Factors that influence the on-going retention of pre-school children aged 0-5 within Childsmile, the national oral health improvement programme for Scotland.

Jamie Brian Rutherford Kidd BA

Matriculation Number - 0813307

Submitted in fulfilment of the requirements for the degree of

MSc by Research

Dental Public Health

College of Medical, Veterinary and Life Sciences

University of Glasgow

June 2012

Abstract

Evidence is abundant that oral health inequalities exist in Scotland. Poor oral health is associated with infrequent dental attendance. Those who need this care the most are the least likely to access it.

Childsmile Practice is an oral health improvement programme established in 2006 to improve child oral health and help reduce the oral health inequalities being experienced by children in Scotland. One aspect of the programme is the intervention of trained Dental Health Support Workers to facilitate children, aged from birth to five years, to attend dental practices where they will receive Childsmile prevention interventions.

The demonstration phase of Childsmile Practice was piloted in three NHS health boards between 2006 and 2009; Ayrshire and Arran, Greater Glasgow and Clyde, and Lanarkshire. Only 47% of children who first attended a Childsmile dental practice appointment during this period returned within twelve months of their initial appointment and retention rates have decreased each year since the programme started.

The aims of this study were to identify which factors were associated with retention in Childsmile Practice by developing a model which could be used to predict those children who had the highest probability of returning within twelve months of their first appointment. Univariately significant variables were analysed by multivariate logistic regression to create prediction models.

No individual variable was found to predict retention and although a combination of variables (outcome of last scheduled appointment, the age of the child, area-deprivation status, and factors related to the dental practice) could identify those children more likely to be retained, the predictability remained low (c-index = 0.61). Children aged under 6 months when they first attended were significantly the most likely to be retained ($p<0.0001$, OR = 1.44). The odds of retention were lower if the parent last visited a dentist for pain relief or smoked.

Although Childsmile is addressing oral health inequality, there remains inequality with regards to those accessing Childsmile Practice regularly. By tackling this problem, Childsmile has a further opportunity to decrease oral health inequalities in children in Scotland.

Table of Contents

List of Tables

List of Figures

Acknowledgements

I would like offer my sincerest gratitude to the following persons for the support and insight which they have offered me throughout the completion of this thesis and whom without, the completion of this thesis would not be possible:

My supervisors Dr Alex McMahon and Dr David Conway whose support, guidance and friendship were vital to the completion of this work. I would also to like acknowledge and offer further gratitude to Dr McMahon for teaching me the programming skills that were not only vital for the completion of this work but will stand me in good stead in my future career (as well as those all so important 4pm meetings on a Friday afternoon).

Professor Lorna Macpherson for having the faith not only to offer me the opportunity to undertake this piece of research but for approving the funding required for the completion of this study over the previous three years.

My colleagues Bill Wright and Yulia Anopa for listening to my constant ‘thinking aloud’ and offering advice, expertise and solutions to the almost daily problems that come with writing a thesis.

Steve Turner for the proof reading of the thesis and for his much needed statistical advice.

Dr Wendy Gnich, Dr Andrea Sherriff, Dr Yvonne Blair, Peter King and all the staff in the Community Oral Health section of the University of Glasgow’s Dental School as well as the Childsmile Central Evaluation and Research Team.

My close friend Campbell for his friendship over the years as well as my parents and grandparents.

And finally, but not least, to my fiancée Susan, for her kindness, patience, generosity and love.

List of Abbreviations

A&A	NHS Ayrshire and Arran Health Board
CDS	Community Dental Service
CRA	Caries Risk Assessment
CERT	Central Evaluation Research Team
CHI	Community Health Index
CHP	Community Care Partnership
DCP	Dental Care Professional
DHSW	Dental Health Support Worker
EHS	Early Head Start
FVA	Fluoride Varnish Application
FTA	Failed to Attend
GDS	General Dental Service
GGC	NHS Greater Glasgow and Clyde Health Board
HEAT	Health, Efficiency, Access and Treatment
HV	Health Visitor
HVCRA	Health Visitor Caries Risk Assessment
ISD	Information Services Division
LAN	NHS Lanarkshire Health Board
NDIP	National Dental Inspection Program
NHS	National Health Service
NSS	National Services Scotland

