

Evaluation of NHS Greater Glasgow Oral Health Action Teams



A Report from the Monitoring and Evaluation Subgroup
of the OHAT Steering Group, November 2005

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Background

In 1996, Greater Glasgow Health Board commissioned a Pre-5-Year-Old Oral Health Gain strategic development programme which aimed to improve the dental health of pre-5-year-olds living in G22 (Possilpark), one of the Board's most socio-economically deprived districts. An interim report (GGHB, 1999) described positive outcomes emerging from epidemiological data from the initial pilot district. These findings provided compelling dental, economic and moral justifications for programme continuation and extension of the evidence-based oral health promotion strategy to other parts of Greater Glasgow. Consequently, programme extension was funded from 1997/98 and 2000/01, respectively, to expand into the further similarly challenged G33 (East-end) district and subsequently to all the remaining socio-economically challenged districts within Glasgow's LHCCs via Oral Health Action Teams (OHATs).

Using the Ottawa Charter for Health Promotion-based approach, OHATs work with diverse community-based multisectoral partners, parents and carers in order to promote the agreed vision statement with respect to pre-5-year-olds:

“To develop a generation of children in Glasgow who grow up actively engaging in positive oral health promoting behaviours, benefiting from good oral health and accessing dental services with appropriate regularity according to their risk of poor oral health.”

OHAT key work themes have included:

Whole Nursery Approach, Oral Health Training, Child-focused dental practice and Community Involvement.

Development of an OHAT Evaluation Strategy

The Monitoring and Evaluation Subgroup's remit is the development of a coherent evaluation strategy for the 14 OHATs which at present cover the 16 LHCC districts in Glasgow. A suitable prospective Evaluation Framework Model (Watt et al, 2001) was identified from the dental literature.

An attempt has been made to fit retrospective process and intermediate outcomes information from existing OHAT-level reports into this framework. This proved difficult to achieve in a consistent manner across OHATs.

The National Dental Inspection Programme (NDIP) datasets have provided quantitative data for inclusion in the evaluation model.

This evaluation report encompasses the period 1997/98 to 2003/04 i.e. outcomes from the initial pilot district from 1997/98 and outcomes from OHATs activities in DepCat 7 districts across Greater Glasgow from 2000/01.

Results

- Statistically significant improvements in 5-year-olds' dental health indices have been recorded in pilot districts (G22 and G33). These improvements have continued beyond the transition to OHAT working.
- Similar statistically significant improvements have been observed across Greater Glasgow's DepCat 7 districts only following the introduction of OHATs' activities.
- No similar significant improvements have been recorded in data for DepCat 1-6 districts.

Conclusions

- Dental health inequalities at 5 years of age, between the poorest and relatively more affluent districts in Greater Glasgow have reduced.
- There is evidence that, relative to pre-community-based oral health promotion activity within DepCat 7 communities, more children have no obvious decay experience, more children have lesser burdens of decay experience and less children have the greatest burdens of decay.
- The magnitude of dental health improvement achieved in NHSGG DepCat 7 communities has been sufficient to cause a measurable and statistically significant improvement in the overall NHSGG values for the dental health indices for 5-year-olds.
- Further improvement is required to enable NHSGG to achieve the 2010 target for 5-year-olds' dental health i.e. at least 60% of 5-year-olds to have no obvious decay experience.
- Appropriate intervention programmes require to be developed for DepCat 1-6 communities.

Key Recommendations

- OHAT activities should continue to be delivered in the future via CHP/CHSCPs.
- This Monitoring and Evaluation Subgroup should continue to use the evaluation framework of Watt et al 2001, as a basis to monitor the delivery of OHAT activities and the resultant dental health outcomes.

Figure 1: Theoretical Evaluation Framework Model (Watt *et al*, 2001)

Health and Social Outcomes (Level 4)	Quality of Life, Equity e.g. Change in number of episodes of toothache	Mortality, Morbidity, Disability e.g. change in dmf levels	
Intermediate Health Outcomes (Level 3)	Healthy Lifestyles e.g. change in milk or water consumption in school	Effective Health Service e.g. change in number of fissure sealants	Healthy environments e.g. change in number of schools selling healthy snacks
Health Promotion Outcomes (Level 2)	Health literacy e.g. change in oral health knowledge and skills	Social influence and action e.g. change in public support for water fluoridation	Change in public policy and organisational practice e.g. change in the number of schools with a food policy
Health Promotion Actions (Level 1)	Education e.g. in-service training for school-teachers on oral health issues	Facilitation e.g. formation of school students nutrition action teams	Advocacy e.g. lobbying for improvements in food labelling

I. THE HISTORY OF ORAL HEALTH ACTION TEAMS

Background

In 1996, Greater Glasgow Health Board commissioned a pre-5-Year-Old Oral Health Gain strategic development programme which aimed to improve the dental health of pre-5-year-olds living in one of the NHS Board's most socio-economically deprived districts. An interim report (GGHB, 1999) described positive outcomes emerging from epidemiological data from the initial pilot district. These findings provided compelling dental, economic and moral justifications for programme continuation and adoption/extension of the evidence-based oral health promotion strategy to other parts of Greater Glasgow. Consequently, the original programme was funded to extend into a similarly challenged East-end district.

The Greater Glasgow Community Dental Review (2000) considered the favourable trends observed in the Pre-5 programme and recommended that future investment in oral health promotion for the pre-5 population should begin by expanding the existing programmes in North and Eastern Glasgow. Thereafter, based on relative deprivation, the successful methodologies should be extended through establishment of locality based multidisciplinary Oral Health Action Teams (OHATs) to Glasgow's remaining LHCCs. The phased OHAT implementation programme is illustrated in Table 1.

The agreed vision statement of OHATs: *"To develop a generation of children in Glasgow who grow up actively engaging in positive oral health promoting behaviours, benefiting from good oral health and accessing dental services with appropriate regularity according to their risk of poor oral health."*



Key tasks of OHATs include:

- A local needs assessment leading to the identification of specific local issues impacting on oral health;
- Creation of a local intelligence base and network of partners to develop and support the approach;
- Incorporation and prioritisation of area-wide objectives to reflect local needs;
- Development of OHAT-specific Action Plans to deliver local objectives;
- Collection of consistent baseline data, followed by;
- Monitoring and evaluation of progress.

Each OHAT is co-ordinated by an Oral Health Promoter (OHP) responsible to the local LHCC General Manager. OHPs receive professional support from the Senior Oral Health Promotion Officer (GGNHSB) and Dental Director (PCT). OHAT teams ideally comprise of an OHP, Lead General Dental Practitioner and Community Dental Officer, Community Pharmacist, Health Visitor, Public Health Practitioner, education staff and community workers, but membership is subject to the degree of local interest and availability to attend meetings.

OHAT Implementation Programme

Table 1: Year of Commencement and Duration of Community Oral Health Promotion OHAT Activity, by LHCC

OHAT/LHCC	OHP staff	Year of Commencement - shading indicates duration							
		1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Northern**	1.0 WTE								
Eastern*	1.0 WTE								
Drumchapel	0.5 WTE								
Clydebank	0.5 WTE								
Bridgeton	1.0 WTE								
Riverside/Westone	1.0 WTE								
South West	1.0 WTE								
Woodside/Maryhill	0.5 WTE								
South East Glasgow	0.5 WTE								
Greater Shawlands	1.0 WTE								
Camglen	0.5 WTE								
ABM	0.5 WTE								
Strathkelvin	0.5 WTE								
Eastwood	Joined with Greater Shawlands								

* G33 district only from 1998-2000. Full LHCC from 2001, continuity of personnel/interventions from Pre-5-Year Old Oral Health Gain Programme, to the present.

** G22 district only from 1996-2000. Full LHCC from 2001, continuity of some Pre-5-Year Old Oral Health Gain Programme interventions.

Creation of local OHAT Action Plans

The OHATs have been established for varying lengths of time. Oral Health Promoters co-ordinate production of a local OHAT Action Plan at the beginning of each financial year. The Action Plans for each OHAT are submitted to the Steering Group for approval.

To date, all such plans have indicated that the OHATs have been addressing the majority of their key tasks. They have incorporated different levels of Needs Assessment, according to the maturity of the OHAT and are all linked with wider LHCC and local community infrastructures. Most plans reflect a local picture of priority for future development of the pre-5s oral health agenda.

Integration of OHATs

In order to create a unified approach for GG's Pre-5s Oral Health Promotion Programme, common themes emerging from the OHATs action plans were identified. This has enabled the localised project approach to continue, whilst concentrating on core activities across NHS Greater Glasgow. These accord with key components identified in the successful Pre-5-Year-Old Oral Health Gain Programme (Blair et al, 2004).

OHAT Key Themes:

1. Whole Nursery Approach

To work alongside local nurseries supporting their development of a whole-day approach to nutrition and oral health protection. This work-strand is underpinned by the Smile Nursery Accreditation Scheme which provides a phased modular approach to OHAT programme implementation e.g.

- Establishment of daily supervised nursery toothbrushing programmes using 1000ppmF⁻ toothpaste from the time of tooth eruption,

- Agreed Snack and Meal policies restricting frequency of ingestion of non-milk extrinsic sugars,
- Dental Information Stations to support parents and carers in their adoption of beneficial home lifestyles for their infants and families.

