

# Associations of Self-Reported Oral Health Quality of Life with Actual Oral Health Status in Children

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### Abstract

**Purpose:** Quality of life is considered a component of patient centered care. The purpose of this study was to examine the relationship between self-reported oral health related quality of life (OHRQoL) and the actual oral health status of children.

**Methods:** This retrospective cohort study consisted of pediatric dental chart reviews from three clinics. Demographic and dental visit data along with the child's OHRQoL utilizing the Pediatric Oral health-related Quality of Life (POQL) instrument, were collected. Associations with untreated decay, treated decay, or POQL score were tested, using Chi-square, Fisher's exact test, 2-sample t-tests, or ANOVA. Linear regression was used to evaluate the effect of statistical confounders in the relationship between untreated decay and POQL scores. Significance level was set to 0.05.

**Results:** Two hundred ninety-seven out of 336 children had both POQL and caries data. White children and children with untreated decay had significantly more negative POQL scores. Children rating their oral health as "excellent" or "very good" and children with sealants on molars had significantly more positive POQLs. Associations between POQL scores were significant with untreated decay, but not sealants, when considering both variables in the same model. After adjusting for having sealants, POQL scores were on average 7.5 points higher (more negative) in children with untreated decay, than in children without decay ( $p < 0.001$ ).

**Conclusions:** Collecting OHRQoL data allows oral health providers to easily incorporate patient perceptions in their assessment and care and would ensure that all oral health needs of the patients are being met. This is important for children, who may have difficulty expressing their concerns, particularly in clinical environments.

**Keywords:** health-related quality of life, pediatric health; oral health, person-centered care, dental caries

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### Introduction

Health care providers have traditionally been taught to use a "medical model" when treating patients. This model treats the person and their social difficulties as medical problems and does not consider any social determinants of health.<sup>1,2</sup> The literature has revealed that this medical model is not optimal due to its restrictions on the individual's self-identity.<sup>3</sup> Emergent trends in contemporary health care challenge providers to focus on the individual's "strengths, interests, positive functions, needs, and characteristics" rather than their disease.<sup>4,5</sup> This trend, "personhood," is considered a vital element for developing patient rapport and trust.

There is an abundance of evidence to support the concept that engaging people in their own health is a fundamental

aspect of providing high-quality health care.<sup>6-8</sup> For many decades, the World Health Organization has acknowledged that health goes beyond physical attributes and that an individual's quality of life should be considered as a component of patient care.<sup>9</sup> This concept was more recently emphasized in Healthy People 2020 when the United States (US) Surgeon General incorporated quality of life into its measures. A goal was included to promote "quality of life, healthy development, and health behaviors across all life stages."<sup>10</sup> More importantly, health care providers must also be aware that one's quality of life is determined by the patient, and not the provider.<sup>11</sup>

The need to consider quality of life is not exclusive to medical providers. This concept is also essential in dentistry. The American Dental Education Association Commission on Change and Innovation in Dental Education (ADEA CCI) 2.0 is a group of dental education stakeholders concerned with establishing oral health education and practice strategies that are responsive, practical, and collaborative. One of the three goals targeted by the ADEA CCI 2.0 in 2017, was person-centered health care.<sup>12</sup> It has been asserted that person-centered health care will become the dominant model of health care delivery in the future and members of the ADEA CCI 2.0 have been establishing innovative ways to prepare the dental workforce for this change.<sup>13</sup>

One practical method to integrate person-centered care into practice is by including oral-health related quality of life questions (OHRQoL) into patient assessments. These questions are based on the assertion that an acceptable level of oral health, comfort, and function is essential to a person's overall health.<sup>14</sup> Oral-health related quality of life has been defined as a "multidimensional construct that reflects, among other things, an individual's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health."<sup>15</sup>

The University of Missouri – Kansas City Oral Health-Related Quality of Life (UMKC OHRQL) theoretical model, a conceptual model designed to be a foundation for "assessing, planning, implementing, and evaluating" OHRQoL outcomes, was developed in 1998 by Williams et al.<sup>16</sup> This model was designed to provide dental hygienists with a framework for developing the current person-centered care environment.<sup>16,17</sup> Darby and Walsh discussed the importance of OHRQoL when developing the human needs conceptual model (HNM) for dental hygiene practice.<sup>17</sup> While acknowledging OHRQoL in the 1993 publication,<sup>17</sup> the most recent version of the HNM incorporates eight human needs into the dental hygiene process of care,<sup>18</sup> but does not explicitly capture OHRQoL outcomes in the same way as the UMKC OHRQL theoretical model.<sup>15</sup> The UMKC OHRQL model requires examination of specific characteristics of the individual including, sociocultural influences, environmental influences, and economic influences,<sup>15</sup> thereby capturing the biopsychosocial measures in the assessment process for consideration in the dental hygiene process of care.<sup>18</sup> The UMKC OHRQL model was one of several models studied by Brondani and MacEntree.<sup>19</sup> In their findings, Brondani and MacEntree acknowledge the UMKC OHRQL model as being one of a few OHRQoL models to illustrate a change in the understanding of oral health to being about more than just illness.<sup>19</sup> Yet, a recent study exploring how the UMKC

OHRQL model is being applied in education, research, and practice, found that the collection and use of quality of oral health data has been minimal in all three settings.<sup>20</sup> While the foundation has been laid for oral health care practitioners to embrace the person-centered care model, it will take greater effort to bring the education and practice community onboard. For the remainder of this paper, OHRQoL will refer to what is known in the literature as oral health-related quality of life.