PSD	Practitioner Services Division
ROC	Receiver Operating Characteristic
SAS	Statistical Analysis Software
SDCEP	Scottish Dental Clinical Effectiveness Programme
SDR	Statement of Dental Remuneration
SHBDEP	Scottish Health Boards' Dental Epidemiological Programme
SIGN	Scottish Intercollegiate Network
SIMD	Scottish Index of Multiple Deprivation
SMS	Short Message Service
WIC	Women, Infants and Children Program

Chapter 1 – Introduction

In 2003 after the completion of a detailed examination of the oral health of five year old children by the *National Dental Inspection Programme* of Scotland, it was reported that there were high levels of dental caries in Scottish children and that there was wide inequality as the majority of the disease was found in those children residing in the most deprived areas [Scottish Dental Epidemiological Co-ordinating Committee, 2003].

The 2005 Scottish Government policy document, *An action plan for improving oral health and modernising dental services in Scotland,* reported that five year old Children living in Scotland had amongst the highest rates of dental caries (tooth decay) in Europe [Scottish Executive, 2005]. To address this, a range of polices were set out to improve the oral health of the Scottish population, with a primary focus on children, which resulted in the funding and development of Childsmile, the national oral health improvement programme which was launched in 2006. Childsmile's overarching aim is to improve the oral health of children in Scotland whilst simultaneously tackling the issues of inequality which are linked to Scotland's poor dental health record.

Childsmile Practice is a key component of Childsmile focused on developing the role and access to dental services towards children from birth. With support from specially trained Dental Health Support Workers, children are invited to attend local dental practices where Childsmile trained dental nurses deliver Childsmile caries clinical prevention interventions to them at regular periods in their childhood starting from the age of six months.

Due to anecdotal information and preliminary data from a pilot study [Watters, 2010], Childsmile Programme Managers were concerned about the retention of children that had attended Childsmile Practice dental appointments. As there had been no formal examination of the data available, there existed a need to investigate retention within Childsmile Practice. This would allow the programme managers to establish the extent of patient retention in Childsmile Practice whilst allowing them to direct additional services and support to those families most at need.

Chapter 2 – Literature Review

2.1 Literature search strategy

Ovid Medline 1996-2012, Embase 1996-2012 were formally searched for relevant literature using the terms ‘child health’, ‘dental attendance’, ‘ public oral health’, ‘public health programmes’, ‘retention’, ‘oral health’ and other related terms. In addition, Google Scholar and Pubmed were also searched. The bibliography of any relevant papers were also checked to identify additional papers that could be used in the review, as were papers which citied those already identified. Google was also used to identify grey literature and discussions were had with Childsmile programme staff and members of its evaluation team to identify reports and audits that were not publically available.

2.2 Oral Health and Dental Caries

Dental caries is a disease which forms in the mouth when acid is produced as a by-product in the metabolism of carbohydrates, such as sugar, by bacteria in dental plaque. This acid corrodes the teeth by breaking down the enamel, dentine and cementum in the tooth [Featherstone, 2007]. There are several risk factors associated with dental caries: the consumption of food and drink high in carbohydrates, particularly non-milk extrinsic sugars, inadequate oral hygiene as a result of not regularly cleaning and flossing teeth [Gibson and Williams, 1999], smoke from tobacco including passive smoking which alters the production of saliva [Aligne et al, 2003] and the suffering of dry mouth (xerostomia) where inadequate amounts of saliva are produced [Fox, 2008]. The deciduous dentition, more commonly known as ‘baby teeth’ are the first set of teeth to grow in the human mouth. These are replaced by the permanent dentition in a process normally starting at the age of six. The highest risk of dental caries is when the tooth erupts through the gum. Therefore the risk of dental caries peaks from the age of two until five for the deciduous teeth and in the early teens for permanent teeth [Moynihan and Peterson, 2004], as most of the deciduous and permanent dentitions are erupted by these ages.

Dental caries has been shown to be linked to tooth pain, the altering of eating habits, and can affect sleeping patterns leading to a decrease in the quality of life of sufferers [Low, Tan and Schwartz, 1999]. Pain and lack of sleep can affect the

physical growth and development of children [Ayhan, Suskan and Yildirim, 1996], as well as contributing to an increased number of days a child and their parent are absent from school and work [Sheiham, 2006].

The World Health Organisation (WHO) [2003] stated that dental caries is the most common disease in the world. They estimate that there are around five billion cases worldwide, with 60-90% of children suffering which can account for up to 10% of a western country's medical expenditure.