2. Oral Health Training

To provide information on oral health needs of infants within the local community and appropriate Oral Health Promotion training covering the importance of:

- Regular daily exposure to topical fluoride from toothpaste,
 - Reducing the frequency of ingestion of between-meal sugars,
 - Regular dental examination and advice,
- for a diversity of local staff including: Nursery Nurses and Head Teachers, Health Visitors (HV), Pharmacists, lay community and voluntary sector workers, dental practitioners and their staff, parents/carers and other interested multi-sectoral partners.

3. "Child-focused" dental practice

- Provide support and resources to local General Dental Practices in order that they deliver consistent contemporary evidence-based Oral Health Promotion messages as part of their Clinical Governance agenda,
- Recruitment of local General Dental Practitioners (GDP) for development of agreed local care pathways to provide protection of childrens' dental health and early restorative care when indicated.

4. Community involvement

To develop OHAT partnership projects in accordance with the Ottawa Charter's principles of advocacy, enablement and mediation in order to support community development aimed to promote:

- Development of Healthy Public Policy,
- Creation of Supportive Environments,
- Strengthened Community Action,
- Development of Personal Skills,
- Reoriented needs-led local service.

Communications and Planning

An OHAT Steering Group meets regularly with the aim of providing broad strategic direction for OHAT implementation.

Funding

From 2001 to 2005, OHATs were funded via Health Improvement Funding (HIF). This funding increased year-on-year as the programme was expanded. From 2005/06, OHATs are funded from central Board funding. Funding from the NHS Board is devolved via the Primary Care Division to each individual LHCC.

In addition to funding for each OHP post, each LHCC has had funding for two lead GDP sessions per month and one lead HV session per week. In addition, each OHAT has received a small resources budget based on its level of deprivation and size of its pre-5 population. ABM, Strathkelvin and Eastwood are the exception to this and receive funding only for the OHP and Lead GDP due to the comparative affluence of their areas.

Future Alignment and Context

Impending NHS reforms will result in four Community Health Partnerships (CHP) and five Community Health and Social Care Partnerships (CHSCP) replacing the existing 16 LHCCs in GG. These will be the frontline primary care organisations, charged with bringing about health improvement. In future, OHATs will integrate with CHP/CHSCP Health Improvement teams, aligning their geographic areas of activity to conform with the new structures. The NHSGG OHAT approach accords fully with the approach advocated by the Scottish Executive in: An Action Plan for Dental Services in Scotland (2000), An Action Plan For Improving Oral Health And Modernising NHS Dental Services In Scotland (2005) and in the newly published Kerr Report (2005). Future development and funding of OHATs will be considered in this context by the Oral Health Planning and Implementation Group (OHPIG).

In the summer of 2004, the OHAT Steering Group reviewed its initial subcommittee structure and, since February 2005 the focus has been adjusted and the composition of the groups has become more multidisciplinary.

The 5 sub groups are as follows:

- Operational Planning
- Health Promotion
- Monitoring and Evaluation
- Preventative Dental Service
- Finance



2. MONITORING AND EVALUATION OF OHATs

Background

The Monitoring and Evaluation Subgroup of the OHAT Steering Group convened for the first time on 28th February 2005. Early discussion identified the need for clarity of remit and a coherent evaluation strategy for the 14 OHATs covering the 16 LHCC districts. Evaluation of OHATs during the LHCC phase is complicated due to the large number of quasi-autonomous projects. Although process and intermediate outcomes information were being collected at OHAT level, their usefulness was limited due to lack of consistency and a variation in quality and comparability across GG. A necessary component in the transition to CHP/CHSCP-based working will be a uniform information set related to process monitoring of the core areas of the OHATs work-programme.

Prior to establishment of The Monitoring and Evaluation Subgroup, a Public Health Subgroup concentrated its work on the monitoring and evaluation of the 5-year-old population's dental health, by ongoing analysis of caries epidemiology data.

Identification of an evaluation framework model for Greater Glasgow's OHATs

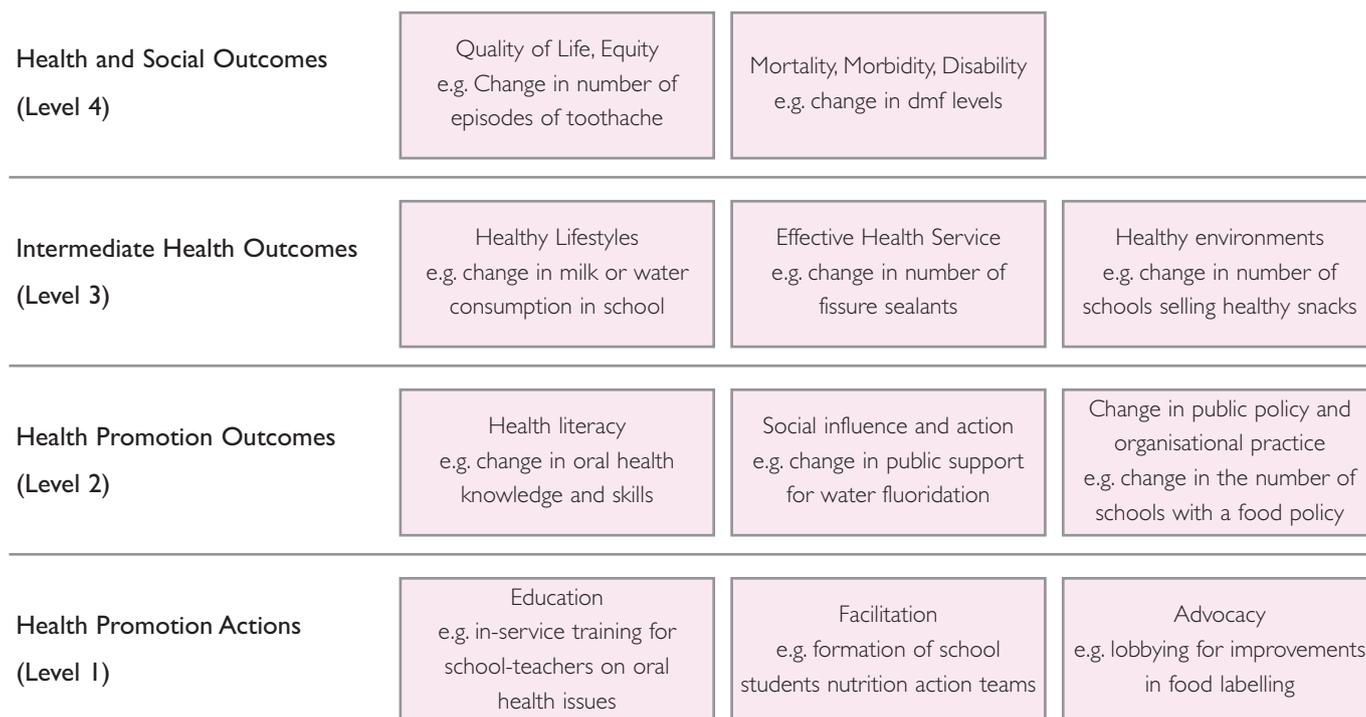
Examination of the literature has confirmed the difficulty in evaluating health promotion interventions in order to demonstrate reliably their effectiveness. Conventional study designs which aim to attribute causality e.g. Randomised Control Trials, are inappropriate methods for evaluating the complexity of community level intervention programmes as these involve elements related to social, political and environmental determinants.

Nutbeam (1998), a leading author in the field, emphasises the need to define and measure outcomes relevant to health promotion and the necessity to assess both the outcome achieved and the process by which it was achieved. Nutbeam describes the complexity of health promotion intervention programmes, timescales and the corresponding sophistication necessary in an evaluation design to deal with this complexity. This is now widely acknowledged. Furthermore, Nutbeam also suggests that the most powerful health promotion actions appear to be long term and are least easily predicted, controlled or measured by conventional means.

Evaluation designs which combine the advantages of quantitative and qualitative methodologies appropriate to the stage of programme development have been advocated, as these have the potential to provide more illuminating, relevant and sensitive evidence of overall effectiveness. Although there are only four agreed OHAT Key Themes for NHSGG, in essence, to date there have been 14 varieties of process implementation at 14 different stages of occurrence.

The OHAT Evaluation Subgroup has, therefore, agreed to adopt the theoretical evaluation framework postulated by Watt *et al* (2001) and adapted from Nutbeam's (1998) model for evaluation of community oral health improvement programmes. This involves recording programme outcomes in a four stage hierarchy on the premise that the OHATs health promotion programmes involve ranges of different actions, each of which requires a specific type of evaluation measure over the short, intermediate and longer terms. Watt *et al*'s evaluation framework model is outlined in Figure 1 and will be modified to make it appropriate for the OHAT programme which is aimed at pre-5s.

Figure 1: Theoretical Evaluation Framework Model (Watt *et al*, 2001)



Levels within the selected Evaluation Framework Model:

1 Health Promotion Actions

Anything contributing towards Health Promotion meets the inclusion criteria to appear within the Model at foundation/action stage. The day-to-day activity of OHATs would be expected to appear in this section. This provides an illustrative example of the way in which this Evaluation Framework Model could be used at macro level, if an agreed standardised information-set can be captured from the OHATs in the nine future CHP/CHSCPs.