The literature on OHRQoL as it applies to adult populations has existed for several decades, however, research on OHRQoL in children has been limited. A variety of instruments for capturing OHRQoL in children have been developed in recent years.<sup>21–25</sup> The Pediatric Oral health-related Quality of Life (POQL) instrument was developed by a team of researchers from Boston University, with an emphasis on capturing experiences and views of children and has been shown to be valid and reliable as a measure of OHRQoL in children.<sup>26</sup> A study by Gadbury-Amyot et al. revealed that asking OHRQoL questions of children could be integrated into the process of care with minimal disruption and time.<sup>27</sup> The investigators found that asking OHRQoL questions of children using the POQL instrument only added an average of 6 minutes to the appointment. Additionally, oral healthcare workers noted that having the OHRQoL information directly from the child, provided greater insight about the child and their oral health.

The POQL has been validated across a wide variety of populations.<sup>26,28–30</sup> However, Huntington et al. evaluated the POQL in children from a general, metropolitan population in the US, not limited to a specific race/ethnic group, in order to validate the instrument.<sup>26</sup> Further studies are needed to demonstrate that the POQL score is a good indicator for a child's actual oral health in general populations across the US. The purpose of this study was to examine the relationship between demographics, health perceptions, dental characteristics, and self-reported OHRQoL with actual oral health status for children.

## Methods

This retrospective cohort study was approved by the University of Missouri-Kansas City Institutional Review Board (#17-040).

### *Sample population*

A mobile school-based dental program in Kansas, a fixed school-located dental program in Missouri, and a fixed safety net dental clinic in Missouri, participated in this study. All three programs were associated with community health

centers and were each unique in the way they delivered oral health care services to children. One program employed dental hygienists to deliver oral health care in schools using portable equipment for the delivery of care. Another program employed a more traditional mix of dental workforce personnel where they delivered oral health care services in fixed school-located dental clinics. The third program conducted screenings in schools, but the actual delivery of care was provided by dentists and dental hygienists in two safety-net dental clinics in the community.

### Survey instrument

All three participating programs agreed to integrate a short survey containing the POQL instrument into their standard process of care; hereafter, referred to as the Child Self-Report POQL. Dental hygienists administered the survey by verbally asking children the POQL questions and documenting their answers on a paper copy of the instrument. The survey instrument contained six standalone questions, three on child's self-reported health and oral health perceptions and three on the child's self-reported dental history, in addition to the ten original POQL items. The ten POQL questions, which were used to generate the POQL score, elicited concerns that the child had regarding their oral health in the last three months and the frequency and severity of those concerns. The survey instrument is shown in Table I.

### Data collection

Each clinic generated a list of children who had received dental care at specified school-based dental clinics during a three-month window of time. A retrospective chart review was performed for each child on the list. Data was abstracted from the child's electronic health record including patient record number, demographic data (age at last visit, gender, race, ethnicity, and insurance status), dental visit data (visit date, number of primary and permanent teeth present, number of teeth with treated and untreated decay, number of permanent molars eligible for and having sealants), and Child Self-Report POQL results. Abstracted data was entered into REDCap (Research Electronic Data Capture; <http://project-redcap.org/>) and subsequently downloaded into Stata 15.1 (Stata Corp; College Station, TX, USA College Station, TX, USA). All data was abstracted from the child's most recent visit that contained all the dental data of interest and Child Self-Report POQL.

### Statistical analysis

The POQL score was calculated from the ten original questions only, according to instructions obtained from the authors of the POQL instrument. Scores could range from

**Table I. Child self-report POQL instrument questions**

How would you rate your health in general?
In general, how would you rate the health of your <i>teeth and mouth</i> ?
Compared to one year ago, how would you describe the health of your teeth and mouth <i>now</i> ?
<b>In the past 3 months...</b>
1. Did you have pain because of your teeth or mouth?
2. Did you have trouble eating any foods (hard/hot/cold) because of your teeth or mouth?
2. Did you have trouble paying attention in school because of your teeth or mouth?
4. Did you miss school because of your teeth or mouth?
5. Did you not want to laugh or smile around others because of your teeth or mouth?
6. Did you worry that you were not good looking to others because of your teeth or mouth?
7. Were you unhappy with the way you looked because of your teeth or mouth?
8. Were you angry or upset because of your teeth or mouth?
9. Did you feel worried because of your teeth or mouth?
10. Did you cry because of your teeth or mouth?
In general, how would you describe your experiences with your dentist?
When was your last visit to a dentist?
What was the reason(s) for your last dental visit? <i>Please select all that apply.</i>

0 (most positive OHRQoL rating) to 100 (most negative OHRQoL rating). Additional standalone questions on child self-reported health and oral health perceptions within the Child Self-Report POQL were dichotomized. Child rated health in general and rated oral health in general were collapsed to "excellent" or "very good" versus "good", "fair", or "poor." The Child rating of their oral health at present day compared to one year ago was dichotomized to "much better" or "somewhat better" versus "about the same", "somewhat worse", or "much worse".

