

# Factors influencing the use of oral health services among adolescents in New Zealand

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## ABSTRACT

**Objectives:** This study investigated the impact of parental use of dental services, ethnicity and socio-economic background on adolescents' recent use of dental services.

**Design:** Secondary analysis of cross-sectional data from the 2009 New Zealand Oral Health Survey (2009 NZOHS).

**Participants/Materials and Methods:** A sub-sample of all adolescent participants aged 12-17 years (n=509) from the nationally representative 2009 NZOHS. The NZOHS included self-report data on oral health status, risks and protective factors, and utilisation of oral health services.

**Main outcome measures:** Outcome measures were 'most recent dental visit' and 'type of provider last visited'. Key exposure factors were 'most recent dental visit by primary caregiver' (among 12-14-year-olds), ethnicity, and socioeconomic deprivation. Univariate analysis for each outcome was conducted using survey-weighted estimates, followed by multivariable analysis using logistic regression.

**Results:** Four in five adolescents reported having visited a dental provider within the last year (79.9%), with almost half having last visited a private general dental practice (46.6%). No significant associations were found for either outcome with the primary caregiver exposure factor (Most recent dental visit outcome fully adjusted OR (primary caregiver not visited) = 0.93, 95% CI 0.32, 2.72; Visited provider other than private general dental practice outcome fully adjusted OR (primary caregiver not visited) = 1.60, 95% CI 0.39, 6.57). Compared to European/Other adolescents, Māori and Pacific adolescents were significantly more likely to have not visited in the last year (Māori 12-14 years fully adjusted OR = 4.20, 95% CI 1.54, 11.50; Pacific 12-17 years fully adjusted OR = 2.61, 95% CI 0.84, 8.07 – the latter was not significant after adjusting for socioeconomic deprivation), and significantly less likely to have last visited a private general dental practice (Māori 12-17 years fully adjusted OR = 2.16, 95% CI 1.13, 4.12; Pacific 12-17 years fully adjusted OR = 5.15, 95% CI 1.69, 15.74).

**Conclusion:** Ethnicity was strongly associated with use of oral health services among New Zealand adolescents. No statistically significant evidence was found that primary caregiver use of oral health services or socioeconomic deprivation were impacting on adolescent uptake of oral health services.

## INTRODUCTION

The three national oral health surveys conducted in New Zealand (1976, 1988 and 2009) show that the prevalence of dental decay among adolescents has decreased overall (Cutress et al., 1979; Hunter et al., 1992; Ministry of Health, 2010a). However, over the same period inequalities in oral health have widened amongst adolescents from different population groups. The 2009 New Zealand Oral Health Survey (2009 NZOHS) found that Pacific children and adolescents (5-17 years) were less likely to be caries-free in their permanent teeth, and Māori children and adolescents (5-17 years) had a higher average DMFT<sup>1</sup> score, than non-Pacific and non-Māori children and adolescents respectively (Ministry of Health, 2010a)<sup>2</sup>. In contrast, the 1976 and 1980 New Zealand oral health surveys found smaller (and in some instances more favourable) differences in dental decay experience for Māori and Pacific children and adolescents (Cutress et al., 1979; Hunter et al., 1992).

Adolescents in New Zealand can access dental care free of charge until their 18th birthday through the Oral Health Service for Adolescents (OHSA), mainly provided through private general dental practices. This service has annual utilisation rates of around 68% to 79.9% of adolescents (estimates vary based on the source of the data) (Adolescent Health Research Group, 2008; Ministry of Health 2010a; 2012). Inequalities by ethnicity have also been found in the use of this service. The 2009 NZOHS found that Māori and Pacific children and adolescents were significantly less likely to receive their free annual check-up than non-Māori and non-Pacific children and adolescents (Ministry of Health, 2010a). This finding is supported by another recent national survey which found that Māori and Pacific adolescents were less likely than non-Māori, non-Pacific adolescents to have visited a dental provider in the last year. This adolescent-specific survey also found inequitable access to dental care among those from areas with medium and high socioeconomic deprivation (Araai et al., 2011).

New Zealand research has indicated that regular dental visiting is associated with better oral health outcomes, better self-rated quality of life, and more favourable oral health beliefs (Broadbent et al., 2006; Broughton et al., 2012; Lawrence et al., 2008; Thomson et al., 2010). Despite this, there is limited research on which factors are associated with utilisation of oral health services among adolescents. Other than the above mentioned surveys indicating that ethnicity and socioeconomic deprivation are important factors to consider, previous New Zealand and international research have indicated that regular use of dental services by parents may have a considerable impact on regular dental visiting among adolescents and children. However, the

<sup>1</sup> An index of dental caries experience as measured by counting the number of decayed (D), missing (M) and filled (F) permanent teeth (T).

