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Validity of dental screening questions in an Indigenous young adult population

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Indigenous Australians have worse oral health than their non-Indigenous counterparts.¹ Despite the public health importance of Indigenous Australian oral health, there is limited epidemiological information available upon which to guide Indigenous oral health policy. This raises an important question regarding the oral health, or more specifically, the untreated dental needs, of Indigenous Australians: can screening questions and other self-reported risk indicators be used to predict Indigenous Australians' probability of experiencing untreated dental decay? A positive answer might permit population-level screening for untreated decay among Indigenous Australians using screening questions that are simpler to administer than processes requiring intra-oral examination.

Our aim was to evaluate the validity of screening questions used to predict untreated dental decay among Indigenous Australian young adults. Participants were members of the Aboriginal Birth Cohort study, a prospective longitudinal investigation of Indigenous Australians living in the Northern Territory's Top End.² Data for this analysis was collected at mean age 18 years.

The dental screening questions represented three domains: pain, impact on eating and dental service utilisation. The questions were based on evidence that each was a valid predictor of untreated dental decay in other populations.^{3,4} Experience of pain was assessed by two questions: 'Since the last wet, how have your teeth been?' and 'Do you have any trouble with your teeth, gum or jaw right now?' Response options for the former included 'all good, none hurting', 'some good, some hurting' or 'no good, all hurting'. These were

dichotomised into 'all good, none hurting' (No) and 'some good, some hurting' and 'no good, all hurting' (yes). Binary responses of 'yes' or 'no' were provided for the latter. Avoiding food because of oral health problems was assessed by asking participants: 'Since the last wet, have you stopped eating some foods because they hurt your teeth?' and response options were 'yes' or 'no'. 'Since the last wet' pertains to the 'wet season' period which typically lasts from November to March in the Northern Territory's Top End. The dental service utilisation question was 'Have you ever had a tooth pulled out because it hurt too much?' with response options of 'yes' or 'no'.

Information about clinical oral health status was collected during standardised examinations conducted by 2 calibrated dentists. The DT (sum of decayed teeth in the permanent dentition) index was used to assess levels of untreated dental decay; defined as percent DT>0.

Using percentage DT>0 as the dependent variable, an initial multivariate model was constructed using the four dental screening questions (Model 1); a second model was constructed using only the identified risk indicators (Model 2) and a third model included all items (Model 3). The predictive validity of each model was estimated using: (1) statistical significance of overall model; (2) 'pseudo' R²; (3) sensitivity (percentage of occurrences correctly predicted; range 0 to 1) and specificity (percentage of non-occurrences correctly predicted; range 0 to 1); and (4) area under receiver operating characteristics curve (AUC); the plot of sensitivity versus 100 minus specificity obtained from multiple dichotomies of predicted probabilities from a multivariable binary logistic regression model, with each dichotomy cross-classified against clinical diagnosis. AUC has a value of 0.5 under the null hypothesis that the prediction model is no better than chance. Swets proposed the following thresholds for interpretation of AUC values: <0.7 ('poor'), 0.7 to 0.9 ('useful') and >0.9 ('excellent').⁵

Of the 468 who were assessed, 442 agreed to be dentally examined and provided complete information in a self-report dental questionnaire. All subsequent analyses pertain to those 442. The age range was 16 to 20 years and there was approximately equal representation by gender. A matrix of bivariate correlations among the four screening questions indicated that correlations were weak, ranging from zero to 0.23.

Two of the four screening questions were statistically significant predictors of untreated dental decay when assessed in a multivariable binary logistic regression model. Model 1 had moderate sensitivity (0.59) and good specificity (0.78), achieving combined sensitivity plus specificity of 1.37. All three of the traditional risk indicators were statistically significant predictors of untreated dental decay, but together they had worse predictive validity than the initial model (sensitivity plus specificity = 1.26; Model 2). When all seven variables were used to predict untreated dental decay, the overall validity was still less than that obtained for Model 1 alone (sensitivity plus specificity = 1.35; Model 3). Two of the four screening variables remained statistically significant in this full model. When a probability of 0.73 from the DT>0 logistic regression model was used as the threshold to classify participants as predicted cases of untreated dental decay, the AUC was 0.71, 0.66 and 0.74 respectively for the three models.