From 1987 until 2002, the level of dental caries in Scottish children's teeth was measured by the *Scottish Health Boards' Dental Epidemiological Programme* (SHBDEP). Throughout the duration of SHBDEP, over 50% of five year old children had obvious signs of tooth decay when it was measured every second year. The highest recorded levels of dental caries was in 1993 (61.8%) and the lowest in 1999 (54.9%) [Scottish Health Boards' Dental Epidemiological Programme, 1999]. In 2001 the data were only available for NHS Greater Glasgow and Clyde (GGC) where overall, 57% of 5 year olds had obvious signs of tooth decay. Further to that, 72% of children in the most deprived area were experiencing dental caries compared to 40% in the least deprived area indicating an obvious inequality in terms of oral health. [Scottish Health Boards' Dental Epidemiological Programme, 2002].

SHBDEP was replaced in 2003 by the *National Dental Inspection Programme* (NDIP), an annual dental caries epidemiological survey of Scottish school children that alternates yearly between children in primary one (5 year olds) and primary seven (11 year olds). The results of the initial inspection in 2003 were that 55.4% of five-year-old children in Scotland had signs of obvious tooth decay compared with 30% of five-year-olds in the Netherlands. The results also indicated that the highest levels of tooth decay in Scotland were most prevalent in areas of high deprivation [Scottish Dental Epidemiological Co-ordinating Society, 2003]. The 2010 NDIP recorded a marked improvement with only 36% of five-year-olds showing any signs of obvious tooth decay which met the Scottish Government's target of 40%. Just as in 2003, there remains a correlation between dental caries and deprivation status [Macpherson et al, 2010a].

The prevalence of dental caries in three year old Scottish children was measured for the first time in 2006/2007 and again in 2007/2008 as part of NDIP in GGC. GGC

is an area which accounts for around a quarter of births each year in Scotland, comprising of urban and rural areas as well as having a 'representative cross-section of socio-economic groups'. Similar results were reported for both cohorts with 26% of children experiencing dental caries in 2006/2007 and 25% in 2007/2008. Prevalence of caries was highest in the most deprived areas (33% in 2006/2007 and 32% in 2007/2008) compared to the least deprived areas (13% and 16%). These finding provided new evidence that dental caries and oral health inequality exists amongst children as young as three [McMahon et al, 2010].

Three-year-olds were analysed again in 2008/2009 and 2009/2010 and the results indicated that the prevalence of dental caries had dropped to 18% and 17% for these two additional cohorts respectively. The difference between the least and most deprived areas had shortened in these cohorts to 26% versus 20% in 2008/2009 and 24% and 19% in 2009/2010. The lower levels of dental caries and the decrease of oral health inequality within these later cohorts were attributed by the researchers to Childsmile Practice which started in July 2006. As patients could attend Childsmile Practice from birth, children in the latter two cohorts would had more opportunities for attendance in Childsmile Practice compared to the two earlier cohorts when Childsmile Practice was still in its infancy [McMahon et al, 2011]. Whilst these results were significantly lower for the two latter cohorts, it was unknown which children who were screened for dental caries had actually attended Childsmile Practice so although the results suggest that there was an influential factor, it could be suggested that the contribution of Childsmile Practice on oral health remains inconclusive due to the non-linkage of Childsmile Practice and NDIP data.

Early childhood caries is highest amongst children from the most deprived backgrounds i.e. parents with low incomes and low education as well as families that form part of a minority group [Edelstein, 2009]. In the late nineties, research was conducted in Scotland into the link between families living in the most deprived areas and the prevalence of caries [Sweeney, Nugent and Pitts, 1999]. The results substantiate that there is a link between deprivation and dental caries and reported that children from the most deprived areas have over three times the level of caries as their counterparts living in the least deprived areas. A recent analysis of NDIP data reported that children living in rural Scotland had considerably less dental caries than those who lived in an urban environment. This

was linked to lower levels of deprivation in rural areas, although other factors such as decreased access to both ‘fast food restaurants’ and shops selling food high in sugar, as well as a higher proportion of salaried dental practitioners in rural Scotland were also attributed [Levin et al, 2010].

2.3 Oral Health Interventions

The Scottish Intercollegiate Guidelines Network (SIGN) [SIGN, 2005] produced a set of clinical guidelines which identified four main categories of oral health interventions to be used in the prevention and treatment of dental caries in children aged under 5 years: toothbrushing with fluoride toothpaste, diet and nutrition, community based interventions and practice based interventions. In the 2009 document *What is Childsmile?* [Health Scotland, 2009] there is an emphasis on ‘healthy eating, good toothbrushing skills and regular dental attendance’ as the key factors in improving oral health.