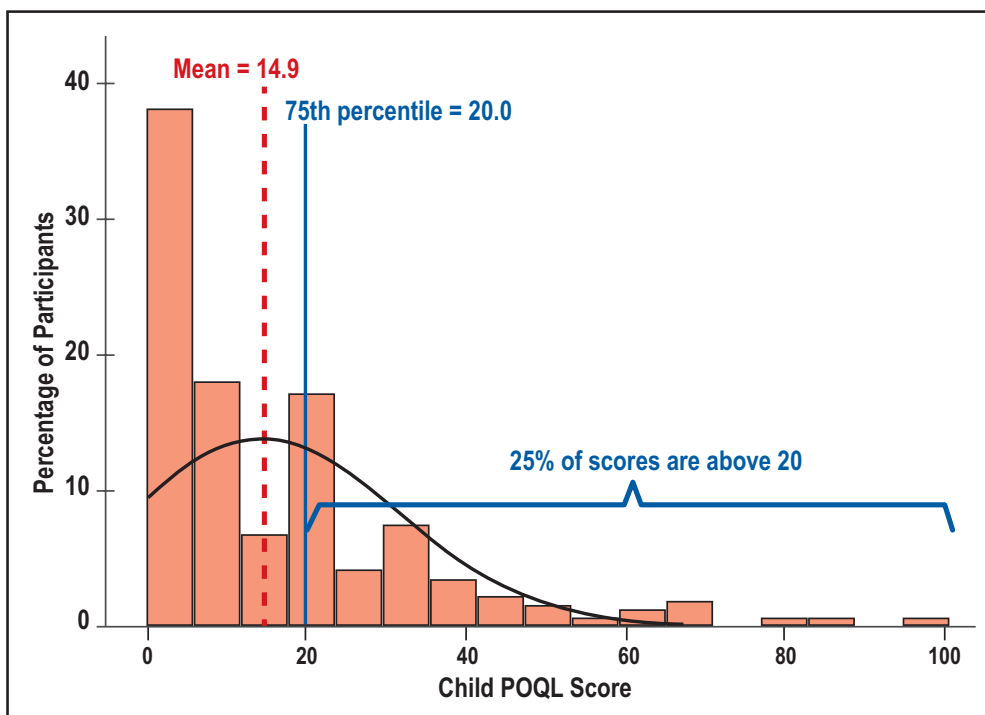
Descriptive statistics were calculated for all variables of interest. Associations between child characteristics and untreated or treated decay was evaluated using Chi-square or Fisher's exact tests. Two-sample t-tests with unequal variances, ANOVA, or Welch's ANOVA were used to test associations between the child characteristics and POQL score. To ensure that difference in the location (the state in which the clinics

were located) did not impact the relationship between oral health variables of interest and child POQL scores, a test to determine whether the specific state of location was an effect modifier of those relationships was performed using linear regression with robust standard errors. No effect modification of those relationships was found. Multivariable linear regression models with robust standard errors were also used to evaluate the association between child POQL scores and any significant dental variables after adjusting for any variables found to be statistical confounders (significantly associated with both predictor and outcome). The significance level was set to 0.05.

## Results

Data was obtained from the dental records of 315 children, between the ages of 8 to 14, who had complete POQL score data. Participants had an average POQL score of 14.9 ( $\pm$  17.1) where 0 (most positive) was the minimum and 100 (most negative) was the maximum value scored. However, most of the participants had a POQL score of 20 or less (75%) and only 25% of the participants had a POQL score greater than 20 (more negative). The distribution of the POQL scores of the sample are shown in Figure 1. Of the 315 participants with POQL scores, 94% (n=297) had complete caries data charted; 45% (n=134) had untreated decay and 62% (n=184) had treated decay.

