
**Factors influencing accuracy of caries risk
assessment among
South Australian children**

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Table of contents

| | |
|---|-----------|
| CHAPTER 1. INTRODUCTION | 1 |
| 1.1 BACKGROUND..... | 1 |
| 1.2 OBJECTIVES..... | 7 |
| 1.3 RATIONALE OF THE STUDY..... | 8 |
| 1.4 STRUCTURE OF THIS THESIS..... | 9 |
| CHAPTER 2. LITERATURE REVIEW..... | 10 |
| 2.1 CONCEPTUAL MODEL OF CARIES AND CARIES RISK ASSESSMENT..... | 10 |
| 2.2 OVERVIEW OF CARIES RISK ASSESSMENT MODELS | 13 |
| 2.3 POTENTIAL FACTORS INFLUENCING THE CARIES RISK ASSESSMENT PROCESS | 19 |
| 2.3.1 <i>Clinician characteristics</i> | 19 |
| 2.3.2 <i>Children's characteristics</i> | 20 |
| 2.4 MEASUREMENTS OF CARIES INCREMENT IN LONGITUDINAL RESEARCH | 27 |
| 2.4.1 <i>DMF increment</i> | 27 |
| 2.4.2 <i>Crude caries increment (CCI)</i> | 27 |
| 2.4.3 <i>Net caries increment (NCI)</i> | 27 |
| 2.4.4 <i>Adjusted caries increment (ADJCI)</i> | 28 |
| 2.4.5 <i>Incidence</i> | 28 |
| 2.4.6 <i>Incidence density (ID)</i> | 29 |
| 2.4.7 <i>The use of incidence density in dental health research</i> | 30 |
| 2.5 INDICATORS OF RISK PREDICTION MODELS ACCURACY | 31 |
| 2.5.1 <i>Sensitivity and specificity</i> | 31 |
| 2.5.2 <i>Receiver Operating Characteristic curve (ROC curve.)</i> | 32 |
| 2.6 CARIES EXPERIENCE AND DENTAL CARE OF SOUTH AUSTRALIAN CHILDREN | 34 |
| 2.6.1 <i>Prevalence and severity of dental caries among Australian children</i> | 34 |
| 2.6.2 <i>School Dental Service in South Australia</i> | 35 |
| 2.6.3 <i>Caries risk assessment in the School Dental Service</i> | 35 |
| 2.6.4 <i>Effect of recall interval on service delivery and oral health – a background to the Personalised Dental Care programme</i> | 37 |

| | |
|---|-----------|
| CHAPTER 3. RELATIONSHIP BETWEEN DENTAL RISK CLASSIFICATION AND OBSERVED DENTAL CARIES RATE AMONG SOUTH AUSTRALIAN SCHOOL CHILDREN..... | 40 |
| 3.1 AIMS..... | 40 |
| 3.2 CHILD DENTAL HEALTH SURVEY..... | 40 |
| 3.2.1 <i>Study sample</i> | 41 |
| 3.2.2 <i>Data items and data collection</i> | 42 |
| 3.3 DATA MANAGEMENT..... | 44 |
| 3.3.1 <i>Data combination</i> | 44 |
| 3.3.2 <i>Selection of archived examination records</i> | 44 |
| 3.4 COMPUTATION OF INDICATORS OF DENTAL CARIES..... | 44 |
| 3.4.1 <i>Computation of dmfs and DMFS indices</i> | 44 |
| 3.4.2 <i>Computation of net caries increment</i> | 45 |
| 3.4.3 <i>Computation of caries incidence density rate</i> | 47 |
| 3.5 ANALYTICAL PLAN..... | 51 |
| 3.5.1 <i>Dependent variables</i> | 51 |
| 3.5.2 <i>Explanatory variables</i> | 51 |
| 3.6 RESULTS..... | 53 |
| 3.6.1 <i>Caries experience and risk status at baseline</i> | 53 |
| 3.6.2 <i>Net caries increment</i> | 64 |
| 3.6.3 <i>Caries incidence density</i> | 67 |
| 3.7 SUMMARY OF THE CHAPTER..... | 73 |
| 3.7.2 <i>Summary of the findings</i> | 74 |
| 3.7.3 <i>Overview – strength and limitations</i> | 74 |
| CHAPTER 4. ACCURACY OF CLINICIANS' CARIES RISK CLASSIFICATION AMONG SOUTH AUSTRALIAN SCHOOL CHILDREN..... | 77 |
| 4.1 INTRODUCTION..... | 77 |
| 4.2 TERMINOLOGY AND CONVENTIONS..... | 78 |
| 4.3 METHODS..... | 80 |
| 4.3.1 <i>Data source and data management</i> | 80 |