2.3.1 Toothbrushing and Fluoride Toothpaste

The SIGN guidelines recommend that from when the first tooth erupts, children should brush their teeth under the supervision of an adult two times per day. Toothbrushing under adult supervision has been shown to decrease the level of caries [Wendt, Hallonsten and Birkhead, 1994] as well as lowering the risk of fluorosis from a child swallowing high levels of toothpaste [Fomon, Ekstrand and Ziegler, 2000]. Health Scotland [2009] recommend attendance at a dental practice where a dental care practitioner can instruct families on how to toothbrush efficiently as well allowing the family to discuss with the dental care practitioner any problems associated with toothbrushing such as bleeding gums.

The use of fluoride in toothpaste and water supplies has been found to lower the rate of dental caries [Weintraub et al, 2006)]. A Cochrane systematic review [Marinho et al, 2003] of over seventy studies provides evidence that the use of fluoride in toothpaste is effective in reducing dental caries. There remains a level of debate as to whether the benefits of using fluoride outweighs any health risks associated with it i.e.fluorosis [Marinho et al, 2009]. Although there is a minimal risk of fluorosis to young children brushing with toothpaste containing 1000 ppm fluoride, evidence suggests that 500 ppm fluoride in toothpaste may not be enough avert dental disease [Conway et al, 2005].

2.3.2 Fluoride Varnish Application

Fluoride varnish has clinically been proven to reduce dental caries in children and can be used effectively as part of a dental public health programme as it can easily be applied to the teeth of children, including infants when their teeth first erupt through the gum, by a dental health professional and poses no risk of fluorosis to the child [Bawden, 1998]. Fluoride varnish protects the teeth of children from tooth decay by increasing the rate of remineralisation whilst slowing down the process of demineralisation of the tooth. This process makes teeth less vulnerable to the acid that causes tooth decay. High levels of fluoride application can also halt the metabolism of sugar by bacteria, which produces the corroding acid [Childsmile, no date(a)].

Weintraub et al [2006] conducted a randomised trial on the effect of fluoride varnish when applied to the teeth of infants coupled with oral health education for their parents. After two years, the prevalence of dental caries was found to be lower when the applications of the varnish were given alongside oral health education compared to those where only oral health education was provided. This indicates that the use of fluoride varnish, even when provided in addition to oral health education, is effective as an intervention.

The Scottish Dental Effectiveness Programme's document *Prevention and Management of Dental Caries in Children* [2010], as well as the SIGN [2005] guidelines for *Prevention and management of dental decay in the pre-school child,* recommend that fluoride varnish should be applied to children aged two and over at least twice a year, and that children at an increased risk of dental caries should receive an additional two application each year.

2.3.3 Diet and Nutrition

SIGN [2005] recommends that oral health interventions should include the encouragement of mothers to breastfeed exclusively for a minimum of six months, based on current guidelines set by the United Kingdom's Department of Health. However, Lida et al [2007] argue that there is lack of evidence to support a direct link between breastfeeding and dental caries. This finding is supported by a systematic review by Valaitis et al [2007] which states that there is a deficiency of evidence of a link between the length of a time a child is breastfed for and early childhood caries. Nevertheless there is plenty of evidence to support the provision

of breastfeeding for child health [Hoddinott, Tappin and Wright, 2008; Horta et el, 2007].

It is recommended that children should only consume sugar in food or drinks during a meal rather than as a snack outside meal times and that the ingredients on packaging should be checked for levels of sugar [Childsmile, no date(b)]. Milgrom et al [2009] conducted a study in the Republic of the Marshall Islands on the use on xylitol, a naturally occurring alternative to sugar with antibacterial properties which can lower the rate of dental caries. One hundred children aged between 9 and 15 months were regularly administered with xylitol in syrup form and the results showed a decrease in dental caries in those children who had been consuming xylitol. Edelstein [2009] argued that the rate of early childhood caries still remained high amongst the participants of Milgrom's study and that just like the use of fluoride, it is not a single solution that is required to eradicate this disease but a combination of pharmacological and social interventions.