**Figure 1. Distribution of child POQL score with a normal density curve showing the Mean and 75th Percentile of the POQL scores overlay.**



## Demographics

The majority of the children were between 9 and 12 years old (62%, n=183), female (52%, n=155), identified as White race (61%, n=181), and had Medicaid insurance (71%, n=211). Age was not significantly associated with untreated or treated decay nor was it associated with the child's POQL score. Gender and Hispanic ethnicity were both significantly associated with untreated decay. Males were significantly more

likely to have untreated decay than females (52%, n=74 vs 39%, n=60) ( $p=0.020$ ). Hispanics were significantly more likely to have untreated decay than non-Hispanics (59%, n=71 vs 36%, n=25) ( $p=0.002$ ). Of the child demographic variables, only insurance status was significantly associated with treated decay. Children with Medicaid insurance were significantly more likely to have treated decay than children with private or no insurance (71%, n=149 vs 62%, n=13 and 33%, n=18 respectively) ( $p<0.001$ ). Race was the only demographic variable associated with child's POQL score. White children had significantly more negative mean POQL scores compared to children from other races (16.8 vs 11.5) ( $p=0.019$ ). Associations between decay and demographic characteristics are shown in Table II.

## Child health perceptions

About half of the children rated their health in general as "excellent" or "very good" (54%, n=160). In contrast, only 37% (n=110) of the children rated their oral health in general as "excellent" or "very good". Additionally, when asked the question, "Compared to one year ago, how would you describe the health of your teeth or mouth now?", half of the children (50%, n=147) reported "about the same", "somewhat worse", or "much worse." Oral health ratings were significantly associated with whether the child had untreated decay and with the child's POQL score. Children who had rated their oral health as "excellent" or "very good," in general, were significantly less likely to have untreated decay (29%, n=32 vs 54%, n=98) ( $p<0.001$ )

**Table II. Decay and POQL scores associations with demographic characteristics (n=297)**

	Entire Sample	Untreated decay*			Treated decay*			POQL score*	
		No n=163	Yes n=134	p-value†	No n=111	Yes n=184	p-value†	Mean (SD)	p-value‡
		n (%)	n (%)		n (%)	n (%)			
<b>Age (years)</b>				<b>0.378</b>			<b>0.374</b>		<b>0.106¶</b>
8	78 (26.3)	38 (48.7)	40 (51.3)		34 (44.2)	43 (55.8)		12.3 (15.1)	
9-12	183 (61.6)	106 (57.9)	77 (42.1)		65 (35.7)	117 (64.3)		15.1 (17.8)	
13-14	36 (12.1)	19 (52.8)	17 (47.2)		12 (33.3)	24 (66.7)		19.3 (16.8)	
<b>Gender</b>				<b>0.020</b>			<b>0.424</b>		<b>0.094</b>
Male	142 (47.8)	68 (47.9)	74 (52.1)		56 (40.0)	84 (60.0)		13.2 (16.0)	
Female	155 (52.2)	95 (61.3)	60 (38.7)		55 (35.5)	100 (64.5)		16.4 (17.9)	
<b>Race</b>				<b>0.485</b>			<b>0.719</b>		<b>0.019</b>
White Race	181 (60.9)	89 (49.2)	92 (50.8)		70 (39.1)	109 (60.9)		16.8 (18.3)	
Other	55 (18.5)	30 (54.5)	25 (45.5)		23 (41.8)	32 (58.2)		11.5 (13.9)	
Missing	61 (20.5)	44 (72.1)	17 (27.9)		18 (29.5)	43 (70.5)		—	
<b>Ethnicity</b>				<b>0.002</b>			<b>0.079</b>		<b>0.137</b>
Not Hispanic	70 (23.6)	45 (64.3%)	25 (35.7)		21 (30.0)	49 (70.0%)		13.4 (15.8)	
Hispanic	121 (40.7)	50 (41.3)	71 (58.7)		51 (42.9)	68 (57.1)		17.1 (18.1)	
Missing	106 (35.7)	68 (64.2)	38 (35.8)		39 (36.8)	67 (63.2)		—	
<b>Insurance</b>				<b>0.298§</b>			<b>&lt;0.001</b>		<b>0.083•</b>
Medicaid	211 (71.0)	117 (55.5)	94 (44.5)		61 (29.0)	149 (71.0)		15.0 (16.4)	
Private	22 (7.4)	15 (68.2)	7 (31.8)		8 (38.1)	13 (61.9)		9.5 (12.7)	
None	54 (18.2)	25 (46.3)	29 (53.7)		36 (66.7)	18 (33.3)		15.8 (17.7)	
Other	5 (1.7)	2 (40.0)	3 (60.0)		3 (60.0)	2 (40.0)		39.8 (37.5)	
Missing	5 (1.7)	4 (80.0)	1 (20.0)		3 (60.0)	2 (40.0)		—	

\*Missing data (including missing caries data) were excluded from tests of associations.

†Chi-square tests except where otherwise indicated; ‡2 sample t-tests (unequal variance) except where otherwise indicated

¶Oneway ANOVA; §Fisher's exact tests; •Welch's ANOVA

and had significantly more positive mean POQL scores (10.5 vs 17.5) ( $p < 0.001$ ) than those who rated their oral health as “good”, “fair”, or “poor.” Participants who described their oral health now compared to one year ago as “much better” or “somewhat better” were significantly more likely to have treated decay than children who said it was “about the same”, “somewhat worse”, or “much worse” (70%,  $n = 98$  vs 55%,  $n = 80$ ) ( $p = 0.008$ ) Associations of the POQL scores with child health perceptions and dental characteristics and conditions are shown in Table III.