2 Health Promotion Outcomes

Health Promoting Actions with immediate impact translate into short-term Health Promotion Outcomes. Measures of Health Literacy include related knowledge, attitudes, intentions and skills in addition to self-efficacy and empowerment. Social Action and Influence refers to enhancing the control of social groups over the determinants of health and can be assessed by level of community participation, social support, community empowerment and public opinion. Creating Healthy Public Policy and Organisational Practice are means by which healthy environments can be created and sustained. Evidence of these would include policy statements, legislation, regulations, resource allocation and organisational practices.

3 Intermediate Health Outcomes

Intermediate Health Outcomes refer to assessment of modifications to determinants of health, such as eating patterns and include improving access to Effective Health Services with provision of preventive care and appropriate clinical services. Measures of the physical and social environment may include availability of healthy food and drinks and restriction of harmful exposures.

4 Health and Social Outcomes

The Ottawa Charter describes health as “*a resource for life, not the object of living*”. Narrower definitions of health e.g. incidence and prevalence of disease provide quantitative information only.

These indices do not have the capacity to inform whether small or even large changes have any meaningful value to, or effect on, individuals or populations to which they pertain.

In considering Health Outcomes, Nutbeam believes it is essential to consider the broader definition of health which encompasses functional independence, equity and resultant quality of life. In his evaluation framework these are placed at the top of the modelled hierarchy and “*represent the end point of health and medical interventions*”. Clearly, assessment of these wider aspects of health is a requirement when adopting this Evaluation Framework Model. Nonetheless, this does not diminish the necessity for evaluation processes at each of the preceding levels of the model. These serve as important short and medium-term milestones along the longer term journey towards Health and Social Outcomes.

Adoption of the Watt *et al* framework model provides an opportunity for a consistent approach across CHP/CHSCPs in the future, as OHATs commence their next phase. The OHAT Steering Group has agreed with the Monitoring and Evaluation Subgroup that the Watt *et al* model is the most suitable tool for evaluating NHS Greater Glasgow's OHATs and it will therefore be adopted as the assessment tool.

To date, during the LHCC phase, process data has been too variable to permit a consistent approach to monitoring and evaluation at LHCC level. However, there is a large amount of data available from LHCCs which is indicative of the types of ongoing activities. An attempt has been made to use this information to populate this new Framework at levels 1-3. An example of Health Promotion Actions (level 1) undertaken in one LHCC is shown in Table 1.

Evaluation Framework Model: Level I

Table I: An example of Health Promotion Actions in one OHAT (2001-2005) set in the Watt *et al* Framework.

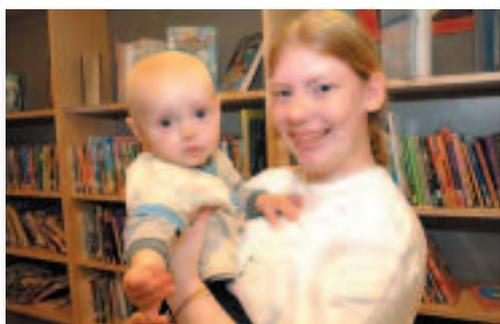
Education	Volume/activity 2004/05
Nursery Brushing	87/87, timing unreported
Healthy snacks in nurseries	87/87, timing unreported
Community Events	yes, 50 nursery-based 2004/05
Nursery Training & Parent Workshops	at >50 locations 2004/05 & ongoing in 2005
Community development/consultations etc	yes, OH strategy-40 multisectoral attendees
Change to cup	17/17 HVs to children @ age 8/12mths
Registration schemes	12/15 practices
Community drop-in clinics	yes, volume unreported
Dental Staff training	12/15 practices (14 GDPs + 1 Hygienist)
Get-cooking	yes, not quantified
Peri-natal sessions/weaning	40 sessions
Focus-group work	Not reported
Play-box	29 x 1 month loans
HV Toothpaste & toothbrush distribution	16/17
Pharmacy F- dentifrice distribution	9/15
Pharmacy cup initiative	10/15 pharmacies 2004/05
Dental practice F- dentifrice distribution	10/15 sites
Events, songbook, decorations etc	50 nurseries 2004/05
Food availability in nurseries Q aire	33/87 nurseries
Volunteer recruitment	yes, actively seeking volunteers
Weaning Fayres	18 (390 parents)
Training LHCC nurses/students	25 x 2hr sessions, demography unknown
Involvement in community Health Fayres	8 events, in 2004/05, attendance unknown
Community Based Scone & Smile Club	Pilot reported, 2004/05
Audit with GDPs-Pre-5s care and advice	8/15
Training the Trainers (volunteers from playgroups)	5 OH champions, based in 5 playgroups
Nursery Brushing	72/87 nurseries
Healthy snacks	47/87 nurseries
Develop Oral Health Care Assistants	3 trained and active
Health Fayres	9 locations, interaction with 1243 persons, 2004/05

Later sections of this report detail the Dental Health Outcomes (level 4). These include data for the G22 and G33 postcode districts in Glasgow, which were the original pilot communities for the pre-5-year-old oral health gain strategic development programme which [commencing in 1995/96 and 1997/98, respectively] immediately preceded OHAT establishment. Community development-based dental intervention programmes have been running longest in these districts and both districts have been subject to long-term caries epidemiological follow-up studies. The epidemiology gives indications of dental health trend (health outcomes) and consistency of effect over time.

Consideration of all of the above levels of this comprehensive framework is necessary to begin to understand the complexity of monitoring and evaluating a multi-intervention community-development based programme s inputs, intermediate outcomes and health and social improvement outputs.

Conclusion

A considerable range of activities, together with the collection of process data has been undertaken by the OHAT featured in this example. In future, precise information will be required from the OHAT Steering Group concerning the nature of core and additional activities for each OHAT. Only relevant information will then be incorporated into a concise data collection template.



3. MEASUREMENT OF ORAL HEALTH OUTCOMES VIA THE NATIONAL DENTAL INSPECTION PROGRAMME (NDIP)

Background

In Greater Glasgow at present, oral health outcomes and oral health improvement are measured via the National Dental Inspection Programme (NDIP). The NDIP datasets yield only quantitative information. Current Health Promotion literature indicates that it is equally important to gain insight into and an understanding of populations' attitudes, values and behaviours which Health Promotion Activity has sought to influence. Further information about the social outcomes from OHAT activities e.g. quality of life, functional independence, equity and social capital is required to complete the adopted evaluation framework model.

The ongoing caries epidemiological monitoring of 5-year-olds has permitted the Monitoring and Evaluation subgroup to carry out statistical modelling, testing, analyses and interpretation of trends in: the two discrete pilot community districts, at DepCat level across NHSGG and at whole NHSGG area level. The expert support of a Consultant Statistician from the University of Glasgow Robertson Centre for Biostatistics enabled up-to-date statistical modelling of the caries datasets. Therefore, the Subgroup have a very high degree of confidence in the robustness of the statistical output.

Introduction to NDIP

The National Dental Inspection Programme (NDIP) was introduced in 2002-03 to replace both the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP) and School Dental Screening systems. In common with the programmes it replaces, the NDIP programme is a statutory function of the Health Boards' Community Dental Service (CDS) and is conducted each year by trained Community Dental Officers. Each year all children in Primary School year groups P1 and P7 are scheduled to have a school-based dental inspection. All children in the identified year groups are invited to receive a Basic dental inspection. The aim is that 100% of P1 and P7 classes receive Basic NDIP inspections each year. In addition, a random sub-set of children receive a Detailed NDIP epidemiological inspection over and above their Basic NDIP dental inspection. Detailed NDIP is conducted by trained and calibrated Community Dental Officers. The subgroups involved in Detailed NDIP samples are drawn from P1 and P7 children in alternate years. To achieve 100% Basic NDIP coverage of NHSGG Primary Schools each academic year, it is necessary to arrange dental inspection for circa 20,000 children per annum.

Information obtained from NDIP

The Basic NDIP inspection programme provides information for each child's parents in relation to their child's caries risk category and also provides aggregated information to Boards for health planning purposes. The Detailed inspections are the basis from which the age-specific decayed, missing and filled teeth (dmft) scores are calculated for Greater Glasgow and Scotland.

Caries epidemiology and caries-risk information

Data from both Basic and Detailed NDIP are the prescribed tools for monitoring age-specific trends in NHSGG children's dental health over time. Detailed NDIP is the basis by which population oral health is monitored at individual Health Board and national levels.

