

**Impact case study (REF3b)**

<b>Institution:</b> University of Glasgow
<b>Unit of Assessment:</b> Unit 3, Allied Health Professions, Dentistry, Nursing and Pharmacy
<b>Title of case study:</b> Childsmile transforms child dental health
<p><b>1. Summary of the impact</b></p> <p>University of Glasgow researchers have played a pivotal role in developing and evaluating the pioneering <i>Childsmile</i> oral health improvement programme. By the late 1990s, more than 50% of 5-year-olds in Scotland showed evidence of dental decay. Since implementation of <i>Childsmile</i> in 2006, this has decreased to 33% and, within this population dental decay in children from the most severely deprived backgrounds has experienced a striking reduction (from 79% to 55%). In 2011, <i>Childsmile</i> was formally incorporated into the primary care dental contract and subsequently in 2012, into the universal child health surveillance programme in Scotland. Since its introduction <i>Childsmile</i>'s community-based, preventive approach has revolutionised dental healthcare from birth for all children up to 12 years of age in Scotland resulting in delivery of <i>Childsmile</i> to over 730,000 children per year.</p>
<p><b>2. Underpinning research</b></p> <p>The link between poor oral health in children and socio-economic deprivation is well established. In the late 1990s the University of Glasgow Community Oral Health group employed a pioneering community-based approach which delivered a comprehensive programme of oral health improvement to children with intensified activities targeted to the most at risk. Thereafter they have played a lead role in the development and evaluation of the <i>Childsmile</i> programme.</p> <p><b><i>Development of a community-based oral health programme (1996-2001)</i></b></p> <p>In 1996, Professor Lorna Macpherson led a research programme that designed and evaluated a community development initiative in one of the most socio-economically disadvantaged areas of Glasgow, and in the UK as a whole.<sup>1</sup> It focused on involving and supporting families and communities in facilitating improvements in oral health. This included improving access to fluoride toothpaste and supporting supervised tooth-brushing schemes, and the introduction of school breakfast clubs and opportunities to develop parenting skills. It was one of the first oral health programmes to use a multi-disciplinary team involving health visitors, community-based support workers, lay community activists, dental practices, nurseries and schools to deliver the intervention. This resulted in a reduction in the percentage of 4-year-olds with dental decay from 83% (1996) to 60% (2000). In 2001 the programme was rolled out across all socio-economically deprived areas within Greater Glasgow and Oral Health Action Teams were created to support this work; evaluation of this second phase in 2006 confirmed the positive outcomes.<sup>2</sup></p> <p><b><i>Development and evaluation of a national tooth-brushing programme (2000-2007)</i></b></p> <p>In a separate programme of work, Professor Macpherson was commissioned to lead all Health Boards in Scotland in developing a nation-wide nursery-based tooth-brushing programme. Professor Macpherson Chaired this programme between 2000 and 2007. In 2013 the Glasgow researchers examined trends in the oral health of 5-year-olds since the national tooth-brushing intervention was first initiated.<sup>3</sup> The team analysed a series of complex individual-level and aggregated datasets (including dental inspection data from over 99,000 children) and demonstrated a strong association over time between the uptake of the tooth-brushing programme and the decline in dental decay in this age group. This was the first demonstration that a national tooth-brushing programme resulted in improved dental health. Over the same time period, levels of related child health indicators (e.g. obesity rates) had not improved, nor had similar improvements been observed in comparable populations elsewhere in the UK, suggesting that the improvements were attributable to the tooth-brushing programme.</p> <p><b><i>Childsmile: development of a national child oral health programme (2006-2010)</i></b></p> <p>University of Glasgow researchers played a pivotal role in developing a comprehensive oral health improvement programme for Scotland named <i>Childsmile</i>. This began in 2006 using the framework of the established national tooth-brushing programme with the addition of a two-tier pilot project. A practice programme pilot modelled on the Greater Glasgow community development programme<sup>1,2</sup> started in the West of Scotland ('Pilot 1') and a nursery fluoride varnishing programme, led by key collaborator Mr Graham Ball, started in the East of Scotland ('Pilot 2'). The diagram below details</p>