### Dental characteristics

At their most recent dental visit, most of the participants had sealants on molars (70%,  $n = 207$ ). Having sealants placed on molars was significantly associated with untreated decay and child's POQL score. A child with sealants placed on molars was significantly less likely to have untreated decay (36%,  $n = 75$  vs 65%,  $n = 57$ ) ( $p < 0.001$ ) and had significantly more positive mean POQL scores (13.2 vs 17.8) ( $p = 0.037$ ) than a child with no sealants placed on molar teeth. Children with untreated decay had significantly more negative mean

**Table III. Untreated or treated decay and POQL score associations**

	Entire Sample n = 297 n (%)	Untreated Decay*			Treated Decay*			Child POQL Score*	
		No n = 163 n (%)	Yes n = 134 n (%)	p-value†	No n = 111 n (%)	Yes n = 184 n (%)	p-value†	Mean (SD)	p-value‡
<b>General health rating</b>				<b>0.284</b>			<b>0.118</b>		<b>0.633</b>
Excellent or Very Good	160 (53.9)	84 (52.5)	76 (47.5)		66 (41.8)	92 (58.2)		14.3 (17.3)	
Good, Fair, or Poor	131 (44.1)	77 (58.8)	54 (41.2)		43 (32.8)	88 (67.2)		15.3 (16.8)	
Missing	6 (2.0)	2 (33.3)	4 (66.7)		2 (33.3)	4 (66.7)		—	
<b>Rated health of mouth or teeth</b>				<b>&lt;0.001</b>			<b>0.074</b>		<b>&lt;0.001</b>
Excellent or Very Good	110 (37.0)	78 (70.9)	32 (29.1)		48 (44.0)	61 (56.0)		10.5 (14.1)	
Good, Fair, or Poor	180 (60.6)	82 (45.6)	98 (54.4)		60 (33.5)	119 (66.5)		17.5 (18.2)	
Missing	7 (2.4)	3 (42.9)	4 (57.1)		3 (42.9)	4 (57.1)		—	
<b>Described health of teeth and mouth compared to 1 year ago</b>				<b>0.144</b>			<b>0.008</b>		<b>0.535</b>
Much better or Somewhat better	141 (47.5)	84 (59.6)	57 (40.4)		42 (30.0)	98 (70.0)		15.1 (17.3)	
About the same, Somewhat worse, or Much worse	147 (49.5)	75 (51.0)	72 (49.0)		66 (45.2)	80 (54.8)		13.9 (16.5)	
Missing	9 (3.0)	4 (44.4)	5 (55.6)		3 (33.3)	6 (66.7)		—	
<b>Sealants placed on molar teeth</b>				<b>&lt;0.001</b>			<b>0.199</b>		<b>0.037</b>
No	88 (29.6)	31 (35.2)	57 (64.8)		31 (35.2)	57 (64.8)		17.8 (17.5)	
Yes	207 (69.7)	132 (63.8)	75 (36.2)		132 (63.8)	75 (36.2)		13.2 (16.3)	
Missing	2 (0.7)	0 (0.0)	2 (100.0)		0 (0.0)	2 (100.0)		—	

\*Missing data (including missing caries experience data) were excluded from tests of associations.

†Chi-square tests; ‡2 sample t-tests (unequal variance)

POQL scores (18.8 vs 11.0) ( $p < 0.001$ ). Associations between untreated and treated decay with POQL scores are shown in Figure 2.