<sup>2</sup> In most of the key findings for the NZOHS adolescents' results were reported in conjunction with children's results.

number of studies investigating this factor specifically in relation to adolescents is limited (most included children and adolescents, or only children), and there is a limited number of relevant studies from New Zealand (Attwood et al., 1993; Crawford and Lennon, 1992; DeVoe et al., 2011; Fitzgerald et al., 2004; Grembowski et al., 2008; Isong et al., 2010; Kelly et al., 2005; Maserejian et al., 2008; Morris et al., 2006; Robson et al., 2011; Scott et al., 2002; Sohn et al., 2007).

Various alternative provider models have been used in New Zealand to help increase access to the OHSA beyond that achieved by provision of this service through private general dental practice. This has included extending the service through Māori health providers, mobile dental providers, and continued provision through the School Dental Service (which usually ceases at 12 years of age). A 2004 review to identify best practice models for Māori child oral health services (including adolescents) indicated that by taking a whānau ora approach<sup>3</sup> Māori providers have helped reduce barriers to oral health care (Mauri Ora Associates, 2004). Any further evidence on the effectiveness of alternative OHSA providers in improving access for adolescents is limited.

The 2009 NZOHS has made available extensive survey data on current oral health practices that is generalisable to the New Zealand population. Initial reporting on adolescent oral health was presented across both younger children and adolescents, which limited insights into specific adolescent oral health issues (Ministry of Health, 2010a). The aim of this study was to conduct a secondary analysis of adolescent oral health data from the 2009 NZOHS to investigate the impact of parental use of dental services, ethnicity and socio-economic background on recent use of dental services and the type of dental provider last visited among adolescents.

## METHODS

This study used quantitative data from the 2009 NZOHS. Being a follow-up survey from the 2006/07 New Zealand Health Survey (NZHS), the 2009 NZOHS utilised a literal sub-sample of the 2006/07 NZHS sample. The target population of the 2006/07 NZHS was individuals of all ages who were usually resident in New Zealand, and who lived in permanent private dwellings (94% of the total population) (Ministry of Health, 2008). Sample frames were based on 2001 New Zealand Census area meshblocks, and a multi-stage, stratified, probability-proportional-to-size (PPS) sample design was used to choose the meshblocks included in the survey sample. From the survey sample, a 'core' and a 'screened' sample of households from each chosen meshblock were selected to participate, with the 'screened' sample chosen to increase sampling of participants from Māori, Pacific and Asian ethnic groups (Ministry of Health, 2008).

From the 2006/07 NZHS, 84% of participating households agreed to be contacted about participating in future health surveys. From this, all Māori, Pacific and Asian participants, and four in ten European/Other participants, were selected for invitation to the 2009 NZOHS. This included a total of 6,318 households, with 6,318 adult participants (15 years and over) and 2,620 child participants (14 years and younger) (Ministry

<sup>3</sup> Providing care to any family members as needed, rather than having a separate service for each family member, e.g. a separate child and adolescent service.

of Health, 2010b). The 2009 NZOHS used computer-assisted, face-to-face interviews, and included questions about oral health status, risk and protective factors, and utilisation of oral health services. There were separate questionnaires for child and adult participants, and child questionnaires were answered by the child's primary caregiver. Further information on the 2009 NZOHS design can be found elsewhere (Ministry of Health, 2010b).

The weighted response rates for the 2009 NZOHS interviews were 70% for adults and 69% for children, if also taking into account the NZHS response rate (68% for adults and 71% for children), the overall response rate was 49% (Ministry of Health, 2010b). Despite this relatively low response rate, the 2009 NZOHS sample was still considered generalisable to the New Zealand population, as there were no significant differences found when comparing responses to oral health questions included in both the 2006/07 NZHS and the 2009 NZOHS (Ministry of Health, 2010b). The sample for the analyses reported in this paper included all 2009 NZOHS participants eligible for the OHSA (from 12 years of age<sup>4</sup> to 17 years of age).

The 2009 NZOHS received ethical approval by the New Zealand Health and Disability Multi-region Ethics Committee (Ministry of Health, 2010b). The analysis conducted for the current study was approved by a departmental level ethical approval process at the University of Otago, Wellington.