2.4 Community & Practice Based Programmes

Health promotion is the empowerment of individuals to have a greater influence on, and improvement of their own health [Nutbeam, 1998]. The WHO's *Ottawa Charter for Health Promotion* [1986] sets out guidelines for health promotion worldwide: increased equality and access to services and health education, the coming together of governments, legislators, health professionals, individuals and all other stakeholders, a refocus of the priorities of health services towards health promotion and the tailoring of health services and promotion to suit the requirements of different environments whilst redirecting services towards those most at need.

In 1998, Kay and Locker completed a systematic review of 164 articles on the effectiveness of oral health promotion. They concluded that there was not an abundant level of evidence available to suggest that health promotion increased the quality of oral health. Although, evidence was available that programmes which promote the use of, or in some cases apply fluoride, are the most beneficial for decreasing dental caries, and that a combination of oral health promotions delivered whilst in a dental location by a dental health professional were the most stable processes of improving oral health.

Oral health promotion can be delivered in a variety of ways and the most effective results can be achieved by combining health promotion with frequent contact between families and dental care practitioners delivering oral health interventions, such as toothbrushing and dietary advice [Gunay et al, 1998]. SIGN guidelines state that interventions should be varied to suit the requirements of communities and social groups, ensuring a level of contribution as part of the intervention from the targeted cohorts alongside education and support from health services [SIGN, 2005]. In 2002, Friel et al studied an oral health intervention programme in the Republic of Ireland of 1534 school children aged between 7 and 12. The programme included a series of television programmes aimed at children within that age group that featured prominent children's television celebrities, an example of a population or universal intervention [Elkan, 2000]. This was coupled with a dental nurse delivering oral health education discussions in the classroom that involved participation from the pupils. The results showed an increase in that the number of children who had been brushing their teeth for a minimum of three minutes each day. The intervention, that was tailored towards a specific social group backed by educational support from a health practitioner, produced positive outcomes that provided evidence to support the SIGN guidelines [SIGN, 2005].

Practice-based interventions offer an opportunity for families to improve the quality of life for both the child and the parent [Minkovitz, 2003]. It is appropriate to change or adapt the interventions being delivered within a practice based intervention programme over time, if monitoring and evaluation of the programme deem it to be beneficial [Petersen and Kwan, 2004].

In 2001, *Smart Smiles*, a practice based oral health intervention pilot programme was introduced in North Carolina, USA for children aged 0 to 3 with poor access to dental services either because of their rural location or socioeconomic factors. As part of *Smart Smiles*, they were provided with basic dental care by medical practitioners who were deemed to be more accessible for children at risk of dental caries. Medical practitioners were trained to check for any obvious oral health problems, administer fluoride varnish, and offer oral health advice to families. Dental hygienists travelled to visit families deemed to be the most at need and whom could not access the initiative via a practitioner. Upon expansion and renaming of the programme to 'Into the Mouths of Babes', training and delivery of

the programme was extended to other health professionals such as nurses and community health workers [Gehshan and Wyatt, 2007]. An evaluation of these two programmes found that they had led to an increase in access to dental support compared to other states in America by the programme only targeting at-risk families [Rozier et al, 2003]. Data gathered by the programme indicated that children who had attended were less at risk of caries than those that had not. Also, those children who had attended the programme on four or more occasions by the age of 3 were the most likely to have gained from the services provided [NC Department of Health and Human Services, 2010]. Whilst this programme provides evidence that the delivery of oral health interventions by non-dental care professionals can have a positive impact on oral health, it was argued by Meskin [2001] that families accessing dental interventions from a medical practitioner could wrongly assume that they do not require further expert dental health care from a dental health practitioner.

Early Head Start (EHS) is an American public health intervention programme that started in 1995 [Love et al, 2005]. EHS provides a range of health services to deprived mothers and their children aged 0 to 3, including access to dental services [Jones et al, 2000]. Those attending EHS reported that access to dental services remained poor and this was attributed to a reluctance of dental practices wishing to engage with Medicaid patients (a low cost American Government funded health insurance scheme [Medicare, 2011]), a lack of readily available appointments, and a shortage of dental practices in rural areas leading to long and expensive commutes [Jones et al, 2000]. In addition to EHS, another general health service, *Women Infants and Children* (WIC), delivers oral health interventions by offering dietary advice and providing toothbrushes to participants (children aged 0 to 5). WIC also provides referrals to dental services which had helped to increase the relationships between dentists and public health programmes. EHS and WIC have begun to collaborate in an attempt to improve access to dental services in the United States [Jones et al, 2000].