**Adjusted associations with POQL scores**

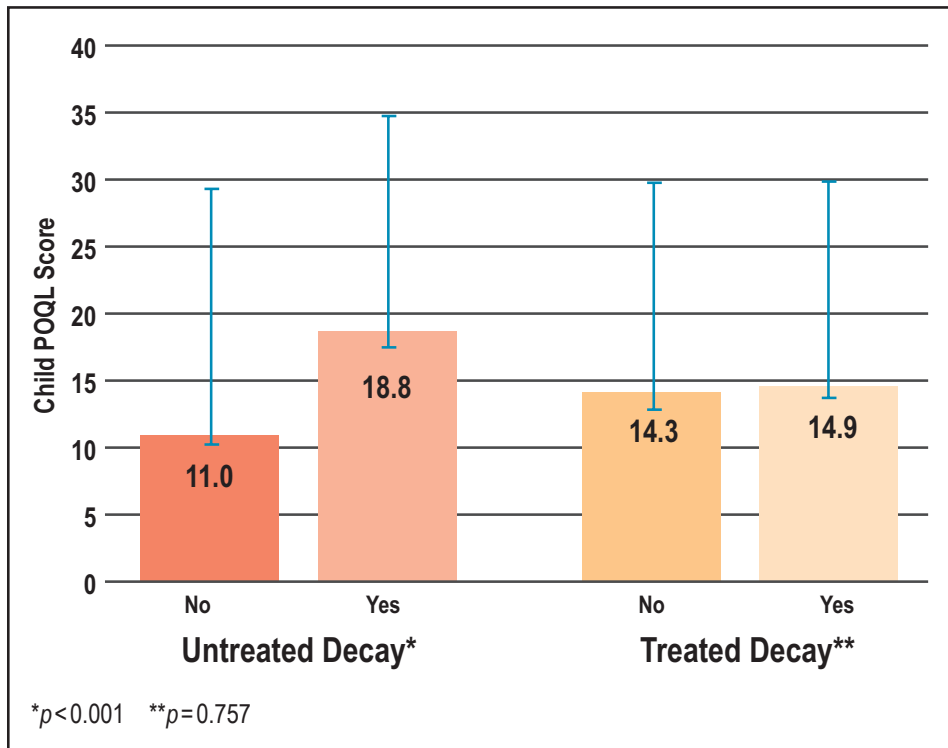
Having sealants on molar teeth and childrens’ perceptions of their oral health were confounders for the association between untreated decay and POQL scores. Therefore, the association between untreated decay and POQL scores was evaluated after adjusting for these variables. The association between untreated decay and POQL scores remained significant in a model adjusting for sealants on molars (slope=7.23,  $p < 0.001$ ), in a model adjusting for child’s rating of their oral health (slope=6.12,  $p = 0.002$ ), and in a model adjusting for both (slope=5.53,  $p = 0.008$ ). Child’s rating of their oral health was significant after adjusting for untreated decay (slope=-5.34,

$p = 0.005$ ) and after adjusting for both untreated decay and sealants on molars (slope=-5.54,  $p = 0.004$ ). However, having sealants on molars was no longer associated with POQL scores in any adjusted model (Table IV).

**Discussion**

A strong association was found between a child’s self-reported oral health quality of life measure and their actual oral health. Children with untreated decay had more negative POQL scores than children with no untreated decay, similar to the Huntington et al. findings from the POQL instrument validation study. Huntington et al. examined over 3,000 children during a 3-year time period from different schools and dental clinics across a metropolitan area.<sup>26</sup> Children with caries, defined as active, untreated decay or any other current

**Figure 2: Associations between untreated and treated decay with POQL score evaluated with 2 sample t-tests with unequal variances.**



dental need requiring immediate treatment, had significantly higher POQL scores than children who were caries free (9.4 vs 6.4) ( $p = 0.003$ ). In this sample of children ( $n = 297$ ), an average POQL for children with and without untreated decay was found to be nearly twice that of Huntington et al. This is most likely due to the differences in regions where the children were living, the Northeast versus the Midwest, and to the much larger sample size of the Huntington et al. study.<sup>26</sup> However, even in studies of Native American Indian children, who have been found to have a high caries rate, caregiver reported POQL scores were significantly higher in children having early childhood caries<sup>29</sup> or with higher utilization rates of urgent dental services during the past year.<sup>31</sup> Notably, the POQL scores were not associated with treated decay, indicating that this particular OHRQoL instrument is sensitive to current oral health concerns and not dental treatment that had occurred in the past.

Results from this study revealed a significantly more positive POQL score in children with sealants placed on molar teeth than children without sealants. Dental sealants have been shown to prevent more than 80% of cavities in the posterior teeth, where the majority of cavities occur<sup>32-34</sup> and it is not surprising that children with sealants placed on molar teeth had a more positive oral health quality of life than the children with without sealants. However, using a model that evaluated the associations of POQL scores with both untreated decay and molar sealants together, only the untreated decay was found to be significantly associated with POQL scores. It appears that the relationship between sealant placement and the POQL score was confounded by the child's current level of untreated decay, suggesting that the OHRQoL in this sample was primarily driven by the child's current decay status.

Children with Medicaid or private dental insurance in this study had significantly higher rates of treated decay than children without any dental insurance. This may

be due to the fact that children with dental insurance coverage are more likely to have treatment performed when needed, than children without insurance coverage.<sup>35</sup> White children reported significantly more negative OHRQoL than nonwhite children in this study. It is unclear why this result was found. Future studies should further explore this difference.

Children's perceptions of their oral health were strongly associated with untreated decay in this study. Children who rated their oral health as "excellent" or "very good" had significantly lower rates of untreated decay than children who rated their oral health as "good", "fair", or "poor". Results from this study demonstrate that the patient's perception of their present oral health was captured by the POQL instrument.

The Child Self-report POQL instrument shows promise in facilitating person-centered oral health care. The only cost is the minimal amount of time it takes to administer the instrument. Baseline knowledge of a child's concerns with their oral health can be easily and effectively elicited with the use of this instrument. Follow-up by the oral health care provider on issues that are brought up by the child can aid in improving the child's overall oral health and oral health quality of life. Oral health providers have reported that the POQL questions help to elicit valuable information, such as a child being bullied because of how their teeth looked, that they would not have otherwise known.<sup>27</sup> Traditionally, dental providers in community health settings have not collected quality of life data from the patients during their visits. Oral health care providers should consider integrating OHRQoL instruments as key components of person-centered care, to help ensure that they are able to understand the oral health concerns of their patients, especially children.