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the development of *Childsmile* with University of Glasgow led aspects shown in shades of blue. Following successful pilot studies, the services were combined and rolled out to all 14 Health Boards in Scotland in 2010. The University of Glasgow team has led the research and evaluation of the programme since its inception, providing evidence that influenced policy and led to further service development and on-going refinement of the programme. This includes recent work assessing the effectiveness and reach of the targeted component of the programme.<sup>5</sup>



**Child health improvement programmes reduce dental inequalities**

The group’s expertise in complex statistical analysis has been pivotal to the understanding of dental health inequalities and their potential to further inform and optimise the design of oral health improvement programmes to reduce the gaps. In 2007, the group initiated the dental examination of 3-year-old children. Results revealed that almost 30% of children in Glasgow exhibited dental decay by 3 years of age; additional data analysis using the Scottish Index of Multiple Deprivation provided compelling evidence that inequalities were present even by this young age.<sup>4</sup> In 2013 the group reported the most comprehensive assessment of simple and complex tests of dental inequality data and trends over a 15-year period (1993-2008).<sup>6</sup> This demonstrated a large reduction in absolute inequality over the time period of the national tooth-brushing programme.

**Key researchers:** Professor Lorna Macpherson: Senior Lecturer in Dental Public Health (2001-2006), Professor of Dental Public Health (2006-present); Dr Yvonne Blair: Honorary Clinical Teacher (2006-2012), Honorary Clinical Senior Lecturer (2012-present); Dr David Conway: Clinical Lecturer then Senior Lecturer (2000-present); Dr Alex McMahon: Senior Lecturer (2007-2009), Reader in Epidemiology (2009-present).

**Key collaborators:** Mr Graham Ball: Consultant in Dental Public Health, South East Scotland.

**3. References to the research**

1. Blair Y, *et al.* Glasgow nursery-based caries experience, before and after a community development-based oral health programme's implementation. *Community Dent Health.* 2004; 21:291-8. [Neither DOI nor URL are available, a scanned copy is available on request]
2. Blair Y, *et al.* [Dental health of 5-year-olds following community-based oral health promotion in Glasgow, UK.](#) *Int J Paediatr Dent.* 2006;16:388-98. doi: 10.1111/j.1365-263X.2006.00767.x  
*References 1 and 2 were included in the 2005 SIGN Guideline "Prevention and management of dental decay in the pre-school child".*
3. Macpherson LMD, *et al.* [National supervised toothbrushing program and dental decay in Scotland.](#) *J Dent Res.* 2013;92:109-13. doi: 10.1177/0022034512470690; see also [Appendix.](#)
4. McMahon AD, *et al.* [Reductions in dental decay in 3-year-old children in Greater Glasgow and Clyde: repeated population inspection studies over four years.](#) *BMC Oral Health.* 2011;11:29. doi: 10.1186/1472-6831-11-29.
5. Brewster L, *et al.* [Effectiveness and reach of a directed-population approach to improving dental health and reducing inequalities: a cross-sectional study.](#) *BMC Public Health.* 2013;13:778. doi:10.1186/1471-2458-13-778
6. Blair Y, *et al.* [Comparison and relative utility of inequality measurements: as applied to Scotland's child dental health.](#) *PLoS One,* 2013b; 8(3):e58593. doi:10.1371/journal.pone.0058593

**Professor Macpherson has received over £4 million in funding from the Scottish Government to support this work.**

**4. Details of the impact**

**Context**

Dental decay is an almost entirely preventable condition, yet it represents the most common cause of disease among children in the UK and is the most frequent reason for children to require

admission to hospital for a procedure under general anaesthesia. Historically, child oral health in Scotland has been among the worst in Europe. In the mid-2000s a staggering 30% of 3-year-old children in Glasgow showed evidence of dental disease with social deprivation, poor diet (frequent sugar consumption), lack of tooth brushing and difficulty in accessing regular dental check-ups contributing to the problem. This unacceptably early age of onset of child dental disease prompted the Scottish Government to highlight child oral health as a priority health concern.