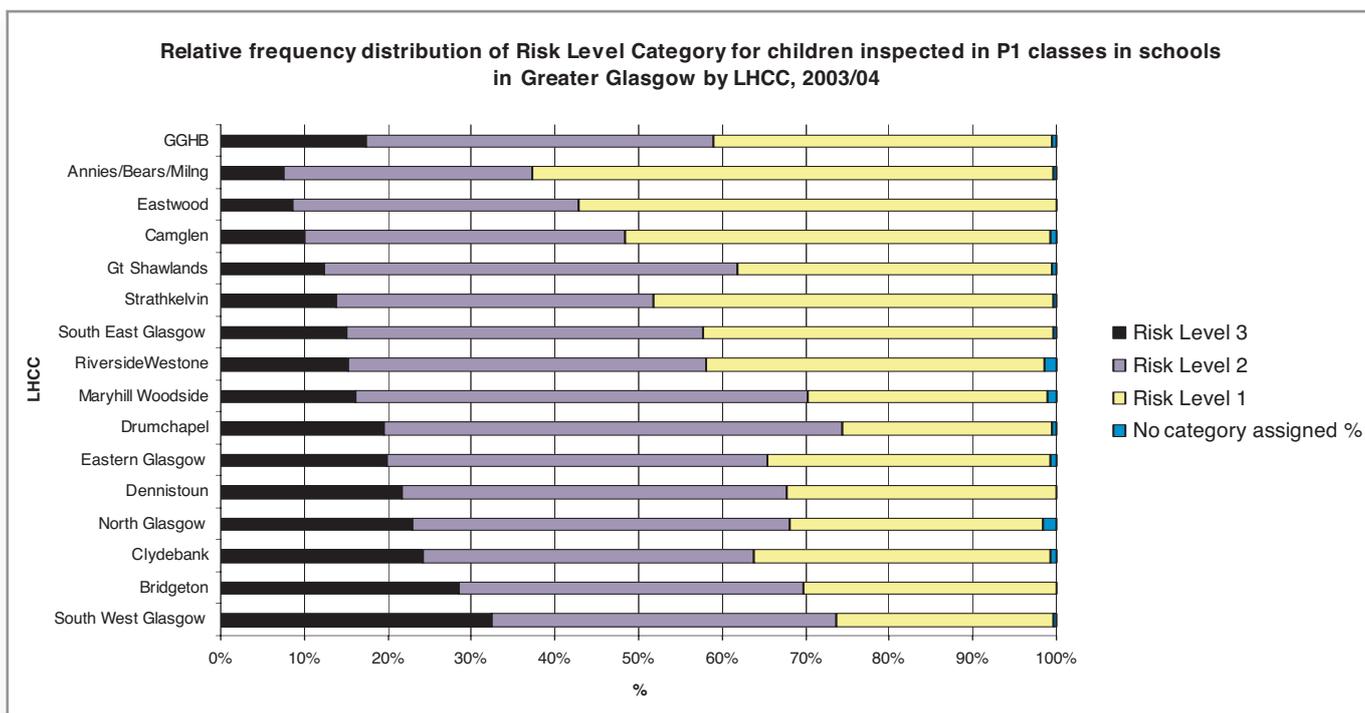
Basic NDIP can provide information on caries risk profile. Because Basic NDIP data is based on census data from the whole population of P1 and P7 children, this type of caries-risk profile can be compiled at a variety of levels e.g. NHSGG, DepCat, LHCC, or school-based. Examples of the type of caries-risk profile showing frequency and relative frequency of Caries Risk Level 1 (low), Risk Level 2 (at risk) and Risk Level 3 (at high-risk), which can be obtained from Basic NDIP are shown in Figures 2-5 alongside definitions of the risk categories.

Examination of data in Figure 2 indicate that Anniesland/Milngavie/Bearsden LHCC has the lowest proportion of P1 children at high caries-risk when compared to all other LHCC districts. However, data in Figure 5 show that there is a high degree of dental health inequality within this apparently relatively advantaged district e.g. Clober Primary School has 60% of P1 children at-risk or at high-risk. This is very similar to the caries-risk profile of schools located in Glasgow's poorer [east-end] districts (Figure 4).

Detailed NDIP data have been based on random school class-based cluster samples NHSGG-wide and are not necessarily representative at LHCC level at present. The Evaluation and Monitoring Sub-group will in future produce random caries epidemiological population samples for NHSGG, stratified at CHP/CHSCP level. If these samples are sufficiently representative of the CHP/CHSCP level population, this will enable production of CHP/CHSCP-based caries epidemiological data similar to that already produced since 1997/98 for monitoring caries epidemiological trends in the G22 and G33 initial programme districts.



Figure 2:
Caries risk data from Basic NDIP modelled at LHCC level

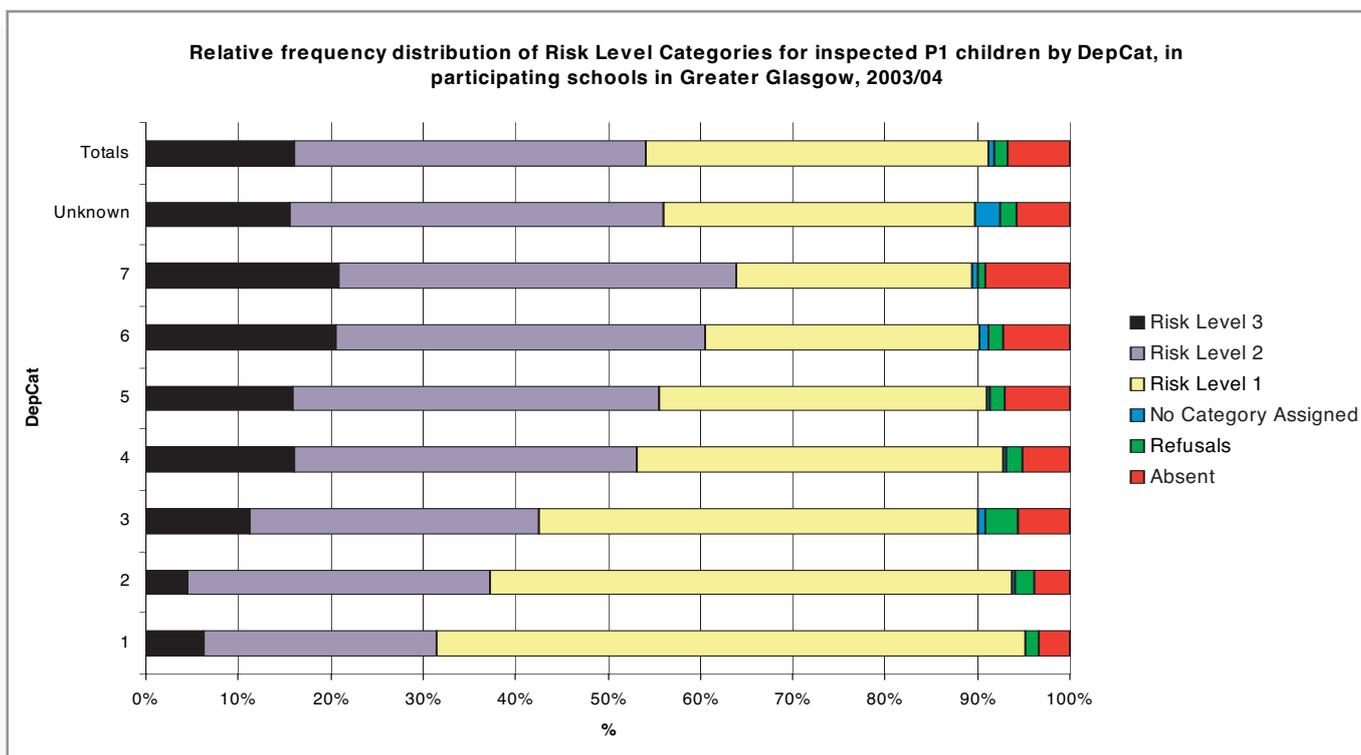


Risk Level 1 equates to no obvious decay experience in deciduous teeth and reasonable oral hygiene.

Risk Level 2 equates to obvious evidence of decay experience and/or poor oral hygiene which would benefit from dental care/advice.

Risk Level 3 equates to obvious advanced and/or widespread current decay which would benefit from immediate attention.

Figure 3:
Caries risk data from Basic NDIP modelled at DepCat level

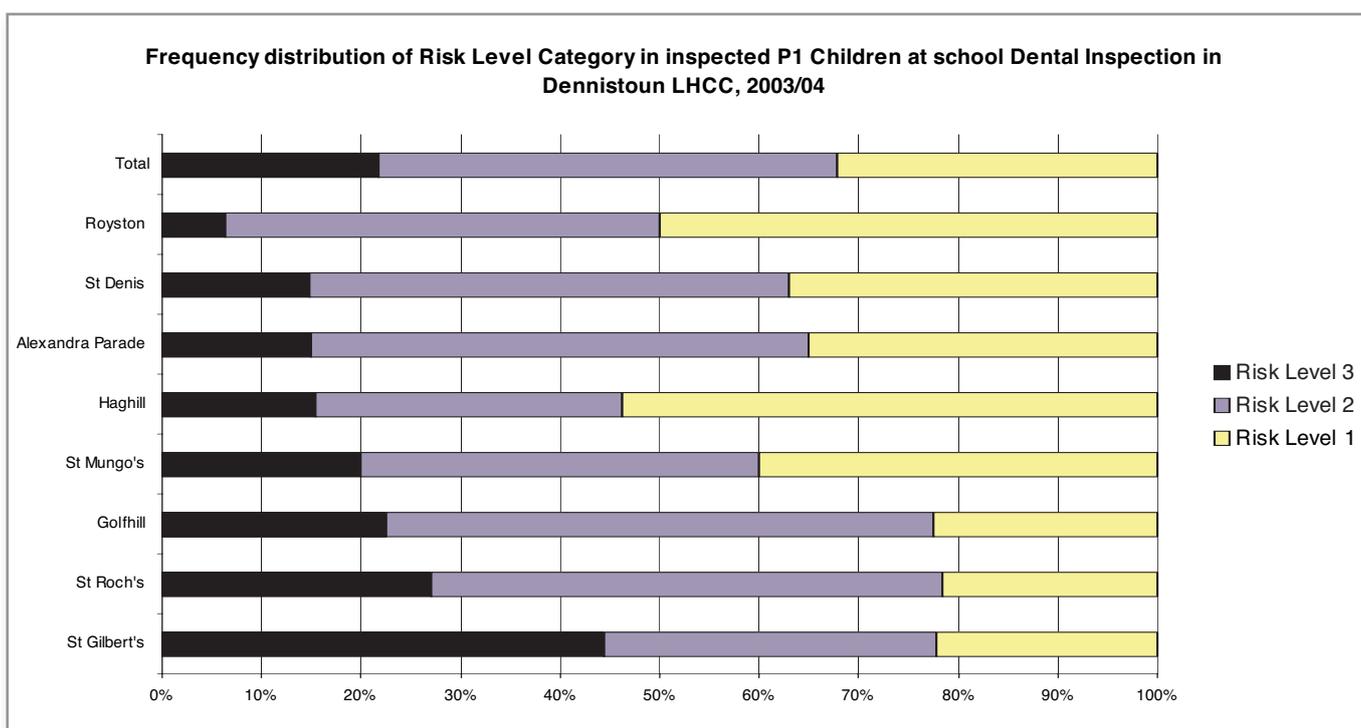


Risk Level 1 equates to no obvious decay experience in deciduous teeth and reasonable oral hygiene.