**Table IV. Associations with Child POQL scores\* after Adjustment for Confounding using Linear Regression with Robust Standard Errors.**

	POQL Score								
	Adjusted Model 1			Adjusted Model 2			Adjusted Model 3		
	Mean Difference	95% CI**	p-value	Mean Difference	95% CI**	p-value	Mean Difference	95% CI**	p-value
<b>Untreated decay</b>			<b>&lt;0.001</b>			<b>0.002</b>			<b>0.008</b>
No	reference			reference			reference		
Yes	7.23	(3.33, 11.14)		6.12	(2.31, 9.93)		5.53	(1.47, 9.58)	
<b>Sealants on molar teeth</b>			<b>0.232</b>			<b>--</b>			<b>0.133</b>
No	reference			--	--		reference		
Yes	-2.64	(-6.97, 1.7)		--	--		-3.32	(-7.66, 1.01)	
<b>Rated health of mouth or teeth</b>			<b>--</b>			<b>0.005</b>			<b>0.004</b>
Good, Fair, or Poor	--	--		reference			reference		
Excellent or Very Good	--	--		-5.34	(-9.05, -1.63)		-5.54	(-9.3, -1.77)	

\* Adjusted for confounding using linear regression with robust standard errors.

\*\*CI = Confidence Interval

### **Implications of findings and limitations**

This study highlights the benefits of utilizing OHRQoL as part of data collection in a person-centered healthcare environment, where patient perceptions play a critical role in their overall assessment and care. It is particularly important to ensure that the oral health care being provided to pediatric patients considers the oral health factors that are important to the individual child.

This study had several limitations. This study was limited to convenience data from three types of dental clinics located in two states, limiting the generalizability of the results. Furthermore, neither the clinics nor the sample population were randomized for enrollment and unmeasured factors could confound associations in the sample. Additionally, each participant's dental data and the POQL results were taken from the same dental visit. Hence, any causality of the association between POQL scores and dental data would be hard to infer. Future studies should include a larger sample population across multiple states. An important next step in this research would be to conduct a prospective cohort study to evaluate a child's OHRQoL at the initial baseline visit and evaluate whether the OHRQoL is a predictor for future dental needs.

### **Conclusion**

Higher rates of untreated decay were associated with a more negative OHRQoL in pediatric patients. Oral health care providers should be encouraged to move to a more person-centered care model, where data such as oral health quality of life are collected and factored into patient care. Use of an OHRQoL assessment tool for evaluating a child's oral health quality of life is strongly associated with their actual dental health and can be a powerful aid in understanding the oral health perceptions and needs of pediatric patients.

