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COMPETING RISKS SURVIVAL MODELLING OF CHILDHOOD CARIES

J Stephenson

INTRODUCTION

The survival of primary molar teeth to caries was investigated using data from a cohort study of 2,654 children aged ~5 years at baseline, undertaken by Cardiff University School of Dentistry in 1999-2003.

AIMS & OBJECTIVES

• To model the occurrence of caries in primary molar teeth using parametric survival analysis methods, and to assess the effect of exfoliation on the survival of primary molar teeth and surfaces to caries
• To identify factors significantly linked with childhood caries within the framework of a hierarchical frailty model structure
• To compare and contrast survival to caries across children, teeth and surfaces with differing characteristics

MATERIALS & METHODS

Children were selected from fluoridated areas in the West Midlands and non-fluoridated areas in South Wales. Caries data was recorded on all surfaces of all primary molar teeth on 3 occasions at intervals of ~2 years. The gender, age at each exam and socio-economic status (SEC score) of all children was recorded. Tooth and surface parameters were also recorded. Parallel analyses were undertaken on the surface data, and on the data transformed into tooth-level responses. Parametric survival modelling was undertaken using 4 contrasting survival distributions, considering the concurrent risks of caries and exfoliation.

RESULTS

Marginal survival models

Marginal survival of primary molar teeth and surfaces were derived with respect to caries and exfoliation, using frailty models with surface- and tooth-level observations nested within children. These may be interpreted as the survival experience that would be observed in the absence of other risks. Surface-level results are illustrated.

Calculation of likelihood ratio statistics show the log-logistic distribution to be the best fit to the data.

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Null model log likelihood from assumed distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries</td>
<td>-53,240</td>
</tr>
<tr>
<td>Exfoliation</td>
<td>-44,695</td>
</tr>
</tbody>
</table>

Survival to caries is affected by surface type and fluoridation status. Non-occlusal surfaces of children from areas with fluoridated water show best survival rates.

SEC score also affects marginal survival to a lesser extent. Other covariates have little substantive effect.

Exfoliation rates are not affected by surface type or demographics.

CONCLUSIONS

Survival of primary tooth surfaces to caries is substantively associated with fluoridation status, SEC score and surface type. Exfoliation is a significant limiter on caries occurrence later in life.