Smile with the Prophet is an oral health intervention programme in England. It combines religion and education to promote oral health amongst Muslim children by connecting religious texts to good oral hygiene. Resources for promoting good oral hygiene such as toothbrushes, toothpaste and leaflets were distributed within the mosque [Race for Health, 2008]. Although this is an example of example of the

WHO's recommendations of adapting services to meet the cultural requirements of the target group, there is no evidence currently available to support the effectiveness of this particular intervention.

To deliver an effective oral health intervention programme, regardless of whether it is delivered universally to a population or just to a targeted group, it is recommended that the programme should be a combination of interventions [SIGN, 2005] encompassing education with actual treatments such as fluoride varnish applications [Edelstein, 2009].

Health, Efficiency, Access and Treatment (HEAT) targets have been set by the Scottish Government to improve the health of Scottish children and the efficiency and accessibility of NHS services whilst insuring that treatment is tailored to a patient's individual requirements [Scottish Government, 2010]. The HEAT targets set for 2010 were that 60% of primary one children will not show any signs of obvious tooth decay and that 80% of children aged between 3 and 5 will be registered with a dental practice [Ballard, 2008]. To assist in reaching these targets, the Scottish Government in conjunction with NHS Boards introduced an oral health intervention programme called Childsmile in 2006.

Oral health promotions and interventions, for example those that adopt an educational approach, may not reduce oral health inequalities if those accessing the intervention are equally spread across all socioeconomic groups. Further to that, interventions may actually widen the gap in inequality if it predominantly benefits those from the more affluent socioeconomic groups [Macintyre, 2007]. For example, an oral health educational programme in Scotland targeted at mothers with five-year-old children found that those with a higher level of education benefited the most from the intervention [Schou and Wright, 1994]. If health promotions and interventions are mostly available to those who are least at need of the service ('inverse care law'), then this will further widen health inequalities [Tudor Hart, 1970].

2.5 Childsmile

In 2005, the Scottish Executive published an *Action Plan for Improving Oral Health and Modernising Dental Services in Scotland*. The key aims of this document was to provide a modern approach to dental services offered by the NHS whilst improving

the oral health of children in Scotland, which the document suggested was amongst the poorest in Europe. This document led to the launch of Childsmile in 2006 as a demonstration programme that was funded by the Scottish Executive which was aimed at "improving the oral and general health of children in Scotland, and to reduce inequalities, both in dental health and access to dental services" [Health Scotland, 2009]. The foundations for Childsmile were based around the *WHO Ottawa Charter* [Shaw, Macpherson and Conway, 2009] that proposed the following starter blocks for health promotion; "Build Healthy Public Policy", "Create Supportive Environments", "Strengthen Community Actions", "Develop Personal Skills" and "Re-orientate Health Services" [World Health Organisation, 1986].

Childsmile consists of four different components [www.childsmile-org]: Childsmile Core, Childsmile Nursery, Childsmile School and Childsmile Practice. Childsmile Practice is the component that this study focuses on. Guidelines and descriptions of these components are contained within the *Programme Manual for Childsmile Staff* [Childsmile, 2011] and described as follows:

2.5.1 Childsmile Core

As part of the Childsmile Core component, children are regularly provided with toothbrush, toothpaste and oral health information as part of a dental pack six times in the first five years of their life. Every child participates in supervised toothbrushing on a regular basis if they are attending a nursery. Supervised toothbrushing is also provided in a child's first two years of their primary schooling if their school is located in one of the 20% most deprived areas in a health board. This targeting is to reduce inequality [Macpherson et al, 2010b].

2.5.2 Childsmile Nursery & School

Childsmile Nursery is aimed at nursery school children who may be at a higher risk of poor oral health (if the nursery is located within the 20% most deprived areas in a health board). The programme consists of fluoride varnish being applied two times a year to these children's teeth as well the child receiving advice on oral health and hygiene and supervised toothbrushing, all which are delivered in the nursery setting.

Childsmile School follows a similar pathway to Childsmile Nursery in that it targets primary school children who may require extra dental care. Again this care consists of fluoride varnish being applied two times a year to children's teeth as well the child receiving advice on oral health and hygiene. Access to additional dental treatment is enabled for those indentified as requiring this service [Ball, 2008].