Risk Level 2 equates to obvious evidence of decay experience and/or poor oral hygiene which would benefit from dental care/advice.

Risk Level 3 equates to obvious advanced and/or widespread current decay which would benefit from immediate attention.

Figure 4:
 Caries risk data from Basic NDIP modelled at school level within
 Dennistoun LHCC

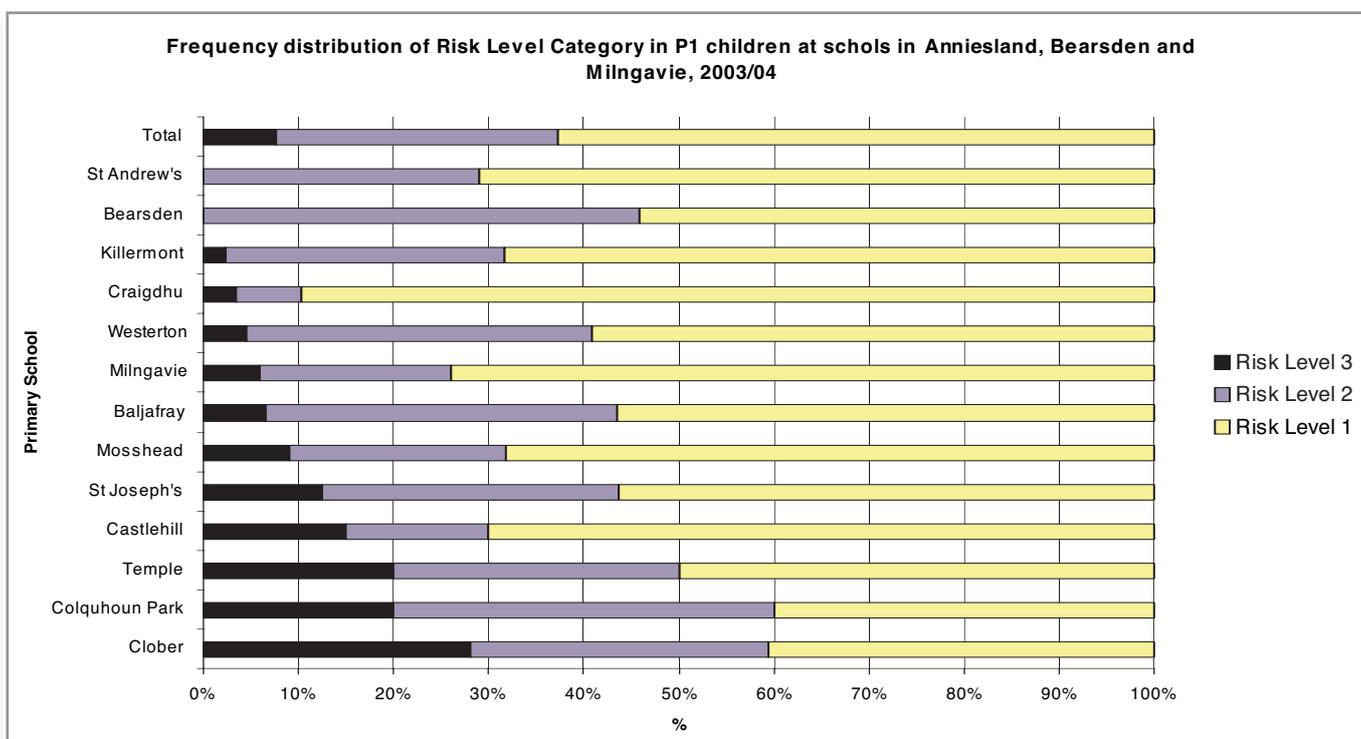


Risk Level 1 equates to no obvious decay experience in deciduous teeth and reasonable oral hygiene.

Risk Level 2 equates to obvious evidence of decay experience and/or poor oral hygiene which would benefit from dental care/advice.

Risk Level 3 equates to obvious advanced and/or widespread current decay which would benefit from immediate attention.

Figure 5:
 Caries risk data from Basic NDIP modelled at school level within
 Anniesland, Bearsden and Milngavie LHCC



Risk Level 1 equates to no obvious decay experience in deciduous teeth and reasonable oral hygiene.

Risk Level 2 equates to obvious evidence of decay experience and/or poor oral hygiene which would benefit from dental care/advice.

Risk Level 3 equates to obvious advanced and/or widespread current decay which would benefit from immediate attention.

Associations between establishment of OHATs (and predecessor programmes) and the epidemiological trends

As mentioned previously, NHSGG OHATs evolved from the Board's Pre-5-Year-Old Oral Health Gain Programme. The original Programme's postcode districts, namely G22 (Possilpark) and G33 (East-end) have had appropriate epidemiological sampling at each successive 5-year-olds SHBDEP/NDIP to permit long-term follow-up.

Trends in G22 (Phase I, Pre-5-Year-Old Oral Health Gain Programme)

Age-specific mean dmft scores denote the average cumulative experience of dental disease in a population at a designated age. In the G22 postcode district (entirely DepCat 7), over the life of the Pre-5-Year-Old Oral Health Gain Programme and continuing into the OHAT phase, reduction in mean dmft scores has been observed (Figure 6). Overall mean dmft has reduced from 5.5 (95%CI 4.5-6.4) to 3.6 (95%CI 2.5-4.7) between 1997/98 and 2003/04 and the percentage of 5-year-olds with no obvious decay experience has increased from 11% to 29% ($p=0.010$, $OR=0.25$ for $dmft>0$, logistic regression of dmft after adjusting for age).

Decreases in the decayed teeth (dt) component account for the majority of the reduction in dmft scores. There has been comparatively little change in the mean number of teeth extracted (mt) or treated restoratively (ft) over the period. However, the proportion of children with missing (extracted) teeth decreased from 33% to 22%. The proportion of children with untreated decayed teeth decreased from 82% to 59%. Coincidentally, the proportion of children with restored (filled) teeth reduced from 22% to 15%.

The commencement of this trend towards improvement in mean dmft scores coincides with the start of the Oral Health Gain project. The G22 district's dental health gains have continued to be observed following the transition from special project area status to OHAT working and have endured changes in local personnel. Improvement in the mean dmft scores is attributable to a reduced incidence of decayed teeth. This observed reduction in the average number of decayed teeth cannot be explained by an increase in provision of restorative or surgical clinical dental care.

Examination of Figure 7 shows a redistribution of the relative frequency distribution of dmft scores, over the interval, away from categories with dmft scores ≥ 6 , into lesser dmft scores (Wilcoxon tests adjusted for age $p=0.012$). This indicates that dental health gains have been observed even in the population subgroups which were at greatest caries-risk at baseline, prior to commencement of the interventions.