### ***Childsmile: a preventive oral health programme for every child in Scotland***

University of Glasgow researchers were central to the establishment of *Childsmile* — a robust programme of evidence-based preventive care and practical dental health support and advice delivered to all Scottish children and/or their families. *Childsmile* employs an overarching population-based programme of nursery and school-based tooth brushing, oral health improvement initiatives and clinical prevention, with more intensive support provided for those children at high risk of dental decay. This innovative approach (developed from 2001-2009) was later called ‘proportionate universalism’ by The Marmot Review in 2010. In *Childsmile*, children at high risk are identified at birth – before dental decay even occurs – and referred to a more intensive programme of oral health support from health visitors and community-based dental health support workers.<sup>a</sup>

### ***Childsmile has delivered major improvements in child oral health***

The National Dental Inspection Programme (NDIP) is an oral health surveillance programme undertaken annually for the Health Boards and Scottish Government to monitor levels of dental decay in school children (ages 5 and 11 years). These data are used to inform government of the prevalence of dental decay and to monitor the effects of oral health improvement programmes. Before introduction of the oral health initiatives led by the University of Glasgow team, dental decay was present in 54% of Scottish 5-year-olds (2000), rising to 79% among those from the most severely deprived backgrounds. Since the introduction of the national tooth brushing initiative (2001), and later the start of the *Childsmile* programme (2006), levels of dental decay decreased dramatically in 5-year-olds to 42% in 2008, 36% in 2010 and 33% in 2012.<sup>b</sup> Crucially, dental decay in the most severely deprived children reduced from 79% (2000) to 55% (2010).<sup>c</sup> Between 2002 and 2011 this translated to 5749 fewer children per annum undergoing general anaesthesia for extraction of teeth (from 15,877 to 10,128 respectively), highlighting the positive impact of *Childsmile* on cases of severe decay.

### ***Childsmile incorporated into national dental service contract and child health surveillance***

In October 2011, in direct response to the demonstrated benefits above, *Childsmile* was formally incorporated into the Scottish NHS primary care dental contract (Statement of Dental Remuneration).<sup>d</sup> This ensured delivery of *Childsmile* at all levels of the NHS general dental service for all children from birth to 12 years of age in Scotland, providing robust oral health care to over 730,000 children per annum. This change was described by Scotland’s Chief Dental Officer as

*“the most significant change to the NHS primary care dental contract since its inception [and] the first attempt to shift dentistry from a treatment to prevention anticipatory care model.”*

The National Child Health Surveillance assessment is the cornerstone of the Scottish Government’s Child Health Programme. This mandatory assessment, consisting of core health screening, is carried out by health visitors on every child at 6–8 weeks of age with a review at 27–30 months of age. In 2012 a *Childsmile* referral option was formally embedded into the Child Health Surveillance assessment performed at 6-8 weeks; this was extended to inclusion in the 27–30 months review in 2013.<sup>e</sup> This clear governmental support for inclusion of *Childsmile* in this process reflects the value of investing in universal oral health monitoring from birth.