## Outcome factors

The outcome factors used for this study were 'most recent dental visit' and 'type of dental provider last visited' among adolescents. The responses to the relevant questions in the 2009 NZOHS used for these two outcomes (Q53 and Q54 in the child survey; Q68 and Q73 in the adult survey) were grouped into two response categories to create binary variables suitable for multivariable logistic regression analysis. The responses for the 'most recent dental visit' outcome were grouped into whether a dental provider had been visited in the last year (Yes or No) and the responses for the 'type of dental provider last visited' outcome were grouped into whether the last visit had been to a private general dental practice (Yes or No)<sup>5</sup>.

## Exposure factors

The exposure factors included in the univariate and multivariable analysis were 'most recent dental visit by primary caregiver', prioritised ethnicity (Ministry of Health, 2004) and socio-economic deprivation (NZDep2006) (White et al., 2008). Only the 12-14-year-old adolescents in the sample (n=288) could be linked to their primary caregiver for the primary caregiver exposure factor, as the 15-17-year-olds participated in the NZOHS as adults, and therefore could not be directly linked to a primary caregiver answering questions on their behalf (and

<sup>4</sup> Adolescent are eligible for the OHSA from Year 9 of school (start of high school), when most are between 12–13 years of age. In this study all 12-year-olds were included, even though they may not have been eligible for the OHSA at the time (not yet started high school), as it was not possible to identify which of the 12-year-olds were eligible.

<sup>5</sup> Providers other than private general dental practices included School Dental Service, Community Providers, Specialists or other unspecified providers.

although older adolescents could be linked to another adult NZOHS participant in their household, the survey dataset did not identify whether the other adult participant was the older adolescent's primary caregiver). Two separate analyses were therefore conducted: one among the 12-14-year-old adolescents, which included the primary caregiver exposure factor, and one for the total 12-17-year-old sample to provide an overview of dental service utilisation patterns among all adolescents (excluding the primary caregiver factor). In addition, age and sex were included as exposure factors in the analyses, as they are commonly associated with health behaviours and outcomes, and were key factors included in the descriptive analysis of key findings in the 2009 NZOHS report (Ministry of Health, 2010a).

## ANALYSIS

Analysis for this study was conducted using Stata (Stata 11.2, StatCorp, TX). The 2009 NZOHS survey data was weighted to account for probability of being selected into the survey, and to match a set of population benchmarks related to age group, sex, ethnicity and whether a dental professional had been visited in the last 12 months (Ministry of Health, 2010b). Jackknife replicate weights were used to estimate sampling error for the univariate and multivariable analyses in this study. The univariate analysis included weighted estimates of proportions and 95% confidence intervals (95% CIs) for the two outcome factors by age, sex, ethnicity and socioeconomic deprivation, with 'most recent dental visit among primary caregivers' exposure variable also included for the 12-14 year-old sample.

Binary logistic regression models were subsequently used to assess the impact of the chosen exposure factors on each outcome

variable, while also adjusting for any confounding effects of these exposure variables. For the 12-14-year-old sample the exposure factors included in the regression model were parental use of dental services, ethnicity, age, sex and socioeconomic deprivation. A similar procedure was used for the total 12-17-year-old sample, excluding the primary caregiver factor). Odds ratios (ORs) and 95% CIs were estimated in the logistic regression models.

## RESULTS

The sample for this study consisted of 509 adolescents aged 12-17 years (of whom 288 were 12-14 years old). The unweighted study sample demographic characteristics are shown in Table 1. For the 'most recent dental visit' outcome, 20 adolescents were excluded from the analysis due to missing or 'do not know/refused' replies; for the same reasons, 14 adolescents were excluded for the 'type of dental provider last visited' outcome. One adolescent in the 12-14-year-old sub-sample was also excluded due to missing data for the primary caregiver exposure factor in the 'most recent dental visit' outcome analysis, and two were excluded for the same reason in the 'type of dental provider last visited' outcome analysis.