### **Disclosure**

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## References

1. Lyman KA. Bringing the social back in: a critique of the biomedicalization of dementia. *Gerontologist*. 1989 Oct;29(5):597–605.
2. CDC. Social determinants of health frequently asked questions [Internet]. Atlanta (GA): Centers for Disease Control; 2017 [cited 2018 Jul 18]. Available from: <https://www.cdc.gov/nchhstp/socialdeterminants/faq.html>.
3. Kitwood T. The technical, the personal, and the framing of dementia. *Soc Behav*. 1988;3(2):161–79.
4. Harrison C. Personhood, dementia and the integrity of a life. *Can J Aging*. 1993;12(4):428–40.
5. Fazio S. The individual is the core-and key-to person-centered care. *Generations*. 2013 Fall;37(3):16–22.
6. Nilsen ES, Myrhaug HT, Johansen M, et al. Methods of consumer involvement in developing healthcare policy and research, clinical practice guidelines and patient information material. *Cochrane Database Syst Rev* [Internet]. 2006 Jul 19 [cited 2018 Jul 18];3:CD004563. Available from: <http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD004563.pub2/full>.
7. Elwyn G, Frosch D, Thomson R, et al. Shared decision making: a model for clinical practice. *J Gen Intern Med*. 2012 Oct;27(10):1361–7.
8. Kon AA. The shared decision-making continuum. *JAMA*. 2010 Aug 25;304(8):903–4.
9. WHO. World health assembly resolution WHA51.12 - health promotion [Internet]. Geneva (CH): World Health Organization; 2018 [cited 2018 Jul 18]. Available from: <http://www.who.int/healthpromotion/wha51-12/en/>.
10. FDI World Dental Federation. Oral health and quality of life [Internet]. Geneva (CH): FDI World Dental Federation; 2019 [cited 2019 Oct 22]. Available from: <https://www.fdiworldddental.org/resources/policy-statements-and-resolutions/oral-health-and-quality-of-life>.
11. Salehi A, Harris N, Sebar B, et al. Self-perception of quality of life and its association with lifestyle behaviours of young Iranian women. *Iran J Public Health*. 2015 Mar;44(3):332–40.
12. Palatta AM, Kassebaum DK, Gadbury-Amyot CC, et al. Change is here: ADEA CCI 2.0—a learning community for the advancement of dental education. *J Dent Educ*. 2017 Jun 1;81(6):640–8.
13. American Dental Education Association. ADEA CCI 2.0 [Internet]. Washington (DC): American Dental Education Association; 2016 September [cited 2018 Jul 18]. Available from: <http://www.adea.org/cci/>.
14. Inglehart MR. Oral health-related quality of life. 1st ed. Bagramian R, editor. Chicago: Quintessence Pub Co; 2011. 208 p.
15. NIDCR. Oral health in America: a report of the Surgeon General (executive summary) [Internet]. Bethesda (MD): National Institute of Dental and Craniofacial Research; 2018 [cited 2018 Jul 18]. Available from: <https://www.nidcr.nih.gov/research/data-statistics/surgeon-general>.
16. Williams KB, Gadbury-Amyot CC, Bray KK, et al. Oral health-related quality of life: a model for dental hygiene. *J Dent Hyg*. 1998;72(2):19–26.
17. Darby ML, Walsh MM. A proposed human needs conceptual model for dental hygiene: part I. *J Dent Hyg*. 1993 Oct;67(6):326–34.
18. Bowen D, Pieren J. Darby and Walsh Dental Hygiene: Theory and practice. 5th ed. Saunders; 2019. 1072 p.
19. Brondani MA, MacEntee MI. Thirty years of portraying oral health through models: what have we accomplished in oral health-related quality of life research? *Qual Life Res*. 2014 May;23(4):1087–96.
20. Gadbury-Amyot CC, Austin KS, Simmer-Beck M. A review of the oral health-related quality of life (OHRQL) model for dental hygiene: Eighteen years later. *Int J Dent Hyg*. 2018 May;16(2):267–78.
21. Cunnion DT, Spiro A, Jones JA, et al. Pediatric oral health-related quality of life improvement after treatment of early childhood caries: a prospective multisite study. *J Dent Child (Chic)*. 2010 Apr;77(1):4–11.
22. Li L, Wang H, Han X. Oral health-related quality of life in pediatric patients under general anesthesia: a prospective study. *Medicine (Baltimore)*. 2017 Jan;96(2):e5596.

23. Jokovic A, Locker D, Stephens M, et al. Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. *J Dent Res.* 2002 Jul;81(7):459–63.
24. Broder HL, Wilson-Genderson M. Reliability and convergent and discriminant validity of the Child Oral Health Impact Profile (COHIP Child’s version). *Community Dent Oral Epidemiol.* 2007 Aug;35 Suppl 1:20–31.
25. Pahel BT, Rozier RG, Slade GD. Parental perceptions of children’s oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). *Health Qual Life Outcomes.* 2007 Jan 30;5:6.
26. Huntington NL, Spetter D, Jones JA, et al. Development and validation of a measure of pediatric oral health-related quality of life: the POQL. *J Public Health Dent.* 2011 Summer;71(3):185–93.
27. Gadbury-Amyot CC, Simmer-Beck ML, Scott JM. Implementing the Pediatric Oral Quality of Life (POQL) instrument in clinical practice: early results. *Can J Dent Hyg.* 2018 Jun;52(2):122–31.
28. Yazicioglu I, Jones JA, Cortés D, et al. Hispanic parents’ reading language preference and pediatric oral health-related quality of life. *J Public Health Dent.* 2013 Sep 1;73(4):329–38.
29. Braun PA, Lind KE, Henderson WG, et al. Validation of a pediatric oral health-related quality of life scale in Navajo children. *Qual Life Res.* 2015 Jan;24(1):231–9.
30. Yazicioğlu İ, Jones J, Doğan C, et al. Validity and reliability of a Turkish pediatric oral health-related quality of life measure. *Eur Oral Res.* 2018 Jan;52(1):27–35.
31. Braun PA, Lind KE, Batliner T, et al. Caregiver reported oral health-related quality of life in young American Indian children. *J Immigr Minor Health.* 2014 Oct;16(5):951–8.
32. Griffin SO, Wei L, Gooch BF, et al. Vital signs: dental sealant use and untreated tooth decay among U.S. school aged children. *MMWR Morb Mortal Wkly Rep.* 2016 Oct 21;65:1141–5.
33. Griffin SO, Oong E, Kohn W, et al. The effectiveness of sealants in managing caries lesions. *J Dent Res.* 2008 Feb;87(2):169–74.
34. Griffin SO, Naavaal S, Scherrer C, et al. Evaluation of school-based dental sealant programs: an updated community guide systematic economic review. *Am J Prev Med.* 2017 Mar;52(3):407–15.
35. Fisher MA, Mascarenhas AK. A comparison of medical and dental outcomes for Medicaid-insured and uninsured Medicaid-eligible children: a U.S. population-based study. *J Am Dent Assoc.* 2009 Nov 1;140(11):1403–12.