### ***University of Glasgow continued evaluation and improvement of Childsmile***

Professor Macpherson continues to have a pivotal role in *Childsmile*. As Co-Director and Evaluation Lead, she is responsible for its continuous development and on-going delivery of the programme. This is achieved through her Community Oral Health research group, which provides fundamental expertise in delivering 6-monthly quantitative and qualitative formative evaluation reports with feedback to each of the Health Boards, Programme Boards and the Scottish Government for the on-going improvement and development of the programme, ensuring that

*Childsmile* is constantly responsive to the needs of the target population. The group carried out a cost analysis of the national nursery tooth-brushing programme for the Health Management Committee of the Scottish Government in June 2013, and showed an expected cost saving to the health service of £3.9 million per annum, a decade after its introduction.<sup>f</sup>

### ***Childsmile provides training and resources to support dental health professionals***

Public awareness and acceptance of the *Childsmile* programme has been achieved using bright, attractive colours and an easily recognisable *Childsmile* logo. The *Childsmile* website<sup>a</sup> provides information to parents as well as a comprehensive section for dental professionals with links to the programme outline, NHS Education for Scotland (NES) training courses and the underpinning evidence from University of Glasgow and the wider research community. In the 16 months since the *Childsmile* website was upgraded in March 2012, it has had more than 68,000 visitors browsing an average of 4 pages per visit. Visitor demographics show that users are located in the UK, US, Australia, Asia and the Middle East.<sup>g</sup> The website also links to the *Childsmile* manual which provides information to support dental professionals in the implementation and delivery of the programme. Over the same period, the manual has been the most popular download from the *Childsmile* site (2013 times) and the tooth-brushing video has been the most viewed (1167 views) further demonstrating usage of the resources embedded within the *Childsmile* site.<sup>g</sup> Drawing directly on the community development model developed and evaluated by the Community Oral Health Group (ref 2 section 3) the delivery of *Childsmile* within dental practices is complemented by specially trained, dedicated *Childsmile* community and practice-based dental health staff. Since 2008, 1149 such staff have been trained by NES to deliver *Childsmile*.<sup>h</sup>



### ***Childsmile's success has been recognised internationally***

*Childsmile* is Scotland's flagship oral health improvement programme and its success has been recognised internationally. Professor Macpherson and her team have given over 40 presentations on the *Childsmile* programme, both nationally and internationally.<sup>i</sup> A Europe-wide initiative launched in response to a European Parliament call cited *Childsmile* as best practice in oral health promotion in its 2012 report, "The State of Oral Health in Europe".<sup>j</sup> In Wales, a similar programme called "*Designed to Smile*" is currently being implemented in response to the clear benefits of *Childsmile* in Scotland, and *Childsmile* was cited in the National Assembly for Wales's inquiry into child oral health.<sup>k</sup> Furthermore, based on her experience with *Childsmile* in Scotland, Professor Macpherson has been appointed (July 2013) as an Advisor to a Public Health England working group as they develop national guidance for Local Authorities on child oral health improvement programmes.<sup>l</sup> In light of New Zealand's potential withdrawal of mass water fluoridation, Professor Macpherson was the keynote speaker at The New Zealand Community Dental Services Society forum (May 2012) and also gave presentations around New Zealand on the *Childsmile* strategy.

By providing a personalised, practical dental care programme for every child in Scotland from birth, *Childsmile* has established the foundations of sustainable oral health for the future.

### **5. Sources to corroborate the impact**

- a. [Childsmile website](#).
- b. [National Dental Inspection Programme report 2012](#) – Figure 5, p7,
- c. [National Dental Inspection Programme report 2010](#) – Appendix, Figure 14, p22
- d. [Scottish Government incorporation of Childsmile into statement of dental remuneration](#)
- e. Child health Systems Programme Pre-School (CHSP Pre-School) [6-8 week review form](#) and [27-30 month review form](#)
- f. Claim can be substantiated by the Chief Dental Officer for Scotland if required.
- g. Childsmile website statistics - obtained directly from NHS Health Scotland, available on request.
- h. [Childsmile National Headline Data, September 2013](#)
- i. A list of presentations detailing *Childsmile* dissemination is available on request.
- j. "[The State of Oral Health in Europe](#)", September 2012, citing *Childsmile* as a best practice initiative in oral health promotion within Europe
- k. National Assembly for Wales's inquiry into child oral health (PDF available on request)
- l. Personal communication with representative from Public Health England – available on request.