Figure 6

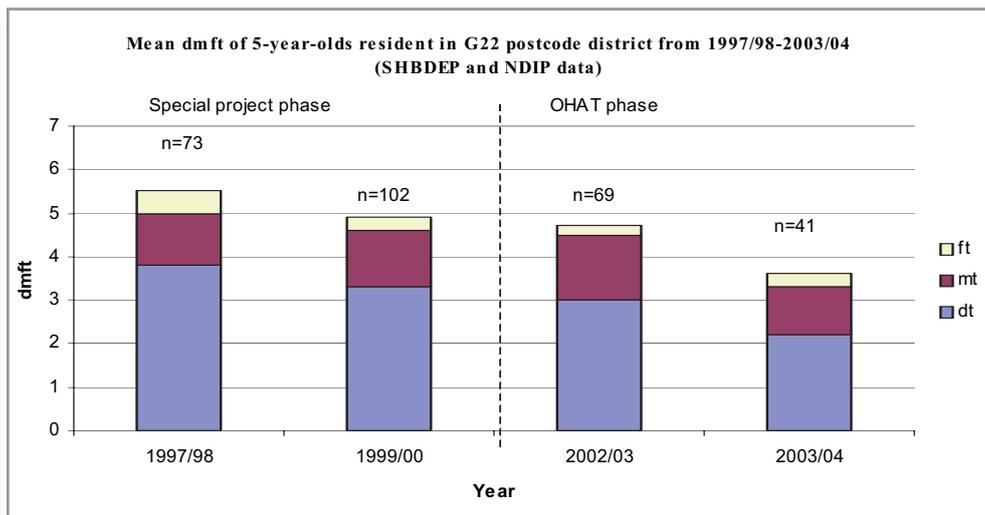
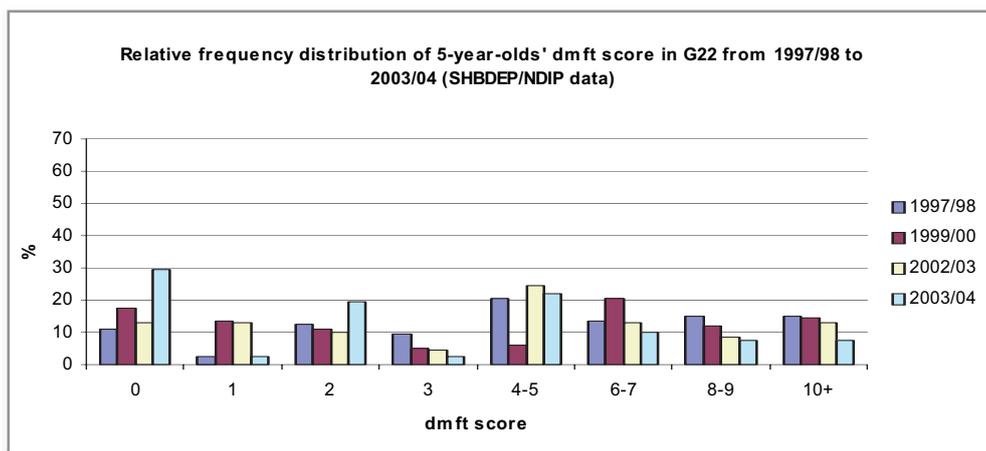


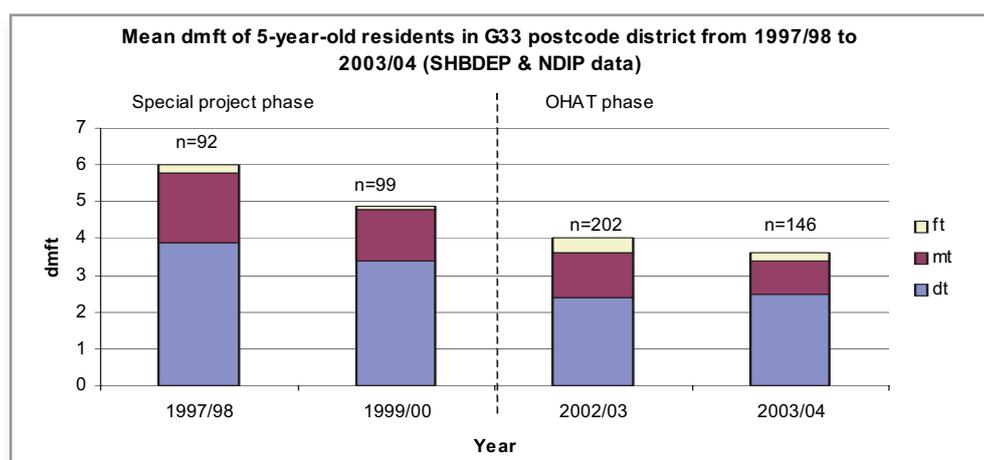
Figure 7



Trends in G33 (Phase 2, Pre-5-Year-Old Oral Health Gain Programme)

In the similarly deprived G33 postcode district, 5-year olds dental health indices also improved following commencement of community level interventions. Mean dmft decreased from 6.0 (95%CI 5.2-6.8) to 3.6 (95%CI 3.0-4.2) and the percentage of 5-year-olds with no experience of obvious tooth decay increased from 10% to 32% ($p=0.006$, $OR=0.30$ for $dmft>0$, logistic regression of dmft after adjusting for age and DepCat) since 1997/98. In this district, in addition to the reduction in the average number of untreated decayed teeth, there have been substantial decreases in the average number of extracted teeth (Figure 8). The proportions of 5-year-olds with missing (extracted) teeth decreased from 42% to 18% and for those with untreated decay from 84% to 60% over the interval.

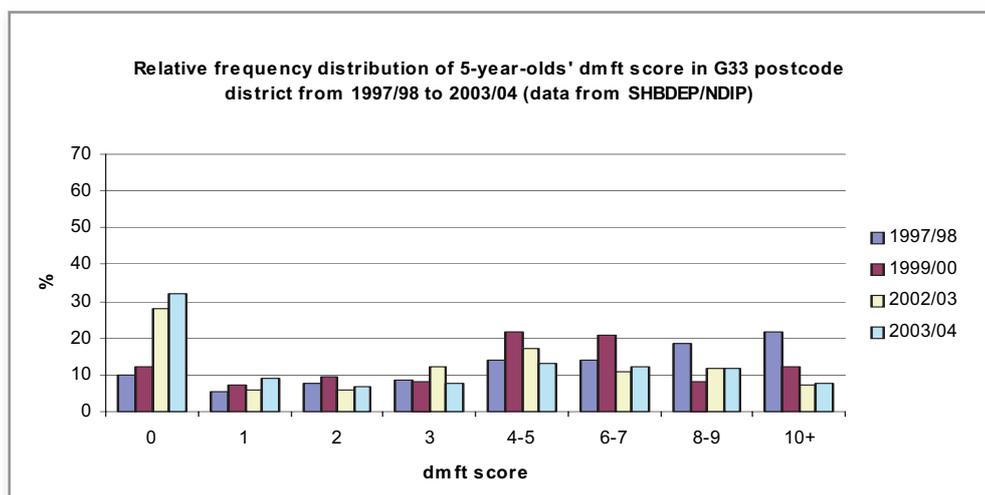
Figure 8



Examination of the relative frequency distribution of dmft score (Figure 9) shows that, after establishment of community interventions, the proportions of children in the higher dmft score categories decreased and the proportion with dmft=0 increased ($p<0.001$, Wilcoxon tests adjusted for age and DepCat), since 1997/98.

This indicates that, as in the earlier reported G22 district, the most vulnerable subgroups at greatest risk of dental caries at programme outset were susceptible to the effect of the community level programme.

Figure 9



Trends in childrens oral health in NHSGG DepCat 7 districts targeted by OHATs

The aims of OHATs are to improve NHSGG s 5-year-old dental health and to decrease inequalities in dental health between those children living in the most advantaged districts and those facing the greatest socio-economic challenges. In NHSGG (2003), 32% of this age group lived in the most deprived social circumstances.

The priority for establishment of OHATs was relative need. Activities within OHATs have been targeted towards the most disadvantaged sections in respective LHCC populations. Mean dmft of NHSGG 5-year-olds residing in DepCat 7 communities before and after the advent of OHATs are illustrated in Figure 10.

No improvement in mean dmft score occurred prior to the introduction of OHATs in the non-intervention phase. However, following extension of community based oral health promotion activity via the introduction of OHATs, a reduction in mean dmft from 4.9 (95% CI 4.6-5.3) to 4.1 (95% CI 3.7-4.4) and improvement in the percentage with no experience of obvious caries from 20% to 32% was observed ($p < 0.001$, logistic regression of dmft adjusted for age). The proportions of 5-year-olds with experience of extracted teeth decreased from 35% to 22% ($p < 0.0001$) and those with untreated decay decreased from 75% to 58% ($p < 0.0001$) over the period. However, as observed in the G22 and G33 districts, there was no increase in the proportion of children who had received restorative care. This provides further evidence of a temporal association between commencement of targeted community-level intervention programmes and observation of improvement in infants mean dmft scores which cannot be explained by clinical restorative or surgical dental intervention.

Figure 10

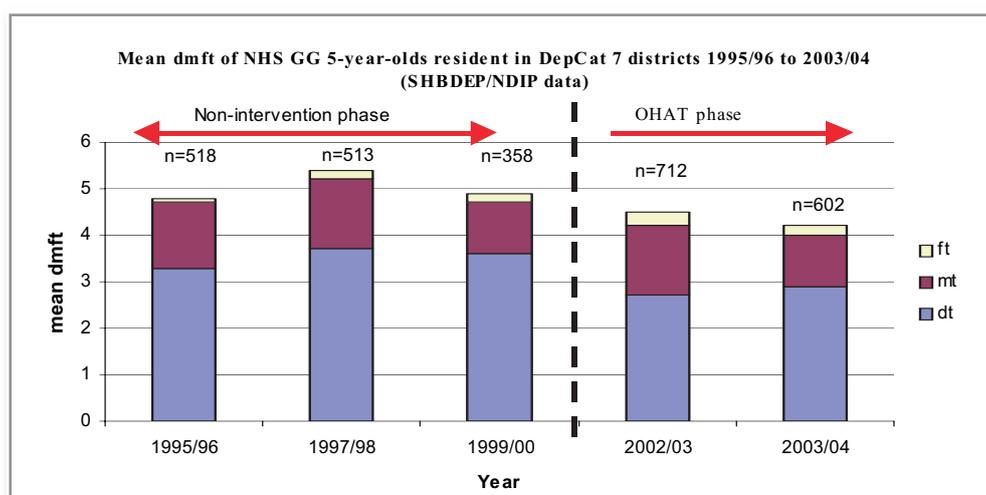
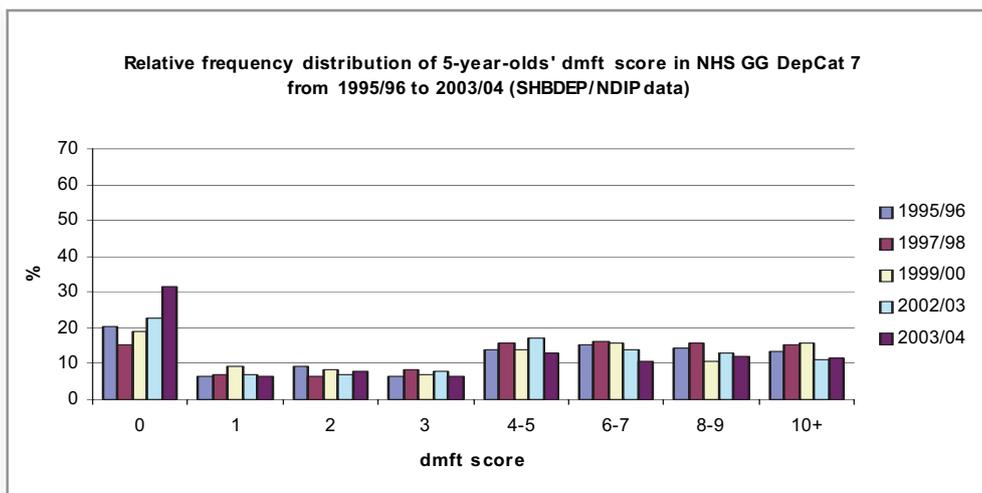