| | | |
|--|--|------------|
| 4.3.2 | <i>Statistical analysis</i> | 80 |
| 4.4 | RESULTS..... | 85 |
| 4.4.1 | <i>Descriptive statistics</i> | 85 |
| 4.4.2 | <i>Clinician-level accuracy in caries prediction</i> | 87 |
| 4.4.3 | <i>Overall accuracy in caries prediction</i> | 90 |
| 4.5 | SUMMARY AND DISCUSSION OF THE RESULTS..... | 96 |
| 4.5.1 | <i>Overview</i> | 96 |
| 4.5.2 | <i>Strengths and limitations of this sub-study</i> | 98 |
| 4.5.3 | <i>Implication of the findings</i> | 100 |
| CHAPTER 5. DISTRIBUTION OF CLINICIANS' PERCEPTIONS AND PRACTICES REGARDING CARIES RISK ASSESSMENT..... | | 101 |
| 5.1 | AIMS..... | 101 |
| 5.2 | METHOD..... | 101 |
| 5.3 | RESULTS..... | 107 |
| 5.3.1 | <i>Response rate and characteristics of participants</i> | 107 |
| 5.3.2 | <i>Clinical practices usually undertaken during examination and caries risk assessment</i> | 109 |
| 5.3.3 | <i>Clinician's perceptions and beliefs regarding caries risk assessment</i> | 114 |
| 5.3.4 | <i>Confidence in routine practice</i> | 118 |
| 5.3.5 | <i>Development of summary measures</i> | 118 |
| 5.4 | DISCUSSION..... | 141 |
| 5.4.1 | <i>Overview of findings</i> | 141 |
| 5.4.2 | <i>Strengths and limitations</i> | 141 |
| 5.4.3 | <i>Interpretation of the results</i> | 142 |
| CHAPTER 6. FACTORS ASSOCIATED WITH ACCURACY OF CLINICIANS' CARIES RISK CLASSIFICATION AMONG SA SCHOOL CHILDREN..... | | 145 |
| 6.1 | INTRODUCTION..... | 145 |
| 6.2 | METHODS..... | 146 |
| 6.2.1 | <i>Data management</i> | 146 |
| 6.2.2 | <i>Analytical approach</i> | 148 |
| 6.2.3 | <i>Development of caries prediction models</i> | 156 |