2.5.3 Childsmile Practice

In Childsmile Practice, families are referred to Childsmile via a Health Visitor (HV) if the family are "risk-assessed" as needing additional support from a Dental Health Support Worker (DHSW) [Turner et al, 2010]. Direct referrals to dental practices providing Childsmile Practice can also be made from the child's parent/carer, or from a dental practice. The DHSW is then able to offer an early dental intervention from the age of three months onwards, before assisting with the facilitation of the child into a dental practice or clinic that provides Childsmile. Once enrolled in Childsmile, the child is invited to attend the dental practice on a regular six monthly basis for the remainder of their childhood where toothbrushing demonstrations, and advice on fluoride and diet, are given from a dental nurse trained in delivering Childsmile interventions. Fluoride varnish application (FVA) is also offered from the age of two years onwards. During the initial demonstration phase of the Childsmile programme (2006-2009), Childsmile Practice was targeted towards infants living in the three most deprived Scottish Index of Multiple Deprivation (SIMD) quintiles in the West of Scotland. From 2009 through to 2011, Childsmile moved into the interim demonstration phase of the programme where HVs were to invite all infants to enrol with a dental practice that was delivering Childsmile Practice.

For families that are referred to the DHSW from a HV, the role of the DHSW is to explain the Childsmile practice programme to the family, provide oral health information, facilitate a Childsmile appointment for the child at a dental practice, to communicate with the family prior to the appointment and to remind and accompany them to the appointment if required. The DHSW can also provide additional home support to the family before or alongside the Childsmile appointments. The DHSW is also informed if the child does not attend an arranged appointment at the dental practice to allow the DHSW, alongside the child's HV if necessary, to attempt to re-engage the child back into Childsmile Practice.

During the demonstration phase, non-salaried general dental practitioners (dental practitioners who are paid from the NHS for individual treatment claims) were paid an enrolment fee for each child under the age of three which increased with the age of the child after they attended their first Childsmile appointment. The practitioners would continue to receive an enrolment fee regardless of whether or not the child returned for a subsequent Childsmile appointment. Once Childsmile moved into the interim demonstration phase, payment of the enrolment fee ceased if the child did not attend a Childsmile appointment within twelve months. The enrolment fee was no longer calculated by age but instead by the SIMD score of the child's home address. The fee increased for children living within the three most deprived SIMD quintiles [Childsmile, 2010].

2.6 Retention

2.6.1 Retention in General Public Health Programmes

Apart from the benefits to the participant's health, the retention of participants in public health programmes is important to ensure that the programme is effective in terms of achieving its desired outcomes as well as being cost effective [Glasgow, Vogt and Boles,1999].

A review of methods for retaining those from lower socioeconomic groups or from ethnic groups in longitudinal health studies, concluded that maintaining a good relationship with participants is essential at both the first engagement and throughout the study [Goncy, Roley and van Dulmen, 2009]. It was suggested that a positive relationship can be maintained by ensuring that any issues the participants may have are resolved swiftly. In addition, providing compensation for participation was also identified as important in ongoing retention.

Ingoldsby [2010] conducted a review of methods used since 1980 to retain families within child mental health programmes. Ingoldsby states that there is a large amount of evidence available to predict that participants who lived in areas of high deprivation, or were from a minority group, or were part of a single-parent family were the least likely to be retained in child mental health programmes. The reasons for non-attendance were usually given in terms of practicality: cost involved; poor accessibility of transport; the need to arrange child care; and fitting the appointments into already busy schedules. Other given factors were related to the way in which the programme was delivered including: that the programme did

not meet the participants' perceived needs; that those delivering the programme were not sympathetic towards the participants' situation; and that the programmes were not widely available in areas of high deprivation.

Approaches related to short term retention were hypothesised by Watt el al [2007] after an analysis of an Australian programme for families with children experiencing behavioural problems. They found that providing appointment reminders increased involvement for those families whose child had high levels of behavioural problems (those most at need of the service). However it did not increase the involvement of the other families. This suggests that additional reminders alone are not enough to improve retention with those families who may perceive themselves as not requiring the service.The identification of family members who were the source of resistance towards treatment being offered, and addressing the issues they had by offering counselling and additional support, increased retention in a public health programme from 25% to 75% [Szapocznik et al, 1988]. Families were more likely to engage in a health programme for children with mental health issues when substantial contact was made with the families to discuss and resolve (where possible) any concerns such as finance, transport and scheduling which were creating obstacles to accessing of the service [McKay et al, 1998]. After reviewing these studies it was summarised that these cases were for outpatient treatment and it was unknown whether or not these methods could increase retention in preventive programmes.

