

# Oral health literacy comparisons between Indigenous Australians and American Indians

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**Objectives:** To compare oral health literacy (OHL) levels between two profoundly disadvantaged groups, Indigenous Australians and American Indians, and to explore differences in socio-demographic, dental service utilisation, self-reported oral health indicators, and oral health-related quality of life (OHRQoL) correlates of OHL among the above. **Methods:** OHL was measured using REALD-30 among convenience samples of 468 Indigenous Australians (aged 17–72 years, 63% female) and 254 female American Indians (aged 18–57 years). Covariates included socio-demography, dental utilisation, self-reported oral health status (OHS), perceived treatment needs and OHRQoL (prevalence, severity and extent of OHIP-14 ‘impacts’). Descriptive and bivariate methods were used for data presentation and analysis, and between-sample comparisons relied upon empirical contrasts of sample-specific estimates and correlation coefficients. **Results:** OHL scores were: Indigenous Australians - 15.0 (95% CL=14.2, 15.8) and American Indians - 13.7 (95% CL=13.1, 14.4). In both populations, OHL strongly correlated with educational attainment, and was lower among participants with infrequent dental attendance and perceived restorative treatment needs. A significant inverse association between OHL and prevalence of OHRQoL impacts was found among American Indians ( $\rho=-0.23$ ; 95% CL=-0.34, -0.12) but not among Indigenous Australians. **Conclusions:** Our findings indicate that OHL levels were comparable between the two groups and lower compared to previously reported estimates among diverse populations. Although the patterns of association of OHL with most examined domains of correlates were similar between the two groups, this study found evidence of heterogeneity in the domains of self-reported OHS and OHRQoL.

**Key words:** oral health literacy, oral health, Indigenous populations, Australian Indigenous, Native American, American Indian, quality of life

## Introduction

Historically, Indigenous Australians and American Indians have many similarities. Both are groups who were dispossessed of their land by non-native settlers in the 1800s (McDonnell, 1991; Moreton-Robinson, 2003), both have been victims to sustained government policies of discrimination and disempowerment (Gardiner and Bourke, 2002; Wright *et al.*, 1998) and both are groups who continue to experience profound socio-economic disparities and dysfunction at a community-level in comparison with their non-native counterparts (Oberg, 2010; Trudgen, 1999).

Evidence suggests that both the Indigenous Australian and American Indian populations do not enjoy the same level of general health as their non-Indigenous or non-native counterparts (AIHW, 2006; Dixon and Roubideaux, 2001). In Australia, the Indigenous population have 15–20 years shorter life expectancy, much higher levels of cardiovascular disease, diabetes and other chronic conditions, and are more likely to experience disability and reduced quality of life due to ill health (Edwards and Madden, 2001). In the North American context, American Indians have a higher prevalence of heart disease, cancer, diabetes, chronic liver disease and stroke as well as obesity, Sudden Infant Death Syndrome, mental ill health and substance abuse-related illnesses when compared with the general United States population (NCHS, 2010).

There has been little work in the field of oral health literacy (OHL) among disadvantaged groups such as Indigenous Australians and American Indians. Health literacy has been defined as “the degree to which individuals can obtain, process and understand the basic health information and services they need to make appropriate health decisions” (Selden *et al.*, 2000). In the context of dentistry, a group of the National Institute of Dental and Craniofacial Research defined OHL as “the degree to which individuals have the capacity to obtain, process and understand basic oral health information and services needed to make appropriate health decisions” (NIDCR, 2005). This definition encompasses the skills necessary for people to understand the causes of poor oral health, to learn and adopt fundamental aspects of positive oral self-care behaviours, to communicate with oral health care providers, to place their names on dental treatment waiting lists or organise appointments, to find their way to the dental clinic, to fill out the necessary forms and to comply with any required regimes, including follow-up appointments and compliance with prescribed medication. OHL, in this definition, encompasses far more than reading; it involves writing, numeracy, speaking, listening and ‘understanding the system’ (USDHHS, 2003). It is suggested that the complexity of both verbal and written oral health communications create a substantial barrier to improving oral health (Horowitz and Kleinman, 2008)

and that OHL is required in order to promote oral health and to prevent oral disease (USDHHS, 2000).