| | | |
|---|---|------------|
| 6.3 | RESULTS | 158 |
| 6.3.1 | <i>Representative of sample</i> | 158 |
| 6.3.2 | <i>Analysis at the clinician-level</i> | 160 |
| 6.3.3 | <i>Child level analysis</i> | 181 |
| 6.3.4 | <i>Multivariate predictive models</i> | 195 |
| 6.4 | SUMMARY OF FINDINGS..... | 204 |
| 6.4.1 | <i>Factors at clinician level</i> | 204 |
| 6.4.2 | <i>Factors at child level</i> | 205 |
| 6.4.3 | <i>Implications of the findings</i> | 205 |
| CHAPTER 7. DISCUSSION | | 207 |
| 7.1 | KEY RESULTS..... | 207 |
| 7.1.1 | <i>Factors influencing the observed accuracy in caries risk assessment</i> | 207 |
| 7.1.2 | <i>Clinicians and their routine practice and perception of caries risk assessment</i> | 208 |
| 7.1.3 | <i>Clinician’s caries risk prediction accuracy</i> | 208 |
| 7.1.4 | <i>Magnitude of effect of clinician and child factors on clinician accuracy</i> | 212 |
| 7.1.5 | <i>Caries rate among South Australian children</i> | 213 |
| 7.2 | OVERVIEW – STRENGTHS AND LIMITATIONS..... | 213 |
| 7.2.1 | <i>Strengths of the study</i> | 213 |
| 7.2.2 | <i>Limitations of the study design and population</i> | 216 |
| 7.3 | CARIES RISK ASSESSMENT STRATEGY WITHIN SCHOOL DENTAL SERVICE..... | 219 |
| 7.4 | IMPLICATIONS OF STUDY FINDING | 220 |
| 7.4.1 | <i>Implication for research</i> | 220 |
| 7.4.2 | <i>Implications for population oral health</i> | 221 |
| 7.4.3 | <i>Implications for dental practitioners</i> | 223 |
| CHAPTER 8. SUMMARY AND CONCLUSIONS..... | | 225 |
| BIBLIOGRAPHY | | 227 |
| APPENDIX 1: CARIES RISK ASSESSMENT CRITERIA..... | | 236 |
| APPENDIX 2: SURVEY INSTRUMENT..... | | 240 |
| QUESTIONNAIRE TO CLINICIANS..... | | 240 |

List of tables

| | |
|--|----|
| Table 2.1: Domains of determinants of oral health according to level of influence | 12 |
| Table 2.2: Summary of caries prediction models in children | 15 |
| Table 3.1 Convention used to define events (De Paola grid) for caries increment computation | 45 |
| Table 3.2: Convention used to enumerate surface-years at risk computation | 48 |
| Table 3.3: Example of incidence density..... | 49 |
| Table 3.4: Example of incidence density for mixed dentition | 50 |
| Table 3.5: Distribution of children by sociodemographic characteristics..... | 54 |
| Table 3.6: Caries experience of the selected and initial sample..... | 55 |
| Table 3.7: Baseline dental caries experience by study sample characteristics at baseline | 60 |
| Table 3.8: Distribution of risk status at baseline by children's characteristics | 62 |
| Table 3.9: Caries experience at baseline in three risk classification groups..... | 63 |
| Table 3.10: Mean of net caries increment by baseline risk status..... | 66 |
| Table 3.11: The distribution of deciduous caries incidence density | 67 |
| Table 3.12: The distribution of permanent caries incidence density | 68 |
| Table 3.13 The distribution of combined permanent and deciduous caries incidence density | 68 |
| Table 3.14: Incidence density (calculated for whole group) by children's characteristics | 70 |
| Table 4.1: Schematic 2x2 table for calculation of sensitivity and specificity | 79 |
| Table 4.2: Hypothetical scenario 1: sensitivity and specificity among children who did not receive fissure sealants..... | 84 |
| Table 4.3: Hypothetical scenario 2: sensitivity and specificity among children who did receive fissure sealants | 84 |
| Table 4.4: Agreement between caries risk predicted at baseline and the actual gold standard caries rate during the study period..... | 90 |
| Table 4.5: Low/medium risk versus high risk and gold standard among children who did not receive any new fissure sealant during the study period | 91 |
| Table 4.6: Accuracy among children who were examined at both baseline and follow-up examination by the same clinician. | 92 |