Table 2 shows unadjusted prevalence estimates for the 'most recent dental visit' outcome. In total, 20.1% of adolescents in the 12-17-year-old sample and 12.7% of adolescents in the 12-14-year-old sub-sample had not visited a dental provider in the last year. The 12-14-year-old adolescents whose primary caregiver had not visited a dental provider in the last year were not found to be any less likely to have visited a dental provider in the last year than adolescents whose primary caregiver had visited in the last year (12.3% vs 12.5%;  $p=0.971$ ). However, there were

Table 1. Unweighted study sample demographic characteristics (n, %) among adolescents 12-17 years of age

Factors	Adolescents (12-14 years)		Adolescents (15-17 years)		Total (12-17 years)	
	n	%	n	%	n	%
<b>Total</b>	288	56.6	221	43.4	509	100
<b>Sex</b>						
Male	155	53.8	109	49.3	264	51.9
Female	133	46.2	112	50.7	245	48.1
<b>Ethnicity (total)<sup>1</sup></b>						
Māori	128	44.4	92	41.6	220	43.2
Pacific	59	20.5	35	15.8	94	18.5
Asian	40	13.9	32	14.5	72	14.2
NZ European/Other	168	58.3	145	65.6	313	61.5
<b>NZDep2006 Quintile</b>						
Quintile 1	44	15.3	33	14.9	77	15.1
Quintile 2	50	17.4	48	21.7	98	19.3
Quintile 3	61	21.2	49	22.2	110	21.6
Quintile 4	53	18.0	48	22.0	101	20.0
Quintile 5	80	27.8	43	19.5	123	24.2
<b>Primary caregiver dental visit in last 12 months<sup>2</sup></b>						
Yes	149	52.3	N/A	N/A	N/A	N/A
No	136	47.7				

<sup>1</sup> Total ethnicity reported, i.e. participants were able to report more than one ethnicity.

<sup>2</sup> n=3 missing replies.

**Table 2.** Estimates of ‘most recent dental visit’ (unweighted n, weighted percentage with 95% CI) being >12 months ago among 12-17 year old adolescents.

Factor	Most recent visit (12-14 years) n=275 <sup>1</sup>		Most recent visit (12-17 years) n=489 <sup>2</sup>	
	n visited >12 months ago	% visited >12 months ago (95% CI)	n visited >12 months ago	% visited >12 months ago (95% CI)
<b>Total</b>	48	12.7 (8.3, 18.8)	116	20.1 (15.2, 26.2)
<b>Primary Caregiver Dental Visit (&lt;=12 months ago)<sup>3</sup></b>	<b>p=0.971</b>			
No	27	12.3 (7.5, 19.5)		
Yes	20	12.5 (6.5, 22.6)		
<b>Ethnicity (prioritised)</b>	<b>p=0.063</b>		<b>p=0.006</b>	
Māori	27	20.7 (13.1, 31.1)	59	26.3 (19.5, 34.5)
Pacific	7	22.2 (9.1, 44.8)	20	40.5 (25.7, 57.2)
Asian	4	12.3 (4.2, 30.9)	12	10.0 (4.1, 22.3)
European/Other	10	9.1 (4.3, 18.1)	25	17.2 (10.8, 26.2)
<b>Age</b>	<b>p=0.018</b>		<b>p = 0.007</b>	
12 years	10	4.6 (2.1, 9.6)	10	4.6 (2.1, 9.6)
13 years	11	12.4 (4.6, 29.0)	11	12.4 (4.6, 29.0)
14 years	27	21.4 (12.6, 33.9)	27	21.4 (12.6, 33.9)
15 years			20	17.6 (9.5, 30.2)
16 years			25	31.8 (17.3, 51.0)
17 years			23	31.1 (16.7, 50.4)
<b>Sex</b>	<b>p=0.277</b>		<b>p=0.261</b>	
Male	24	10.3 (6.3, 16.4)	55	17.2 (11.3, 25.4)
Female	24	15.2 (8.3, 26.0)	61	23.5 (16.0, 33.0)
<b>NZDep2006 Quintile</b>	<b>P&lt;0.001</b>		<b>p=0.012</b>	
Quintile 1	5	6.7 (1.7, 23.4)	20	22.3 (10.7, 40.8)
Quintile 2	14	28.4 (14.2, 48.7)	25	26.5 (15.5, 41.5)
Quintile 3	9	5.4 (2.5, 11.4)	18	7.5 (3.5, 15.3)
Quintile 4	4	2.6 (0.8, 8.1)	20	13.4 (7.1, 23.8)
Quintile 5	16	21.2 (11.3, 36.4)	33	33.7 (21.1, 49.2)

<sup>1</sup> n=13 excluded due to missing or ‘do not know/refused’ replies.

<sup>2</sup> n=20 excluded due to missing or ‘do not know/refused’ replies.