Richman and colleagues (Richman *et al.*, 2007) developed REALD (Rapid Estimate of Adult Literacy in Dentistry), an instrument to measure dental health literacy based on the Rapid Estimate of Adult Health Literacy in Medicine (REALM). REALD-30, a shortened version, was also developed and validated, with participants with poor oral health-related quality of life and poor self-rated oral health having low REALD-30 scores (Lee *et al.*, 2007).

This study aims to contribute to an increased understanding of OHL among two of the world's most disadvantaged populations; Indigenous Australians and American Indians. The rationale for a formal analysis comparing the two populations are two-fold: (1) to enable greater clarity around any OHL *similarities* between the two historically vulnerable groups at a country-to-country level; similarities that might indicate that factors influencing OHL are not markedly influenced by country, ethnic background or culture; and similarly (2) to enable greater clarity around any OHL *differences* between the two groups at a country-to-country level; differences that might indicate that cultural, historical or country-specific influences over-ride the pervasive effect of basic impoverishment that the two groups share. Specifically, this study's aims were to compare OHL levels using the REALD-30 instrument between two convenience samples of Indigenous Australians and Native American Indians, and to explore differences in socio-demographic, dental behaviour and knowledge correlates of OHL among the above.

## Methods

Since 2003, the Australian authors (LMJ and EJP) have worked closely in Port Augusta, South Australia with the Indigenous community. Concerns around poor oral health systems navigation and lack of understanding around oral health information and oral health behaviours were revealed in focus group discussions (Jamieson *et al.*, 2008). A further study to investigate associations between OHL and self-reported oral health outcomes was developed following community feedback (Parker and Jamieson, 2010). A convenience sample of Indigenous Australian adults living in the Port Augusta region was involved in this cross-sectional study, which was conducted in August 2008. A range of recruitment techniques were used including: home visits, Indigenous Health Worker contact, attendance at health promotion sessions and community centres, the waiting room of the Indigenous-controlled health service, word of mouth, interviews on radio, street stalls and flyers. Inclusion criteria included: participants identified as being Indigenous, lived in the Port Augusta region, were aged 17 years or older and understood and communicated in spoken English. Morning and afternoon tea, as well as transport, were provided when sessions had been more formally arranged by Indigenous Health Workers. On completion of the questionnaire participants received a \$20 supermarket voucher.

The self-reported questionnaire's items included those used by the Australian Research Centre for Population Oral Health in other research investigations. Modifications occurred after the questionnaire was tested among five Indigenous adults. The questionnaire was admin-

istered through a combination of interview and self-complete approaches, with the exception of REALD-30 (which required an interview). To ensure completion, all questionnaires were reviewed by the interviewer. Questionnaires were completed in a number of settings including Indigenous resource centres, the local Aboriginal-controlled health service, community halls, in people's homes, at a street stall outside the local supermarket and in schools. The Aboriginal Health Council of South Australia and the Human Research Ethics Committee of the University of Adelaide granted ethics approval for the study. Before participating, participants gave written informed consent.

In the US, prior to this investigation, evidence on literacy in the oral health context in the United States had been limited to few studies among care-seeking subjects. These early studies indicated that differences in OHL exist between ethnic-racial groups and between subjects attending private dental or University clinics. A recent report revealed racial differences in OHL among non care-seeking subjects that persisted after controlling for the effect of education, with American Indians having lower OHL compared to other US groups (Lee *et al.*, 2011).

The Carolina Oral Health Literacy (COHL) project is a prospective cohort study that commenced in August 2008. At enrolment all participants were interviewed to obtain baseline information on OHL and other oral health indicators and measures of interest. Analyses of children's Medicaid claims and caregivers' follow-up interviews are part of the longitudinal arm of the COHL project. Caregivers attending the Women, Infants and Children's (WIC) clinics at selected sites were approached by trained study personnel and invited to participate in the COHL project. These study sites were selected based on geography, demographics, rural/urban composition, clinic activity and history of previous collaboration with the investigators. Purposeful quota sampling was used to ensure adequate representation of minority groups, including American Indians. Eligible individuals had to be 18 years or older, English speaking and the primary caregiver of a healthy American Society of Anesthesiologists (ASA) Physical Status Classification System category ASA I or II, Medicaid-eligible child of 5 years or younger. Following the interview, all respondents received a \$20 gift certificate for their participation.