| | |
|--|-----|
| Table 4.7: Overall sensitivity and specificity for clinicians with low/medium/high assignment of high-risk children | 94 |
| Table 4.8: Overall sensitivity and specificity among children without/with caries experience at baseline..... | 95 |
| Table 5.1: Response rate by dentist and dental therapist | 107 |
| Table 5.2: Description of clinicians' characteristics | 108 |
| Table 5.3: Distribution of dental examination procedures undertaken by the clinician for caries risk assessment | 110 |
| Table 5.4: Distribution of interview information for caries risk assessment items..... | 113 |
| Table 5.5: Distribution of clinician perceptions and beliefs regarding clinical factors for caries risk assessment | 115 |
| Table 5.6: Clinician's perceptions and beliefs of non-clinical caries risk factors..... | 117 |
| Table 5.7: Distribution of confidence items | 118 |
| Table 5.8: Factor analysis of clinician routine dental examination..... | 120 |
| Table 5.9: Variation in conducting dental examination among clinician subgroups | 122 |
| Table 5.10: (continued) | 123 |
| Table 5.11: Number of bitewings taken per 10 children by clinicians' characteristics..... | 125 |
| Table 5.12: Factor analysis of items on interviewing for CRA..... | 127 |
| Table 5.13: Sub-scale score for child-related information collected by clinicians by clinician characteristics ^(a) | 129 |
| Table 5.14: Clinician's perceptions and beliefs on clinical factors regarding caries risk assessment..... | 132 |
| Table 5.15: Distribution of clinician's perceptions and beliefs on subscale for clinical factors regarding caries risk assessment ^(a) | 133 |
| Table 5.16: Clinician's perceptions and beliefs on subscales for clinical factors regarding caries risk assessment by clinician characteristics ^(a) | 135 |
| Table 5.17 Factor analyses of clinician's perceptions and beliefs on non clinical factors regarding caries risk assessment..... | 138 |
| Table 5.18: Distribution of clinician's perception and beliefs on sub-scales for non clinical caries risk factors ^(a) | 139 |

| | |
|--|-----|
| Table 5.19: Clinician's perceptions and beliefs on clinical factors regarding caries risk assessment by clinician characteristics ^(a) | 140 |
| Table 6.1: Independent variables..... | 150 |
| Table 6.2: Outline of child and clinician models of clinician accuracy | 151 |
| Table 6.3: Summary of model developing | 155 |
| Table 6.4: Representativeness of clinician's sample..... | 158 |
| Table 6.5: Representative of child sample | 159 |
| Table 6.6: Mean age, dmfs and DMFS scores of this study sample and full sample..... | 159 |
| Table 6.7: Clinician accuracy by clinician daily clinical practices..... | 161 |
| Table 6.8: Accuracy by collecting relevant information for CRA scales | 162 |
| Table 6.9: Accuracy by clinicians' perceptions and beliefs of clinical caries risk factors..... | 163 |
| Table 6.10: Accuracy by clinicians' perceptions and beliefs of non-clinical caries risk factors | 164 |
| Table 6.11: Clinician accuracy by reported level of confidence in clinical situations | 166 |
| Table 6.12: Accuracy by clinician characteristics..... | 167 |
| Table 6.13: Accuracy by clinician working conditions | 168 |
| Table 6.14: Clinician accuracy by child characteristics..... | 170 |
| Table 6.15: Summary of bivariate association between clinician- and child-related factors and clinician accuracy..... | 172 |
| Table 6.16: Correlation matrix among variables in the multivariate regression models..... | 174 |
| Table 6.17: Clinician-level multivariate model of factors associated with clinicians' sensitivity | 176 |
| Table 6.18: Clinician-level multivariate model of factors associated with clinicians' specificity | 178 |
| Table 6.19: Clinician level multivariate model of factors associated with clinician's combined Se+Sp | 180 |
| Table 6.20: Child level multivariate binomial regression model for sensitivity by child factors | 182 |
| Table 6.21: Child level multivariate binomial regression for specificity by child socio-demographic factors..... | 183 |
| Table 6.22: Estimated clinician accuracy by child socio-demographic characteristics | 185 |