Figure 11 illustrates that, in 1997/98 relative to 1995/96, prior to establishment of OHATs, there was a deterioration in the oral health of 5 year-olds in all-Glasgow DepCat 7 communities as a reduction in the proportion of infants with dmft=0 and an increase in caries burden was observed i.e. more children had more caries.

However, since the introduction of OHATs across NHS GG DepCat 7 communities, by 2003/04 a statistically significant improvement in the prevalence of decay experience in 5-year-olds (for $dmft > 0$, $OR = 0.35$, $p < 0.001$, logistic regression, adjusted for age), was recorded compared to the poorest level of dental health observed in 1997/98. These statistically significant improvements in the oral health of 5-year-old residents in DepCat 7 communities are occurring in the absence of any consistent indication of improvement in comparatively more affluent districts.

Figure 11



Whole NHSGG 5-year old caries trend (DepCat 1-7 inclusive)

In the period prior to the introduction of OHATs, there was no evidence of improvements in dental health indices across the whole NHSGG 5-year-old population (Figure 12). However, following the introduction of community level activity targeted predominantly at the most vulnerable DepCat 7 communities, a downward trend in mean dmft value from 3.5 (95% CI 3.3-3.7) to 3.1 (95% CI 2.9-3.2) and an increase in the proportion with no obvious tooth decay from 34% to 42% ($p < 0.0001$) have become apparent in the whole 5-year-old population (Figure 13).

The proportions of GG infants with untreated dental caries has decreased from 63% to 50% ($p < 0.0001$) and those with experience of tooth extraction decreased from 21% to 16% ($p < 0.001$). However, there has been no change over the time period in the proportion (12%) with filled teeth, nor in the mean number of filled teeth ($ft = 0.2$). These data suggest that efforts in NHSGG to improve the dental health indices of the one third of infants resident in the poorest socio-economic circumstances, who historically have suffered the worst dental health, have had beneficial impact on the aggregated 5-year-old caries data for the whole NHSGG area.

Figure 12

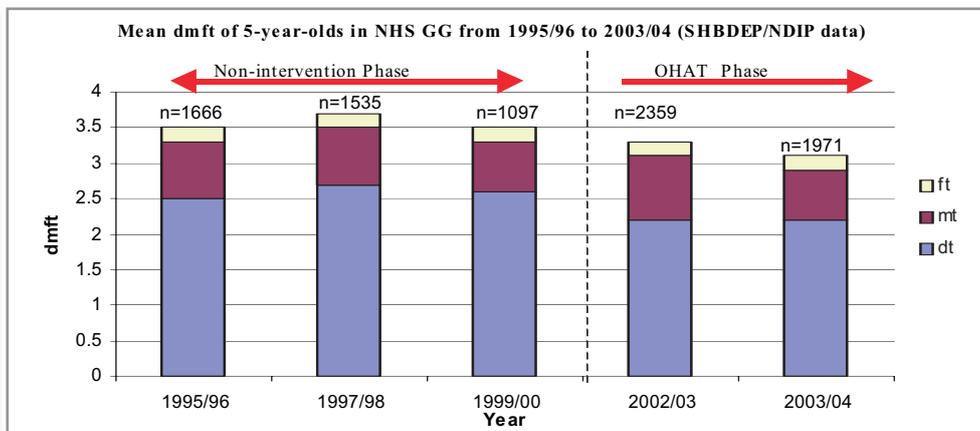


Figure 13

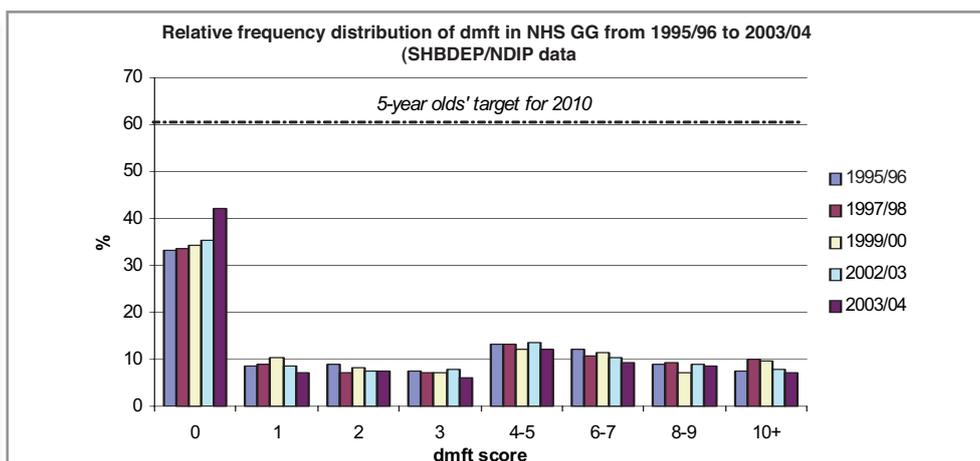


Table 2:
Summary of 5-Year-Olds Oral Health Trends Since the Commencement of Targeted Community Level Interventions Aimed at Oral Health Improvement (1997/98—v-2003/04)

Area	Mean				Percentage of 5-yr-olds with:			
	dmft	dt	mt	ft	dmft=0	dt>0	mt>0	ft>0
G22 (Possilpark)	↓	↓	↓	↓	↑	↓	↓	↓
G33 (East-end)	↓	↓	↓	No change	↑	↓	↓	No change
All NHSGG DepCat 7	↓	↓	↓	No change	↑	↓	↓	No change
All NHSGG DepCat 1-7	↓	↓	No change	No change	↑	↓	↓	No change

Dental health improvements

A summary of 5-year-olds oral health trends since the introduction of community oral health interventions in 1997/98 is shown in Table 2.

In G22, G33 and all districts targeted by OHATs, there have been significant increases in the proportions of 5-year-old children with no obvious decay experience. During the period there has been no evidence of any increase in the clinical provision of fillings (mean ft) or dental extractions (mean mt). Such increases (if they had arisen) could have been plausible explanations for the reduction in untreated caries (mean dt).

The observations of trends towards improvement in NHSGG infants dental health indices have followed a pattern consistent with that following the establishment of the initial Pre-5-Year-Olds Oral Health Gain Strategic Development Programme and its subsequent translation into OHATs and their implementation. It is, therefore, not unreasonable to conclude that the reduction in mean dmft which has been observed is attributable to primary dental caries prevention behaviours practiced on a day-to-day basis in the homes and community settings where children live their lives.

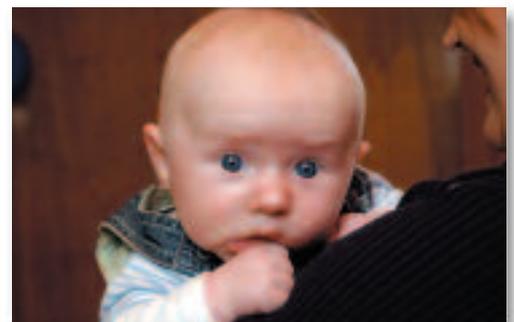
The Monitoring and Evaluation subgroup are confident that the observed improvements in dental health indices are not an artefact of clinical treatment. However, there remains a considerable burden of dental disease in children across the DepCat spectrum.

At this stage, these NHSGG data should be interpreted with some caution as there has been insufficient opportunity to assess the sustainability of this early improvement. It could, however, be expected that children who have been born post area-wide OHAT introduction might display the maximum benefits when they are examined at the age of 5-years at NDIP school-based dental inspections in 2007/08. Continued monitoring is, therefore, essential to ensure that this is a true indication of continually improving standards of oral health in Greater Glasgow's children.

Reductions in Inequalities

Figures 7, 9, 11 & 13, depicting changes in the relative frequency distributions of dmft score for each of the levels, suggest that changes in the relative frequency distribution of dmft score may be a more sensitive indicator of changing dental health in a high caries population than conventional use of mean dmft and % dmft=0 scores alone.