The self-reported study questionnaire included an array of instruments, indices and questionnaire items that were used to collect information in the following domains: OHL, socio-demographic information, dental health indicators and behaviours, oral health-related quality of life and self-efficacy. The study received approval by the Biomedical Institutional Review Board of the University of North Carolina-Chapel Hill.

## Analysis

For purposes of this analysis, the dependent variable was OHL as assessed by the REALD-30 score. Independent variables included four domains: 1, socio-demographic factors; 2, dental utilisation factors; 3, self-reported oral health indicators; and 4, oral health-related quality of life (OHRQoL). Socio-demographic factors included age,

gender, and education. Dental service utilisation included having seen a dentist before and the time of the last dental visit (less than a year ago vs. one or more than a year ago). Self-reported oral health indicators included self-rated oral health (excellent/very good/good vs. fair/poor), perceived need for fillings or extractions and perceived gum disease or need for gum treatment. OHRQoL was measured using three estimates of OHIP-14 impacts: prevalence (any item reported ‘very often’ or ‘fairly often’ vs. none), severity (cumulative OHIP-14 score), and extent (mean number of items reported ‘very often’ or ‘fairly often’).

Descriptive statistics (mean and 95% confidence limits, CL) were used to summarise the distributions of OHL in the Indigenous Australian and American Indian samples, overall and stratified by covariates. To quantify the association between OHL and the three measures of OHRQoL we used Spearman’s *rhos* and 95% CL obtained with bootstrapping (10,000 repetitions). Because the two groups represented non-probability convenience samples of their respective Indigenous Australian and American Indian reference populations (female-only American Indian), we did not formally test any between-groups hypotheses. Comparisons were instead based on empirical contrasts of point estimates and 95 confidence intervals (CI), as well as contrasts of sample-specific trends and measures of association of OHL with covariates. All analyses were conducted with Stata 11.2 (StataCorp LP, College Station, TX, US).

## Results

In the Indigenous Australian context, complete questionnaires were obtained from 468 participants, with an average age of 38 years (range 17 to 72 years) and 63 percent female. The mean REALD-30 score was 15.0 (sd 7.8), with a median of 15 and range from 0 to 30. With regard to American Indians, the analytical sample comprised of 254 female participants, with average age of 26 years (range 18 to 57 years). The mean REALD-30 score was 1.3 units lower, 13.7 (sd 5.3), with a median of 14 and range from 0 to 29. Estimates from both populations were much lower than those reported elsewhere in the literature (Table 1). For example, mean REALD-30 scores of parents of pediatric dental patients in Hong Kong were 25.1 (Wong *et al.*, 2012). Jones and colleagues examined REALD-30 levels among patients in a private dental office and reported a mean of 23.9 (Jones *et al.*, 2007). Mean REALD-30 scores among a sample seeking dental care in a university setting were 20.7 (Miller *et al.*, 2010), while patients in an outpatient medical clinic had mean REALD-30 scores of 19.8 (Lee *et al.*, 2007). White participants in the Carolina Oral Health Literacy project had mean REALD-30 scores of 17.4 (Lee *et al.*, 2011), while African Americans in the same study had mean REALD-30 scores of 15.3.

When comparing the Indigenous Australian and Native American Indian samples, the REALD-30 difference was slightly higher, 1.6 REALD-30 units, when contrasting female subjects only (Table 2). In both samples, older subjects and those with a recent (<1 year ago) dental visit had higher OHL compared to younger subjects and those without a recent dental visit. Pronounced gradients with regard to education were also evident.