| | |
|---|-----|
| Table 6.23: Child’s level multivariate model for sensitivity by child and clinician-related factors..... | 187 |
| Table 6.24: Child level multivariate model for specificity by child and clinician-related factors | 189 |
| Table 6.25: Estimated clinician accuracy by clinician-related factors | 190 |
| Table 6.26: Estimated clinician accuracy using both clinician and child characteristics..... | 192 |
| Table 6.27: Estimated clinician accuracy by child’s caries experience at baseline | 193 |
| Table 6.28: Clinician accuracy by children age groups | 194 |
| Table 6.29: Model 1: predicting odds of high rate using clinical judgement only | 195 |
| Table 6.30: Model 2: predicting odds of high rate using clinician judgment and caries experience..... | 196 |
| Table 6.31: Model 3: Predicting odds of high rate using clinician judgment, caries experience and child’ age..... | 198 |
| Table 6.32: Model 4: Predicting odds of high rate using clinician judgment, caries experience, child’ age and child social factors | 200 |
| Table 6.33: Comparison of Area Under Curve (AUC) and accuracy (Se+Sp) of four models | 202 |
| Table 6.34: Predicting odds of high rate using clinician judgment, child’ age and child social factors among children with no caries at baseline..... | 203 |

List of figures

| | |
|---|-----|
| Figure 1.1: Schematic diagram of the risk assessment process and possible factors affecting the accuracy of this process..... | 4 |
| Figure 2: Social Model of Health – Dahlgren & Whitehead, 1991 | 11 |
| Figure 2.2: Comparing ROC curves | 33 |
| Figure 3.1: Study sample..... | 41 |
| Figure 3.2: Percentage of children by risk classification at baseline..... | 55 |
| Figure 3.3: Histogram of baseline dmfs distribution..... | 56 |
| Figure 3.4: Histogram of baseline DMFS distribution..... | 57 |
| Figure 3.5: Histogram of baseline DMFS + dmfs distribution | 58 |
| Figure 3.6: Distribution of net caries increment of deciduous dentition | 64 |
| Figure 3.7: Distribution of net caries increment of permanent dentition | 65 |
| Figure 3.8: Incidence density by caries experience at baseline..... | 72 |
| Figure 4.1: Distribution of number of examined children during study period per clinician. | 85 |
| Figure 4.2: Distribution of high-risk children seen per clinician | 86 |
| Figure 4.3: Distribution of clinician’s sensitivity | 87 |
| Figure 4.4: Distribution of clinician’s specificity | 88 |
| Figure 4.5: Distribution of clinician’s combined sensitivity and specificity..... | 89 |
| Figure 5.1: Distribution of average number of bitewings taken per 10 children examined by each clinician | 111 |
| Figure 6.1: Schematic of subjects included in the study by each stage | 147 |
| Figure 6.2: ROC curve for Model 1: predictive accuracy using clinician judgment only..... | 195 |
| Figure 6.3: ROC curve for Model 2: predictive accuracy using clinician judgment and caries experience | 197 |
| Figure 6.4: Model 3: predicting high risk using clinician judgment, caries experience and child’ age..... | 199 |
| Figure 6.5: Model 4: predicting high risk using clinician judgment, caries experience and child’ age..... | 201 |

List of equations

- Equation 1: $DMF \text{ increment} = \frac{\sum_{i=1}^n (DMF_{t1} - DMF_{t0})}{n}$ 27
- Equation 2: $CCI = \frac{\sum_{i=1}^n (\text{Events where surface sound at time 0 but decayed or filled at time 1})}{n}$ 27
- Equation 3: $ADJCI_i = Y_{2i} \times \frac{y_{4i}}{y_{3i} + y_{4i}}$ 28
- Equation 4: $\text{Incidence} = \frac{\text{Number of participants experiencing a caries event between two assessments}}{\text{Total number of participants}} \times 100$ 28
- Equation 5: $\text{Incidence Density} = \frac{\text{Total number of new cases of disease during the study period}}{\text{Total number of person years of participation in the study}}$ 29
- Equation 6: $\text{Incidence Density}_{\text{mouth } i} = \frac{\text{Total number of new events of disease during the study period}_i}{\text{Total number of surface years of participation in the study}_i}$ 29
- Equation 7: $\text{Incidence Density}_{\text{(population)}} = \frac{\text{Total number of new events during the study period among the group}}{\text{Total number of surface years of participation in the study of the whole group}}$ 29
- Equation 8: $\text{Incidence density (ID)} = \frac{1}{164.25} \times 100 = 0.6\%$ 50
- Equation 9: $\text{Sensitivity} = \frac{a}{a + c}$ 79
- Equation 10: $\text{Specificity} = \frac{d}{b + d}$ 79

