positive correlation. Parents with a higher education level stated a significantly higher WTP and vice versa. This aligns with a previous study by Nyamuryekung'e et al. (2018) in Tanzania, stating that outpatients' WTP pay for both anterior and posterior teeth filling services would be higher when the outpatients' education was higher (β=0.003; p<0.001). Mubaraki et al. (2017) also found a positive relation between WTP and education, although the influence was insignificant (β=2.446; p=0.366). Education level plays a vital role in increasing parents' understanding

and awareness of maintaining their children's dental health. Formal education contributes to parents' informed decision-making to fulfill the needs of the family members, including their children. Kim, Choi, Kim, & Pop-Eleches (2018) argued that education improves individual economic decision-making and rationality.

In this study, the age variable positively influences WTP (β=298.866) but is statistically insignificant (p=0.600), indicating that parents' WTP for caries prevention was not affected by the parents' age. This result is contradicted by the constructed hypothesis based on Sever et al. (2017), suggesting that there is a negative and significant effect of patients' age on their WTP for improvement in dental care. However, it should be noted that the previous study was conducted in Croatia's public dental clinic for patients of all ages. In contrast, most of the respondents in this study were within a certain age range, above 25 years old. However, parents' attention and awareness were still low. For instance, about 15% of parents never visited a dental service to check their children's orodental health. Besides that, some parents stated in the interview that they would not go to dental care if their children did not get a toothache. Similar to our findings, previous studies by Vernazza et al. (2015) and Srivastava et al. (2019) also failed to find any statistically significant influence of age on WTP for dental interventions.

When asked how many times the respondents brought their children to a dental health facility in a year, 39 parents answered they never did. Some parents maintained that they would visit dental service only when the children got a toothache or showed symptoms. Parents and children mostly visit a dental health facility once a year (123 responses). However, this study could not inform a significant influence of the visit frequency on WTP (β=276.971; p=0.729). Previously, Vernazza et al. (2015) also found that frequent dental visits and WTP were not linked significantly (β=27.46; p=0.230).

In this study, the insignificant influence could be attributed to parents' presumption that dental problems such as cavities are inevitable among children and losing teeth is part of growing up. This may make parents think that it is unnecessary to take children to the dentist earlier and more frequently unless there is a symptom of illness. Longurova et al. (2018) found that parents of 7-12 years old did not know when to take preventive dental care for their children, and it would put the children's health at risk. Interestingly, some parents from SDM Wirobajan 3 and SDM Suronatan claimed their children could go by themselves since dentists are already available at schools, so the parents could not tell the frequency precisely. Some parents also stated their children became regular out-patients of student dentists. Therefore, frequent visits to a dental service did not translate into a higher WTP.

This study found that the perceived need for treatment positively and significantly influences WTP. Parents perceive the risk status of their children seriously. If the dental status of children is riskier, parents are willing to spend a greater amount of money to minimize the risk. In the interview, parents were asked if their children had experienced any dental problems, and 58% revealed it was caries/cavities. The interview also collected information about children's daily consumption of sugary foods and drinks, and 72.3% of parents stated their children consumed sweet products every day. Parents would have

consistently higher valuations for dental services if there are dental problems and know their children's daily sugar intake. These perceptions increase the value of dental treatment (Nyamuryekung'e et al. (2018).

In DIY, routine dental examinations are scheduled by the local community health center. However, the examination results submitted to the schools are only for those with severe problems with pressing needs for medical treatment. In a worst-case scenario, the results are not even submitted at all. Therefore, the schools should play a more active role to know the examination results in detail and share with parents. It is needed to hire dentists working specifically for each school, and they will be responsible for implementing the program. Several schools already have dentists, for example, in SDM Suronatan and SDM Wirobrajan 3. Their work shift is once a week. However, there is no specific program, so not all students receive the benefits. In contrast, some schools do not yet have any dentists, such as in SDM Notoprajan.

Conclusion

This study examines the parents' willingness to pay (WTP) for their children's dental caries prevention program at elementary school. We surveyed 264 parents of students at three elementary schools in Yogyakarta City. The finding showed that the total WTP value for caries prevention was IDR 27,290,000, and the average value was IDR 103,371. Parents are willing to pay more as their income increases. Dental treatment costs are included in national health insurance (BPJS), although it does not cover all kinds of treatment.

With the information about WTP for dental prevention observed in the current study, the policymakers could evaluate the scheme or provide an alternative solution to decrease the prevalence of dental caries among children in Indonesia. Parents' education level significantly and positively affects WTP. The higher the education, the higher WTP is, and vice versa, which indicates that a better understanding of dental health and its impact on overall wellbeing encourages people to prioritize preventive measures like paying for a dental program before the problem happens. Therefore, raising awareness is important, and it could be done by holding socializations, campaigns, promotions, and educational events about dental health. Formal education contributes to parents' ability in the decision-making process about health. Schools can also foster this and help those who did not attain a high education level to make a more informed decision-making regarding health and wellbeing. Perceived need for treatment had a positive and significant influence on WTP, which means it is important to raise awareness of the risks among parents.

The findings of this study imply that preventive care for caries could be more effective to hold at schools. This may also imply socialization for parents about the importance of children's dental health, especially for those who did not attain a higher education level. The role of the government, especially the health department, is important in this regard, including the existence of subsidized or even free dental health facilities. Future studies will benefit from examining parents' education level and perceived need for treatment in

other Indonesian provinces because results may vary depending on social and economic circumstances.

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