With regard to self-rated oral health, Indigenous Australian participants who reported need for fillings or extractions or gum disease/treatment had lower OHL compared to those who did not, whereas no important variation was noted with regard to self-rated oral health status (Table 3). On the contrary, among the American Indian sample, those with fair/poor rating had almost two points lower OHL (12.5) compared to those with higher rating. This estimate was three points lower compared to that of Indigenous Australian participants with fair/poor rating (15.3). Similar trends were noted with regard to perceived treatment needs, with those reporting needs having lower OHL, and American Indians having lower OHL compared to Indigenous Australians in all categories.

In the domain of OHRQoL the two samples were comparable (Table 4). Approximately one out of three subjects, 34 percent of Indigenous Australian and 39 percent of American Indians reported at least one “impact”, and identical proportions (27 percent of Indigenous Australian and 28 percent of American Indians) had an extent score of 2 or greater. Severity (OHIP-14 cumulative) scores were higher among Indigenous Australian: 14.7 (95% CL=13.3, 16.0) vs. American Indian—11.2 (95% CL=9.8, 12.6). Considering stratum-specific REALD-30 scores, those with worse OHRQoL had generally lower OHL, but these differences were more pronounced among the American Indian sample. Considering the correlation coefficients between OHL and OHRQoL in both groups, REALD-30 was negatively correlated with OHIP-14 measures, but some differences were evident. In fact, the correlations between OHL and OHRQoL were of greater magnitude among American Indians, compared to the virtually null associations that were found among Indigenous Australians.

## Discussion

This study set out to compare OHL levels and correlates among two disadvantaged populations; Indigenous Australians and American Indians. Although OHL norms and thresholds have yet to be established, both populations had OHL levels lower than those previously reported. In both Indigenous Australian and Native American populations, OHL levels showed a strong gradient with regard to educational attainment and some variation by age, dental attendance and self-rated oral health status. Although a substantial inverse association between OHL and OHRQoL was found among American Indians, this association was virtually null among Indigenous Australians.

In addition to the similarities Indigenous Australians and American Indians share in terms of social inequalities, community dysfunction and disparities in health, our findings indicate that these groups also share OHL inequalities compared with their non-Indigenous/Native counterparts; inequalities that are likely correlated with timely access of dental services and poor self-reported and clinical oral health. In addition to a commonality between Indigenous Australians and American Indians in regards to OHL, the two groups may share other important oral health-related factors such as oral health beliefs (a general distrust of Western medicine, a reliance on traditional remedies). These were not examined in the current study, thus we are not able to ascertain their impact, if any, on the study findings.

**Table 1.** Comparisons between oral health literacy (REALD-30) among different population groups

	<i>n</i>	<i>REALD-30 mean</i> (95% CL)
Hong Kong (Wong <i>et al.</i> , 2012)	200	25.1 (24.5, 25.7)
Patients from private dental setting (Jones <i>et al.</i> , 2007)	101	23.9 (23.6, 24.2)
Dental care seekers in University setting (Miller <i>et al.</i> , 2010)	106	20.7 (19.6, 21.7)
Patients in outpatient medical clinic (Lee <i>et al.</i> , 2007)	202	19.8 (18.9, 20.7)
Whites in COHL (Lee <i>et al.</i> , 2011)	504	17.4 (17.0, 17.8)
African Americans in COHL (Lee <i>et al.</i> , 2011)	522	15.3 (14.9, 15.7)
Indigenous Australians (Parker and Jamieson, 2010)	468	15.0 (14.2, 15.8)
Native American Indians in COHL (Lee <i>et al.</i> , 2011)	254	13.7 (13.1, 14.4)

**Table 2.** Comparisons between oral health literacy (REALD-30) and socio-demographic factors and dental attendance among Indigenous Australians and American Indians