Notes

References are listed in the bibliography in alphabetical order of author(s) and in date order where there are multiple references for a particular author. References to published work within the text are made by listing author(s) and year of publication in parentheses. When the author's name appears within the text, it is followed by the year of publication in parentheses. If there are up to three authors, reference is made to each author within the text. Where there are more than three authors, the primary author is listed followed by 'et al' in the text, whereas all authors are listed in the bibliography. If reference is made to more than one publication by the same author within a single year, each citation is distinguished by a letter (a, b, etc.) which is added to the pertinent year of publication both in the text and in the bibliography.

Abbreviations

| | |
|--------|---|
| ADJCI | Adjusted caries increment |
| AIHW | Australian Institute of Health and Welfare |
| ANOVA | Analysis of variance |
| ARCPOH | Australian Research Centre for Population Oral Health |
| AUC | Area Under Curve |
| CART | Classification and regression tree analysis |
| CCI | Crude caries increment |
| CRA | Caries Risk Assessment |
| dmfs | Decayed, missing, filled deciduous surfaces |
| DMFS | Decayed, missing, filled permanent surfaces |
| dmft | Decayed, missing, filled deciduous teeth |
| DMFT | Decayed, missing, filled permanent teeth |
| DT | Dental therapist |
| EXACT | Electronic clinical record data management system |
| F | Factor |
| FDA | Food and Drug Administration |
| GLM | Generalised Linear Regression Model |
| h^2 | Communality |
| ID | Incidence density |
| IDR | Incidence density ratio |
| KMO | Kaiser-Meyer-Olkin |
| LRA | Logistic regression analysis |
| LDA | Linear discriminant analysis |
| Max | Maximum |
| Min | Minimum |
| n | Sample size |
| NA | Not available |
| NC | Not calculated |
| NCI | Net caries increment |
| NHMRC | National Health and Medical Research Council |
| NIDR | National Institute of Dental Research |

| | |
|----------------|--|
| NS | Not significant |
| P | p-value |
| PDC | Personalised Dental Care |
| PHR | Percentage high risk patients |
| R ² | Per cent variance explained |
| Ref | Reference category |
| ROC | Receiver Operating Curve |
| SDS | School Dental Service |
| SA | South Australia |
| SA SDS | South Australian School Dental Service |
| SADS | South Australian Dental Service |
| SD | Standard deviation |
| Se | Sensitivity |
| Se+Sp | Sensitivity + Specificity |
| SES | Socioeconomic status |
| Sp | Specificity |
| WHO | World Health Organization |
| 99%CI | 99% Confidence Interval |

Abstract

This thesis examined factors associated with the accuracy of caries risk assessment by South Australian Dental Service (SADS) staff for children enrolled in the school dental service. Understanding those factors can help to address variation in accuracy of assessment and ultimately caries risk among children. The aims of this thesis were to examine the relationship between clinician's assessment of caries risk at a baseline examination and subsequent caries development and to explore the association between accuracy in caries risk assessment and clinician- and patient-related factors.