Our findings suggest that questions designed to screen for untreated dental decay in a birth cohort of Indigenous Australian young adults, together with traditional risk indicators, achieved 'useful' levels of

prediction based on benchmarks proposed for overall predictive validity. The items were easy to administer and could be readily collected in health interview surveys. Data from this study show some promise in the use of screening questions for assessing levels of untreated dental decay in an Indigenous population, although testing in other settings is warranted.

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Sugar consumption from beverages and the potential effects of a text-based information label

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Although obesity is a multi-factorial and complex problem,¹ there is strong evidence that consumption of high-sugar beverages increases the risk of becoming overweight or obese and contributes to the development of diabetes.²⁻⁵

Labelling foods with health and nutrition information has been shown to be an effective way to influence consumer perception and to promote behaviour change towards more healthful choices.⁶⁻⁸ We

hypothesised that text-based, front-of-pack labels advising individuals of the increased health risks associated with consumption of high sugar beverages would lead to a decrease in purchasing of these beverages.

Informed by a review of relevant literature, the potential impact of two alternative labels was assessed via a postal survey. The full survey documents can be viewed at www.adelaide.edu.au/pcsip/drinks. In short, the survey asked respondents about their current purchasing of high sugar and reduced sugar beverages; provided details of a label that would be placed on the front of a range of high sugar beverages; asked a series of questions relating to their comprehension of the label; and then asked respondents to state whether they would alter their current purchasing patterns on the basis of the information on the label.

To target purchasing patterns of households, the postal survey was directed to the person in the household most responsible for grocery shopping. Half the contacted households received a survey stating that the label, 'Drinking this drink may increase your risk of obesity' was to be placed on sugar-sweetened soft drinks, fruit juices, fruit drinks and cordials. The remaining contacted households received an alternative label, 'Drinking sugar sweetened drinks may increase your risk of diabetes', to be placed on sugar-sweetened soft drinks, fruit drinks and cordials (but not fruit juices). Neither label was to be placed on flavoured milk.

Of 197 surveys delivered, 130 (66%) were returned, 68 (52%) contained the obesity label. Table 1 describes current consumption patterns. 79.2% of households purchased at least one of the five high sugar beverages. In households that purchased high sugar beverages, mean (median) sugar intake per person per week from these beverages alone was 314 g (185 g), assuming equal consumption across the household. This is equivalent to an energy intake of 762 kJ (450 kJ) per person per day. The World Health Organization recommends that free sugars make up no more than 10% of the total energy intake for adults.⁹ Based on recommended total energy intake (8700 kJ),¹⁰ 21.3% (95% CI 14.0-28.6) of all households exceeded this level from high sugar beverage consumption alone.

Table 2 shows that of the 100 households who purchased one or more high sugar beverages, 36.0% (CI 26.6-46.2) stated that they would reduce purchasing of one or more high sugar beverages. Of those receiving the obesity label, 35.3% stated they would reduce purchasing of at least one of the four labelled high sugar beverages (CI 22.4-49.9). For the diabetes label, 41.7% (95% CI 25.5-59.2) stated they would reduce purchasing of at least one of the three labelled

Table 1: Current beverage purchasing in a typical week (per person in household).

Beverage Type	Number Purchasing (%) (n=130)	Volume purchased (L) ^a				Sugar Intake (g) ^a				
		Mean (SD)	Median	Min	Max	Sugar (g/100 mL)	Mean (SD)	Median	Min	Max
Regular soft drink	52 (40.0)	2.2 (2.6)	1.3	0.1	12.0	10.8	240.9 (280.4)	143.7	6.7	1,293.6
Fruit drink	17 (13.1)	1.0 (0.7)	1.0	0.2	2.5	10.6	110.6 (74.2)	105.8	19.8	264.5
Regular cordial	36 (27.7)	0.7 (0.5)	0.6	0.0	2.0	40.1	262.9 (210.8)	233.9	12.5	802.0
100% fruit juice	78 (60.0)	0.9 (0.5)	0.7	0.1	2.7	9.8	84.6 (52.0)	69.4	12.3	261.3
Flavoured Milk	22 (16.9)	1.3 (2.1)	0.5	0.2	8.0	9.6	120.8 (203.6)	47.8	17.9	764.8
All high sugar beverages	103 (79.2)	2.4 (2.8)	1.4	0.1	16.0	–	313.6 (371.1)	185.1	12.3	2,307.2

a) Includes only households which purchase the beverage. Excludes households missing volume or household data. Per person quantities calculated as household volume divided by total number of people in household.