	<i>Indigenous Australians (n=468)</i>		<i>American Indians (n=254)</i>	
	<i>n</i> <i>column %</i>	<i>REALD-30 mean</i> (95% CL)	<i>n</i> <i>column %</i>	<i>REALD-30 mean</i> (95% CL)
<b>Entire sample</b>	468 (100)	15.0 (14.2, 15.8)	254 (100)	13.7 (13.1, 14.4)
<b>Socio-demographic</b>				
<b>Age</b>				
25 years or older	110 (24)	16.0 (14.7, 17.3)	108 (43)	13.9 (12.9, 14.9)
Less than 25 years	358 (76)	14.7 (13.9, 15.6)	146 (57)	13.6 (12.7, 14.4)
Above sample median	234 (50)	15.3 (14.4, 16.3)	127 (50)	14.1 (13.2, 15.1)
Below sample median	234 (50)	14.8 (13.7, 15.8)	127 (50)	13.3 (12.4, 14.2)
<b>Gender</b>				
Male	167 (36)	14.5 (13.4, 15.7)	0 (0)	n/a
Female	301 (64)	15.3 (14.4, 16.2)	254 (100)	13.7 (13.1, 14.4)
<b>Education</b>				
High school or less	385 (82)	14.2 (13.4, 15.0)	176 (69)	12.5 (11.7, 13.2)
More than high school	83 (18)	18.9 (17.3, 20.6)	78 (31)	16.6 (15.4, 17.7)
<b>Dental attendance</b>				
Has seen a dentist before				
Yes	428 (91)	15.4 (14.7, 16.1)	100 (100)	13.7 (13.1, 14.4)
No	40 (9)	11.3 (8.8, 13.8)	0 (0)	n/a
<b>Last dental visit</b>				
< 1 year ago	166 (39)	15.4 (14.3, 16.6)	107 (42)	14.0 (13.1, 14.8)
≥ 1 year ago	265 (61)	15.3 (14.4, 16.2)	147 (58)	13.4 (12.4, 14.4)

**Table 3.** Comparisons between oral health literacy (REALD-30) and self-reported oral health indicators among Indigenous Australians and American Indians

<i>Oral health indicators</i>	<i>Indigenous Australians (n=468)</i>		<i>American Indians (n=254)</i>	
	<i>n</i> <i>column %</i>	<i>REALD-30 mean</i> (95% CL)	<i>n</i> <i>column %</i>	<i>REALD-30 mean</i> (95% CL)
<b>Self-reported oral health status</b>				
Excellent/very good/good	295 (63)	14.9 (14.0, 15.8)	187 (74)	14.2 (13.4, 15.0)
Fair/poor	173 (37)	15.3 (14.2, 16.5)	66 (26)	12.5 (11.3, 13.8)
<b>I think I need fillings or extractions</b>				
Yes	205 (44)	13.6 (12.6, 14.6)	127 (50)	13.4 (12.5, 14.3)
No	257 (56)	16.2 (15.2, 17.2)	127 (50)	14.0 (13.1, 15.0)
<b>I think I have gum disease/need gum treatment</b>				
Yes	363 (79)	14.9 (14.1, 15.7)	24 (10)	11.7 (9.7, 13.7)
No	99 (21)	15.6 (13.9, 17.2)	221 (90)	13.9 (13.2, 14.6)

**Table 4.** Association between oral health literacy (REALD-30) and oral health-related quality of life (OHIP-14 impacts) estimates among Indigenous Australians and American Indians

Oral health-related quality of life	Indigenous Australians (n=468)		American Indians (n=254)	
	n, column % or mean (range)	REALD-30 mean (95% CL)	n, column % or mean (range)	REALD-30 mean (95% CL)
<b>OHIP-14 impacts</b>				
<b>Prevalence<sup>†</sup></b>				
No impact	297 (66)	15.5 (14.6, 16.4)	155 (61)	14.6 (13.8, 15.5)
One or more impacts	154 (34)	14.6 (13.3, 15.9)	99 (39)	12.3 (11.3, 13.3)
Spearman's <i>rho</i> (95% CL)	-0.06 (-0.15, 0.04)		-0.23 (-0.34, -0.12)	
<b>Severity<sup>‡</sup> (quartiles)</b>				
<i>Q1</i>	0.4 (0-2)	13.6 (12.2, 15.0)	0.7 (0-2)	14.2 (12.9, 15.6)
<i>Q2</i>	6.8 (3-12)	17.2 (15.7, 18.7)	4.8 (3-7)	14.0 (12.6, 15.4)
<i>Q3</i>	18.0 (13-25)	15.7 (14.4, 17.0)	12.6 (8-17)	13.8 (12.6, 15.1)
<i>Q4</i>	36.7 (26-56)	14.6 (13.0, 16.3)	27.9 (18-49)	12.7 (11.5, 14.0)
Spearman's <i>rho</i> (95% CL)	0.02 (-0.08, 0.11)		-0.16 (-0.29, -0.04)	
<b>Extent<sup>§</sup></b>				
<2 impacts	341 (73)	15.4 (14.6, 16.2)	183 (72)	14.3 (13.5, 15.1)
≥2 impacts	127 (27)	14.1 (12.6, 15.5)	71 (28)	12.2 (11.0, 13.3)
Spearman's <i>rho</i> (95% CL)	-0.06 (-0.16, 0.03)		-0.23 (-0.35, -0.12)	