<sup>3</sup> n=1 excluded due to missing reply.

differences in most recent dental visit by age, ethnicity and socioeconomic deprivation, with these differences apparent in both the 12-14-year-old sub-sample and in the total 12-17-year-old sample.

For the ‘type of dental provider last visited’ outcome, 53.4% of adolescents in the total 12-17-year-old sample, and 76% of adolescents in the 12-14-year-old sub-sample had last visited a dental provider other than a private general dental practice (see Table 3). There was some evidence that those 12-14-year-old adolescents whose parents had not visited a dental provider in the last year were more likely to have last visited a dental provider other than a private general dental practice (than adolescents whose parents had visited a dental provider in the last year), but this difference did not reach statistical significance (82.0% vs 70.9%;  $p = 0.188$ ). As for the recent visit variable, there were

differences in the type of provider last visited according to age, ethnicity and socioeconomic deprivation.

Multivariable analysis for the ‘most recent dental visit’ outcome found no differences among the 12-14-year-old adolescents according to the primary caregiver most recent dental visit factor (OR = 0.93, 95% CI 0.32, 2.72) after adjusting for other exposure factors (ethnicity, age, sex, and socioeconomic deprivation) (Table 4). Māori adolescents in the 12-14-year-old sample were significantly more likely not to have visited a dental provider in the last year than European/Other adolescents (OR = 4.20, 95% CI 1.54, 11.50); with a similar pattern found for Pacific adolescents in the 12-17-year-old sample (the latter was not statistically significant when adjusting for socioeconomic deprivation: OR = 2.61, 95% CI 0.84, 8.07). There were some differences found according to socioeconomic deprivation in both

**Table 3.** Estimates of ‘type of dental provider last visited’ (unweighted n, weighted percentage with 95% CI) being an ‘other’ provider among 12-17 year old adolescents

Factor	Location of last visit (12-14 years) n=285 <sup>1</sup>		Location of last visit (12-17 years) n=495 <sup>2</sup>	
	Other provider n	% Other provider (95% CI)	Other provider n	% Other provider (95% CI)
<b>Total</b>	225	76.0 (67.3, 83.0)	306	53.4 (46.5, 60.1)
<b>Primary Caregiver Dental Visit (&lt;=12 months)<sup>3</sup></b>	<b>p=0.188</b>			
No	123	82.0 (67.2, 91.0)		
Yes	100	70.9 (59.0, 80.5)		
<b>Ethnicity (prioritised)</b>	<b>p=0.019</b>		<b>p=0.002</b>	
Māori	101	83.3 (75.0, 89.3)	136	64.0 (54.5, 72.4)
Pacific	36	94.9 (83.4, 98.6)	50	80.2 (66.4, 89.2)
Asian	29	70.3 (46.8, 86.5)	44	60.4 (33.3, 82.4)
European/Other	59	71.7 (58.8, 81.8)	76	46.3 (37.2, 55.6)
<b>Age</b>	<b>p=0.001</b>		<b>p&lt;0.001</b>	
12 years, n	80	92.4 (79.3, 97.4)	80	92.4 (79.3, 97.4)
13 years, n	70	79.1 (58.3, 91.1)	70	79.1 (58.3, 91.1)
14 years, n	75	56.6 (42.4, 69.8)	75	56.6 (42.4, 69.8)
15 years, n			27	27.3 (16.6, 41.3)
16 years, n			34	37.2 (23.1, 53.9)
17 years, n			20	24.3 (13.4, 39.8)
<b>Sex</b>	<b>p=0.743</b>		<b>p=0.397</b>	
Male, n	121	77.3 (64.0, 86.7)	159	50.6 (41.0, 60.1)
Female, n	104	74.6 (61.5, 84.4)	147	56.6 (46.5, 66.1)
<b>NZDep2006 Quintile</b>	<b>p=0.036</b>		<b>p=0.132</b>	
Quintile 1, n	33	80.2 (59.5, 91.7)	43	53.6 (35.6, 70.7)
Quintile 2, n	37	73.3 (53.4, 86.8)	52	44.9 (31.5, 59.1)
Quintile 3, n	44	59.1 (37.0, 78.1)	61	46.1 (32.2, 60.7)
Quintile 4, n	39	78.6 (54.3, 91.9)	56	58.1 (42.8, 71.9)
Quintile 5, n	72	94.6 (88.1, 97.7)	94	71.0 (55.4, 82.9)

<sup>1</sup> n=3 excluded due to missing or ‘do not know/refused’ replies.