There is evidence that the targeted interventions have reduced dental health inequalities within DepCat 7 communities and between deprived and more affluent communities. The redistribution of relative frequency of dmft scores within DepCat 7 communities reflects decreasing intra-district inequalities. In the targeted DepCat 7 districts across GG, since baseline, highly significant ($p < 0.001$) improvements in the Odds Ratios for dmft > 0 (OR=0.35) and for redistribution of dmft scores ($p < 0.001$) were observed. Over the interval, no similar statistically significant patterns of improvement in 5-year-olds dental health were detected in GG districts DepCat 1-6.



4. DISCUSSION

The Ottawa Charter principles for health promotion which underpinned the Greater Glasgow Pre-5-Year-Old Oral Health Gain Project and OHAT activity have been securely founded on the published evidence base e.g. *The Scientific Basis of Dental Health Education: A Policy Document* (1996, and subsequent revisions). The original Oral Health Gain Project and OHATs have applied evidence-based scientific principles in their delivery of community development style oral health promotion activities.

The formation of a new Monitoring and Evaluation Subgroup has coincided with the transition of the LHCC-based phase of OHATs to CHP/CHSCP-based OHATs. This review of OHATs has been an opportunity to consider historic information and future data requirements.

It is anticipated that OHATs of the future will evolve to acquire a wider remit, with increasing responsibilities. The Monitoring and Evaluation Subgroup, however, also anticipates that its remit will remain for the time being confined to the Pre-5 agenda and it will identify the information and resources required to satisfy each level of Watt *et al's* Evaluation Framework Model.

Prospective data-capturing templates for OHATs will be devised. Appropriate training will be developed and be delivered to ensure consistent completion of these templates by each OHAT.

- Currently detailed NDIP data describe:
 - a. Dental Health Outcomes via caries epidemiology (P1, P7).
 - b. Inequality of dental disease distribution at a Greater Glasgow level (P1, P7).
- Basic NDIP data describe:

Relative frequency distribution of Risk Level category for children inspected in P1 and P7 classes in schools in Glasgow as a whole, by LHCC (CHSCP) and school and allow annual cross-sectional caries-risk profiles of successive 5 and 11 year-old cohorts at NHSGG, at LHCC (CHSCP) and at school levels to be determined.

Indications from previous short-term epidemiological studies related to Health Needs Assessment in GG show that many nursery stage children already have manifest caries by 3 years of age. Therefore, there is a need to inform the balance of future OHAT interventions between those aimed at the child and their family from birth to 3 years and from 3 to 5 years of age, in order to maximise OHAT effectiveness. This could be achieved by conducting epidemiological surveys of 3 year olds.

Although it is not possible to provide absolute and robust scientific proof of the effectiveness of OHATs, Randomised Control Trial (RCT) study design being impractical, the association between interventions and observed dental health improvement does meet the various tests of biological plausibility, consistency and temporal sequence. Phillips & Goodman (2004) consider that combinations of even just some of these elements justify continuation of health promoting interventions. However, as previously explained, it will be important to continue rigorous monitoring and evaluation of trends in oral health in NHSGG and to take into account any background trends in the relevant age groups.

It is probable that Social Outcomes (Watt *et al* 2001) will have followed OHATs establishment and their implementation of oral health promoting actions. The Monitoring and Evaluation Subgroup will investigate appropriate methodologies for the measurement of Quality of Life, Functional Independence, Equity and Social Capital in accordance with Glasgow's adaptation of the Watt *et al* evaluation framework. The relationship between Social Outcomes and Dental Health Outcomes can then be investigated.



5. CONCLUSIONS

This NHSGG analysis of oral health data commencing with the Pre-5-Year-Old Oral Health Gain Strategic Development Programme, indicates that statistically significant improvements in 5-year-olds dental health have occurred consistently at district, DepCat 7 and whole NHSGG population levels in temporal association with each successive introduction of targeted community-based interventions.

By 2003/04 compared to the reference year 1997/98:

- The statistically significant improvements in 5-year-olds dental health indices recorded in the original Pre-5-Year-Old Oral Health Gain Strategic Development Programme district (G22) have continued beyond the transition to OHAT working.
- Statistically significant improvements in 5-year-olds dental health were observed in the second Pre-5-Year-Old Oral Health Gain Strategic Development Programme district (G33) and continue to be observed following transfer to OHAT working.
- Following phased extension of similar targeted community-level interventions into successive LHCC districts via OHATs, based on relative need, statistically significant improvements in 5-year-olds dental health were apparent by 2002/03 in NHSGG s DepCat 7 communities. Further oral health improvements were observed in 2003/04.
- There was no evidence of any background trend towards generalised dental health improvement existing in any 5-year-old population across NHSGG prior to being exposed to the targeted community-level interventions.
- There is no statistically significant pattern of improvement in 5-year-olds dental health indices in any of Greater Glasgow's DepCat 1-6 districts.
- Dental health inequalities at 5 years of age, between the poorest and relatively more affluent districts in GG have reduced.

- There is evidence that within DepCat 7 communities more children have no obvious dental decay experience, more children have lesser burdens of decay experience and less children have the greatest burdens of decay.

- While the dose of community-level Oral Health Promotion may not yet be sufficient to render the majority free of obvious tooth decay it has mitigated their burden of disease in the most deprived communities.

- The magnitude of dental health improvement achieved in NHSGG DepCat 7 communities has been sufficient to cause a measurable and statistically significant improvement in the overall NHSGG value of 5-year-olds dental health indices.

- There is evidence that improvements in NHSGG 5-year-olds dental health indices follow the introduction of community-level intervention and that there is a temporal response i.e. the longer the interventions continue, the greater the consequent dental health improvement.

- Further improvement is required to enable NHSGG to achieve the 2010 target for 5-year-olds oral health i.e. at least 60% with no obvious decay experience.

- Appropriate intervention programmes require to be developed for DepCat 1-6 communities.

- A new prospective monitoring and evaluation framework based on the multi-level framework model described by Watt *et al* and appropriate to the OHATs CHP/CHSCP phase should be developed. This should relate closely to the agreed key work themes of OHATs and the aims and objectives for 5-year-olds dental health improvement contained in CHP/CHSCPs Performance Assessment Frameworks.

The Monitoring and Evaluation Subgroup of the OHAT Steering Group therefore wish to make the following recommendations to NHSGG.

one

The Watt *et al* (2001) Evaluation Framework Model for Community Oral Health Promotion Programmes (appropriately modified for 5-year-olds) should be adopted as NHSGG's evaluation tool for OHATs' evaluation.

two

When the future core and additional activities for each OHAT have been identified by the OHAT Steering Group, the Monitoring and Evaluation Subgroup should devise a systematic evaluation framework which will be predicated by the aims and objectives for 5-year-olds' dental health improvement contained within the CHP/CHSCPs' Performance Assessment Frameworks.

three

The Subgroup should co-ordinate the data collection from OHATs via an agreed communications strategy to ensure timeous, appropriate, systematic, consistent and compatible data from all GPs/CHSCPs.

four

In future, responsibility for completing each individual OHAT's Evaluation Framework Model with Level 1, 2 and 3 data will rest with the OHAT, and their host CHP/CHSCP. This information will be submitted to the Monitoring and Evaluation Subgroup on standardised templates at intervals agreed in the communications strategy and this information will form part of the Performance Assessment Framework for CHSCPs.

five

In order to sustain OHATs with respect to their agreed key work themes and their future enhanced roles and responsibilities in monitoring, evaluation and performance assessment, the Subgroup recommends that NHSGG enable OHATs to receive generic training and support in the use of appropriate monitoring and evaluation methodologies. It is anticipated that peer-group activity will be central to providing i) on-going support to OHATs, ii) a platform for peer-review, iii) clinical-governance and research-governance and iv) dissemination of experiential learning and best-practice.

six

The Monitoring and Evaluation Subgroup of the OHAT Steering Group should use the NHSGG NDIP Programme to populate the Level 4 of the Evaluation Framework Model.

seven

The Monitoring and Evaluation Subgroup recommends that NHSGG carry out caries epidemiology studies of the 3-year-old age group in order to inform the priorities for future OHAT oral health promotion practice.

eight

The Monitoring and Evaluation Subgroup recommends that appropriate qualitative research and further statistical analyses are undertaken to support the framework.

nine

The Monitoring and Evaluation Subgroup recommends that OHATs' activity continues to target pre-5-year-olds to deliver further oral health improvement. Pre-5 activities should not be diluted by extension of OHAT remits without the input of appropriate additional resources.

ten

An appropriate intervention programme requires to be developed to support the oral health of children resident in the DepCat 1-6 communities.

7. GLOSSARY

Glossary of abbreviated terms

CDS	Community Dental Service
CHP	Community Health Partnership
CHSCP	Community Health and Social Care Partnership
DepCat	Deprivation Category
F ⁻	Fluoride
GDP	General Dental Practitioner
GG	Greater Glasgow
GGNHSB	Greater Glasgow NHS Board
HIF	Health Improvement Fund
HV	Health Visitor
LHCC	Local Health Care Co-operative
NDIP	National Dental Inspection Programme
NHSGG	NHS Greater Glasgow
OHAT	Oral Health Action Team
OHP	Oral Health Promoter
OHPIG	Oral Health Planning and Implementation Group
OR	Odds Ratio
PCT	Primary Care Trust
SHBDEP	Scottish Health Boards' Dental Epidemiological Programme
WTE	Whole time equivalent

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