This study consisted of four sub-studies which addressed a set of specific objectives. Two data sources were used in the analysis. The first dataset was obtained from the South Australian component of the Child Dental Health Survey, an ongoing national surveillance survey of the oral health status of Australian children attending school dental services in all states and territories. Data on caries experience were extracted from electronic examination records collected during the period 2002–2005. These data included caries experience (decayed, missing and filled tooth surfaces) of the deciduous (dmfs) and permanent dentition (DMFS). The level of risk status assigned by clinicians at the baseline examination as well as socio-demographic factors of those children, were obtained. This first dataset was used for sub-study no. 1 and sub-study no. 2. Sub-study no. 3 and sub-study no. 4 used additional information from the second dataset, which contained responses to a self-completed clinician questionnaire. This questionnaire collected data on clinicians' personal characteristics, routine caries risk assessment practices and their perception of factors that were important in caries risk assessment and their confidence in their routine clinical activities.

Sub-study no. 1 described caries experience and increment and their associations with clinicians' caries risk assessment. Children who had at least two recorded examinations with an interval of more than six months between them were included. Caries experience in both permanent and deciduous dentitions at baseline examination was described by assigned risk status. Net caries increment and caries incidence density between examinations were computed. Caries incidence density was contrasted according to children' risk status at the baseline examination. Children who were classified as high-risk at baseline had a significantly higher rate of new dental caries regardless of their caries experience status at

baseline. This result supported the conclusion that clinicians' judgement was a valid predictor of future caries development.

Clinicians who examined more than 20 children during the study period were selected for study no. 2. This study aimed to evaluate clinician accuracy in predicting caries risk for South Australian children. Computed caries rate between the two examinations (caries incidence density) was used as the gold standard and compared with clinicians' classification of children' risk status at the baseline examination. Sensitivity (Se) and specificity (Sp) were calculated as measures of clinician accuracy. Accuracy in predicting caries development was moderate, although there was large variation between clinicians. This finding suggested that a number of clinician-related characteristics influenced caries risk assessment accuracy.

In sub-study no. 3, a survey was conducted among all SADS school dental service clinicians using a self-completed questionnaire. The aim of this sub-study was to identify clinician-related factors that associated with caries risk assessment. Factor analysis was used for a group of items collected in the questionnaire. The factor analysis revealed three main constructs belonging to reported clinician routine caries risk assessment practices: clinical procedure during the first examination; child behaviour; and child's stressful life events and family circumstances. Further eight constructs were derived by factor analysis from data items on clinician perception of caries risk assessment including: Ecology; Plaque; Current caries; Past caries; Diet; Socioeconomic status; Fluoride exposure; and Dental behaviour.

Clinician accuracy (Se, Sp and Se+Sp) was used as the dependent variables in sub-study no. 4. The independent variables were clinician characteristics, clinician-related factors which were derived from sub-study no. 3 and children's characteristics which were obtained from the Child Dental Health Survey. Evaluating a child's stressful life events and family circumstance was associated with clinicians' accuracy in both bivariate and multivariate analysis. Clinicians who evaluated a child's stressful life events and family circumstance more frequently had a higher sensitivity and combined sensitivity and specificity than their colleagues. Clinician accuracy was also strongly influenced by the child's caries experience at the baseline examination. Caries risk assessment performed among children with higher level of caries experience was significantly more accurate compared with that observed among children with no level of caries experience at baseline.

In conclusion, the accuracy of caries risk assessment performed by clinicians in routine practice in SADS was comparable to that reported in other studies. Further staff

development in improving clinicians' understanding of a child's stressful life events and family circumstance can potentially improve the accuracy of caries risk assessment. However, the accuracy of caries risk assessment depended largely on the child's level of past caries experience. This finding indicated that among children with no caries experience, the current caries risk assessment is not adequate in predicting caries development. The study also revealed even if risk is correctly identified, and if more preventive treatment is allocated to high risk children, those children still developed significant amount of caries. The focus of future research should be on identifying approaches to limit that disappointing outcome.

Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university. To the best of the candidate's knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

I give my consent to the thesis being made available for photocopying and loan if accepted for the award of the degree.

Signed:.....

Date:.....

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