<sup>2</sup> n=14 excluded due to missing or ‘do not know/refused’ replies.

<sup>3</sup> n=2 excluded due to missing replies.

samples: none of the odds ratios reached statistical significance after adjusting for the other sociodemographic factors.

In addition, there was some patterning of having visited a dental provider in the last 12 months according to age. Younger adolescents (12 and 13-year-olds) were more likely to have visited than 14-year-olds, while older adolescents (16 and 17-year-olds) were less likely to have visited. Fifteen-year-olds did not fit this pattern, as they were found to be more likely to have visited than 14-year-olds. The differences in visiting according to age only reached significance for the 12-year-olds (12-17 year old sample OR=0.18, 95% CI 0.06, 0.50).

For the ‘type of provider last visited’ outcome, the odds ratios were slightly above one for having last visited a dental provider other than a private general dental practice among 12-14-year-old adolescents whose parents had not visited a dentist in the last year.

However, these differences were not significant after adjusting for the other sociodemographic factors (Table 5) (OR=1.60, 95% CI 0.39, 6.57). Pacific adolescents in the 12-14-year-old sub-sample, and Māori and Pacific adolescents in the 12-17-year-old sample were significantly more likely to have last visited a provider other than a private general dental practice than European/Other adolescents (Māori 12-17 years OR=2.16, 95% CI 1.13, 4.12; Pacific 12-17 years OR = 5.15, 95% CI 1.69, 15.74). For Pacific adolescents in the 12-14-year-old sub-sample, the odds ratio was not statistically significant following adjustment for socioeconomic deprivation (OR=3.97, 95% CI 0.54, 29.07). Asian adolescents in the total 12-17-year-old sample also had higher odds of having last visited a provider other than a private general dental practice than European/Other adolescents, although the odds ratio was not significant in the fully adjusted

**Table 4.** Adjusted estimates (odds ratio [OR] and 95% CI from logistic regression) for ‘most recent dental visit’ being >12 months among 12-14-year-old and 12-17-year-old adolescents (reference: most recent dental visit = <12 months).

Factor	12-14-year-old adolescents		12-17-year-old adolescents	
	OR for last visit >12 months	95% CI	OR for last visit >12 months	95% CI
<b>Primary Caregiver Dental Visit (&lt;=12 months)</b>				
Yes	Reference			
No	0.93	(0.32, 2.72)		
<b>Ethnicity</b>				
Māori	4.20	(1.54, 11.50)	1.85	(0.83, 4.12)
Pacific	3.26	(0.58, 18.36)	2.61	(0.84, 8.07)
Asian	1.51	(0.21, 10.96)	0.48	(0.11, 2.09)
European/Other	Reference			
<b>Age</b>				
12	0.17	(0.06, 0.50)	0.18	(0.06, 0.50)
13	0.44	(0.08, 2.41)	0.42	(0.09, 1.97)
14	Reference			
15			0.77	(0.26, 2.32)
16			1.68	(0.51, 5.49)
17			1.98	(0.64, 6.19)
<b>Sex</b>				
Male	Reference			
Female	1.50	(0.55, 4.05)	1.42	(0.65, 3.10)
<b>NZDep2006 Quintile</b>				
Quintile 1	Reference			
Quintile 2	6.17	(0.49, 77.77)	1.07	(0.28, 4.07)
Quintile 3	0.79	(0.07, 8.28)	0.25	(0.06, 1.02)
Quintile 4	0.24	(0.02, 3.12)	0.46	(0.13, 1.69)
Quintile 5	1.87	(0.22, 16.08)	1.17	(0.30, 4.59)

model (OR=4.51, 95% CI 0.91, 22.30). In both samples, adolescents living in the most deprived areas (quintile 5) had higher odds of having last visited a provider other than a private general dental practice; however, these odds ratios were not significant in the fully adjusted model. In addition, 12-year-olds were significantly more likely (12-17-year-old-sample OR=11.19, 95% CI 2.11, 59.32), and 15 and 17-year-olds significantly less likely (15-year-old OR=0.26, 95% CI 0.10, 0.68; 17-year-old OR=0.20, 95% CI 0.07, 0.52), to have last visited a dental provider other than a private general dental practice than the reference age group of 14-year-olds.