† Subjects reporting one or more items fairly or very often.

‡ Cumulative OHIP-14 score.

§ Mean number of items reported fairly or very often.

It is important to describe the shortcomings of both studies. The Indigenous Australian sample was one of convenience, meaning the findings cannot be considered representative of all Indigenous persons in Australia. The number of people who declined to participate was not recorded. The American Indian sample was taken from a WIC clinic, which by definition restricts the sample to a low-income group and is not necessarily generalisable to the American Indian population at large. Additional shortcomings of the American Indian study include the female-only composition and the relatively small sample size of approximately 250 participants. The shortcomings of the REALD-30 instrument are acknowledged, particularly in that it measures word recognition only, that is, with no test of comprehension or function. However, there were few other validated instruments available to measure OHL that are brief, psychometrically robust and considered culturally acceptable to both Indigenous/Native populations.

Shortcomings aside, the findings confirm that those with poorer OHL, as measured by REALD-30, had less frequent dental visits, poorer self-rated oral health status and more perceived treatment needs. Direct comparisons between the two study samples should be interpreted with caution, especially as the groups' age distributions were quite different. The average reported age for the American Indian group was 26 years old, with 57 percent of the sample less than 25 years old and a range of 18–57 years. The average reported age for the Australian group was 38 years old, with 76 percent of the sample less than 25 years old and a range of 17–72 years. In spite of this demographic discordance, the two groups had two out of three OHRQoL estimates virtually identical. Our finding of heterogeneity in the association between

OHL and OHRQoL may be attributed to the differences in sample composition and demography, socio-cultural characteristics or other unknown/unmeasured factors. Noteworthy, race-specific heterogeneity in the relationship between OHL and OHRQoL has been previously reported (Divaris *et al.*, 2011).

Although the causal pathway between poor OHL and poor OHL-related outcomes cannot be definitively tested in this study, the pathway is supported by literature in the general health realm. Low health literacy has been associated with less-than-ideal self-care behaviour (IHS, 2002), more emergency visits to hospital (Baker *et al.*, 1998) and poorer knowledge regarding a chronic condition and its causes (Williams *et al.*, 1998). Although requiring longitudinal studies or randomised controlled trials to categorically confirm, we can perhaps speculate that our findings contribute to the evidence base that increasingly highlights that literacy is one of the key ways in which individuals are able to process and act on information to improve their health outcomes and health care behaviours (Lee *et al.*, 2012; Nutbeam, 2008).

Our findings suggest that further investigation of the specific role of OHL on OHL-related associations and, in turn, clinical oral health warrants further investigation. This research is particularly relevant among Indigenous Australian and American Indian populations, as well as other Indigenous/Native groups at an international level; groups who experience unacceptable levels of both dental disease and poor oral health-related quality of life, and who cannot always access the care they require. As well as contributing to the general literature around oral health and Indigenous Australians and American Indians (which is lacking), the findings have the potential to raise the profile of OHL and to encourage others working with

vulnerable populations to recognise salient aspects of OHL that may be applicable to their work. This could assist, in turn, with the development of appropriate oral health services which, in the long-term, could contribute to a reduction in the oral health disparities currently reported internationally between vulnerable and less-vulnerable populations (Petersen, 2004).

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