

# **Terrorising the Tooth Fairy with GIS: Finding, Filling, Drilling and Closing the Gaps.**

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**Presented at SIRC 2001 – The 13<sup>th</sup> Annual Colloquium of the Spatial Information Research Centre  
University of Otago, Dunedin, New Zealand  
December 2<sup>nd</sup>-5<sup>th</sup> 2001**

## **EXTENDED ABSTRACT**

The Waikato District Health board is responsible for the purchase of dental services for approximately 60,000 preschool and primary school-aged children. A Geographic Information System is used to integrate and analyse the dental records of our children in relation to a variety of demographic and environmental factors. This project has created a range of new information products that are used by dental therapists, health promoters and managers to more effectively target and improve the allocation of health promotion, health education and health resources. This new information enables health promotion at a variety of scales, from Individual, School, Therapist and TLA levels. Results of the work to date show a variation in oral health status throughout the region, however causal factors are difficult to identify. With increasing electronic dental data becoming available, more robust service availability and accessibility trending and spatial modelling will be possible in the future. Results from this project have and will continue to provide better decision-making through the availability of better information for service management & delivery.

**Keywords and phrases:** Oral Health, Dental Services, Children, Dental Therapists, and Health Resource Allocation.

### **1.0 SYNOPSIS**

Oral health has been recognised as a priority area in population health within the NZ Health Strategy Document, June 2000. The impact of oral disease contributes to the disparity in health status throughout the population of our region. Nationally statistics indicate that numbers of decayed, missing and filled teeth are higher amongst Maori and Pacific Island Children and those from lower socio-economic groups.

Dental data from approximately 60,000 school children, treated between January 2000 and September 2001, was processed incorporating information collected by Waikato Dental Therapists, Ministry of Education Roll Counts, the 1996 National Census, NZ Deprivation Index 1996, Territorial Local Authorities, and Health Service Accessibility. In all several million fields of data were overlaid, summarised and analysed.

Analysis and evaluations were based on the average number of fillings per individual child, which were summarised to their associated school, dental therapist and Territorial Local Authority.

As seen in Figure 1 and 2., Provisional results from January – December 2000 indicate there were considerable variations across the 10 Territorial Local Authorities within the Waikato Health District. Results indicate that those treated in the Matamata Piako District Council area have twice as many fillings when compared with the best rate of fillings per child found within the Waitomo District Council area. Generally a higher rate of fillings

was noted in rural areas. The most likely reasons for this could include poor oral hygiene and variation in the service allocation within those areas for the time period understudy.

This information has been shared with the Chief Executive Officer's of the Territorial Local Authorities as a catalyst to forming a working relationship, with a view of moving towards achieving health gains in their local community. As new information becomes available, this too will be forwarded on a regular basis.

ArcView GIS is used as a central and core hub for data and information integration. Figure 3 provides an overview of the processes involved in Stage Two of the oral health programme. GIS has provided the means to reconcile expected enrolments with a range of data from the Ministry of Education (roll counts), demographics from Statistics NZ, and internal counts of children enrolled in the dental service. This ability enables examination and draws attention to those areas with substantial variation.

The data analysis is an ongoing process under continual review, as new techniques are developed and as new datasets become available. Stage Two investigates the environmental and socio-economic factors that may be influencing the apparent oral health variance, including the following:

- Links to the Decile ratings of each school
- The NZ Deprivation index 1996 and other socio-economic factors
- Ethnicity
- Accessibility to dental therapists (serviceability/productivity).

Water supply fluoridation levels using overlay techniques are currently being investigated however the creation of this dataset is a mammoth task. To enable the calculation of a approximate fluoride exposure level for each child, requiring the manual digital creation of up to 3000 water distribution zones based on water sources and supply areas. While a crude Fluoridation layer has been created, it will take a great deal of time to create an accurate layer, which we hope will have been completed by mid 2002.

The ongoing programme will incorporate and assist Dental Therapists, Regional Dental Health Promoters, Health Protection Officers and localised Health Promoters to target key factors of influence and to direct resources accordingly. To facilitate a co-ordinated approach and as a management tool this information has been introduced to the Family Health Team Managers where it should assist to focus resources to the most appropriate areas.

## **2.0 BENEFITS TO THE COMMUNITY**

The indirect and direct benefits to the children within Waikato District Health Board include:

- The Identification of localised factors that may affect oral health, for example socio-economic and environmental influences including access to services and drinking water fluoridation.
- The direction of resources to maximise effective and efficient improvement of services.
- Establishment of superior data collection, validation and analysis methods for improved planning.
- Social and financial cost savings through improved access to information for decision-making processes.
- Development of an intersectorial approach to information sharing on health issues.

The oral health programme has been effective in demonstrating the Waikato District Health Board's ability to develop evidence-based projects and to guide intersectorial development of public health gains, as required under the current legislation. It has also been a practical example of the organisation's ability to incorporate geographical information systems and public health expertise, to provide an analytical tool for health needs analysis. These capabilities have significant potential for a wide range of issues.

We welcome comments, suggestions and enquires.