## DISCUSSION

This study aimed to investigate factors influencing dental care utilisation among adolescents, based on a secondary analysis of adolescent oral health data from the 2009 NZOHS. The study looked at the impact of parental use of dental services, ethnicity and socio-economic background on recent use of dental services and the type of dental provider last visited among adolescents.

Before discussing the findings, the strengths and weaknesses of this study need to be considered. Its main strength was the use

of data from the 2009 NZOHS, which as a national survey had considerable resources available to ensure the generalisability of the study sample and to include measures to assist in reducing the impact of selection and measurement bias.

The study's main limitation was that the 15-17-year-old-adolescents could not be linked to answers on their primary caregivers' oral health behaviours, thus they could not be included in the analysis of the primary caregiver factor. This limited the sample size for that analysis (i.e. only including 12-14-year-olds) and the reduced power may explain why no significant associations were found according to this factor as this finding was not consistent with the majority of previous quantitative research on the issue, all of which had larger samples and found significant associations between child/adolescent and primary caregiver dental care utilisation.

The reduction in sample size from the 2006/07 NZHS to the 2009 NZOHS is an additional limitation. While this was mostly systematic and purposeful, it may still have impacted on the study results. As in most secondary analyses, the sample size in this study was essentially opportunistic: the design of the NZOHS did not specifically sample adolescents as an intended sub-sample of

**Table 5.** Adjusted estimates (odds ratio [OR] and 95% CI from logistic regression) for ‘type of dental provider last visited’ being an ‘other’ provider among 12-14-year-old and 12-17-year-old adolescents (reference: type of dental provider last visited = private general dental practice).

Factor	12-14-year-old adolescents		12-17-year-old adolescents	
	OR for visit to ‘other’ provider	95% CI	OR for visit to ‘other’ provider	95% CI
<b>Primary Caregiver Dental Visit (&lt;=12 months)</b>				
Yes	Reference			
No	1.60	(0.39, 6.57)		
<b>Ethnicity</b>				
Māori	1.31	(0.39, 4.44)	2.16	(1.13, 4.12)
Pacific	3.97	(0.54, 29.07)	5.15	(1.69, 15.74)
Asian	0.90	(0.16, 5.02)	4.51	(0.91, 22.30)
European/Other	Reference			
<b>Age</b>				
12	12.28	(1.46, 103.54)	11.19	(2.11, 59.32)
13	2.29	(0.69, 7.67)	2.82	(0.83, 9.63)
14	Reference			
15			0.26	(0.10, 0.68)
16			0.40	(0.15, 1.06)
17			0.20	(0.07, 0.52)
<b>Sex</b>				
Male	Reference			
Female	1.17	(0.34, 4.08)	1.28	(0.62, 2.62)
<b>NZDep2006 Quintile</b>				
Quintile 1	Reference			
Quintile 2	0.59	(0.13, 2.72)	0.81	(0.30, 2.18)
Quintile 3	0.20	(0.04, 1.01)	0.62	(0.19, 1.99)
Quintile 4	0.62	(0.06, 6.08)	1.10	(0.32, 3.77)
Quintile 5	2.52	(0.59, 10.84)	1.47	(0.54, 3.97)

interest. In addition, the fact that not all NZHS participants made themselves available for future surveys (such as the NZOHS) may have introduced selection bias, particularly if certain population groups were less likely to have participated than others. However, the comparison of replies to oral health questions between the NZHS and NZOHS (since the respondents in the latter were a subset of the former) showed a similar pattern of results, which suggests that the NZOHS sample was representative of the NZHS sample (Ministry of Health, 2010b).

All the outcome data used in this study relied on self-report, and as such are subject to both recall and social desirability biases (Ministry of Health, 2010a). The use of self-report for the outcome variables could partially explain why no differences were found according to SES, given this factor has previously been reported to have an impact on adolescent use of dental services in New Zealand (Areai et al., 2011). It is more difficult to estimate the impact of measurement bias, but there were measures put in place by the 2009 NZOHS to help reduce the impact of these, such as face-to-face interviews and validated questions (Ministry of Health, 2010b). The use of deprivation by area (NZDep2006) as an indicator of socioeconomic status is another possible limitation

as inequalities in socio-economic status at an individual level may not have been captured. However, using deprivation by area (NZDep2006) is consistent with measures used in previous reports on the oral health survey data, such as the Ministry of Health (2010a) 2009 NZOHS report.

For the primary research questions, this study found that primary caregiver utilisation of oral health services was not significantly related to either usage of services by the adolescents (with a point estimate close to the null: fully adjusted OR = 0.93) or the type of provider last visited (fully adjusted OR = 1.6, with a substantially wide confidence interval). This was inconsistent with a majority of the relevant quantitative studies found in the literature review, which showed significant associations between child/adolescent and parental use of dental services (Attwood et al., 1993; Crawford and Lennon, 1992; DeVoe et al., 2011; Grembowski et al., 2008; Isong et al., 2010; Morris et al., 2006; Scott et al., 2002). Most of these studies had larger study samples, suggesting further research on this factor needs to consider the sample size required to maximise power to detect significant associations. The design of such studies for answering this research question would also be improved by taking a

specific focus on adolescent oral health, and include assessment of actual attendance of the parent compared to the attendance of the adolescent.

The key finding of this study was the unequal uptake of dental care by ethnicity. Māori and Pacific adolescents were found to be less likely to have recently visited a dental provider than European/Other adolescents (Māori 12-14 years fully adjusted OR = 4.20; Pacific 12-17 years fully adjusted OR = 2.61 – the latter was not significant after controlling for socioeconomic deprivation). This finding is consistent with a recent survey among New Zealand adolescents (Areai et al., 2011). Māori and Pacific adolescents were also found to be less likely to have last visited a private general dental practice (Māori and Pacific 12-17 years fully adjusted ORs = 2.16 and 5.15, respectively). As with the first finding, this finding may be another indicator that Māori and Pacific adolescents are less likely to be regularly accessing the OHSA (as private general dental practices are the main providers of this service). In addition, it suggests that they are more likely to access alternative dental providers. For Māori specifically, the latter is suggestive of findings in a previous New Zealand study which investigated the improvement to oral health care for Māori by Māori health providers (Mauri Ora Associates, 2004). It was beyond the scope of this study to investigate which providers other than private general dental practices had been visited, such as the school dental service, community providers, specialist providers or other (unspecified) providers.

Socioeconomic deprivation was not significantly related to either of the two outcomes, with the confidence interval for the estimates of all the deprivation quintiles crossing the null in both the 12-14-year-old sample and the 12-17-year-old sample. This is inconsistent with a recent study among New Zealand adolescents, which found that adolescents in medium and high deprivation areas were less likely to have visited a dentist in the last 12 months (Areai et al., 2011). Some of the confidence intervals in the current study were wide, suggesting the estimates were influenced by study power. In addition, the multivariate analysis indicated that socioeconomic deprivation was acting as a confounder for Pacific adolescents' use of dental services. Future research should therefore continue to consider SES in respect to adolescent utilisation of dental services.

Finally, this study noted that there were significant differences found among adolescents of different ages for both outcomes, with older adolescents being less likely to have visited a dental provider in the last year and more likely to have last visited a private general dental practice than younger adolescents. The latter finding is not unexpected due to the transition from the School Dental Service to the OHSA (which is mainly provided by private general dental practices). However, that older adolescents may be less likely to regularly access dental care warrants further investigation to assist in improving access, especially as this is consistent with previous findings about uptake of adolescent dental care (Thomson, 2001; Thomson et al., 2010).

These findings have implications for reorienting child and adolescent oral health services. This is particularly salient if Government is to reduce inequalities in oral health outcomes and access to oral health services – a key action area identified in its oral health policy document, Good Oral Health for All, for Life (Ministry of Health, 2006). The inequalities in access for Māori and Pacific adolescents also falls short of Government's obligations to the UN Convention on the Rights of the Child

(United Nations, 1989) of non-discrimination and a child's right to health, and ensuring equal health outcomes for Māori as obligated by the Treaty of Waitangi.

Further government support for alternative models of oral health care, as well as further research on how these alternative models can work alongside private general dental practices to provide an oral health service that responds well to all adolescents, would therefore be beneficial (as also recommended by Areai et al. 2011 and Fitzgerald et al. 2004). Due to this study's limitations in investigating the adolescent and parent relationship in accessing dental care, and as past New Zealand and international studies have indicated there is a link between parent and adolescent/child access to dental care, further research on this issue would also be beneficial.

Despite considerable investment by the New Zealand Government in the Oral Health Service for Adolescents (OHSA), this study provides evidence that inequalities in access to this service still exist, particularly for Māori and Pacific adolescents. Further action by Government is required to ensure that all New Zealand children have equal access to oral health services and, in turn, enjoy optimal oral health.

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