Ingoldsby then reviewed methods for long term retention. The first paper reviewed was by Heinrichs [2006] who investigated the impact of providing financial support to families with children aged less than five years of age to attend a 'parent-training preventive programme'. It was reported that those who were offered this incentive were more likely to have an initial contact with the service. But due to the high retention rate, the impact of financial support in this programme could not be ascertained. A study by Cunningham , Bremner and Boyle [1995], investigated whether or not families were more likely to regularly attend a public health programme when offered group sessions with other families rather than attending individually.Those families whose profile suggested low participation based on previous research (from a deprived area or minority group) [Locker, 2000] were more likely to attend an initial appointment as part of a group session, although retention itself did not increase for families with these profiles when

attending as part of a group rather than individually. A study investigating whether or not first-time mothers were more likely to be retained when visited by a nurse compared to a 'paraprofessional'(a non-licensed or qualified health-care provider such as a support worker) found that retention increased to 62% compared to 52% when the intervention was being delivered by a nurse [Korfmacher et al, 1999].

Parents Matter is a public health programme for parents or carers of pre-teen children who attend intervention groups to gain sexual health knowledge and communication skills so that they can discuss sexual health issues with their child [Parents Matter, accessed 1 September 2011]. Of those participants who were eligible for a subsequent appointment six months after the initial intervention, 87.2% attended [Armistead et al, 2004]. The researchers attributed the high retention rate to a number of factors including participants being offered a flexible date for their subsequent visit as well as receiving a large amount of contact from a facilitator including a letter to remind the participant of their upcoming appointment and a phone call the evening prior to the appointment. The facilitators would also contact participants who missed an appointment to discuss any issues that may be hindering on-going participation and to help resolve these issues. The participants also received money to cover the costs of travel and childcare which may have increased participation by improving accessibility to those whom otherwise would not have been retained on the programme.

Thriving Teens: Parenting for Positive Growth, was a public health programme designed to educate parents with preventive techniques to lower the use of illegal drugs, alcohol and tobacco by teenagers in the USA [NYU Child Study Centre, no date]. Bruzzese et al [2009] analysed the successful processes used to increase retention within this programme. It was noted that retention in longitudinal studies is often outwith the control of those conducting the research as families can move home or have significant changes in their life meaning that participation is no longer possible. However those conducting the study employed a series of stages to attempt to maximise retention in the study. These included the following: providing multiple reminders to the participants; offering compensation to cover the costs of travel; flexible appointments; contacting families that missed an appointment to rearrange; maintaining regular contact with families to update contact details as maintain rapport. Thorough attempts to gather new contact details when a participant could not be contacted were also made. Retention rates

varied from 87% to 91% and it was concluded that intervention programmes should apply the methods used in this particular programme to increase retention.

In 1997, Lee et al conducted a study of active versus passive methods of recruiting ethnic minority woman to a health promotion programme. It was concluded that were no significant differences in rates of retention between participants who were 'actively' recruited, whether by means of referral or targeting (n=29), and participants who were 'passively' recruited by means of volunteering or responding to adverts (n=97). The insignificant results may have been due to the low number of participants in the study and effect of active versus passive recruitment on retention remains inconclusive.

2.6.2 Retention in Dental Public Health Programmes

Smart Smiles, which was mentioned before in section 2.4, was an oral health programme delivered to children and their families in North Carolina, USA which aimed to improve access to dental services whilst decreasing the prevalence of dental caries in children aged three and under. After examining attendance patterns in the *Smart Smiles* programme, Rozier et al [2003] reported that of those patients who attended in the first quarter of 2001, only 24% of patients returned for a subsequent appointment later that year, whereas retention had increased to 41% in the corresponding quarter of 2002. The researchers attributed this increase in retention to: the on-going development of the programme which included high levels of funding allowing those delivering the programme to be compensated for the costs of delivering the interventions; increased levels of acceptance towards the oral health issues in North Carolina (which itself was equated to nationwide publications such as newspaper reports which reinforced locally held concerns); and an increase in the number of trained staff who could deliver the interventions to meet the increasing demand for the service.

A study by Olson et al [1981] of children in the USA who were identified at an initial assessment as requiring additional dental care, found that 53% of patients returned to receive the required treatment when additional reminders were provided, compared to the 12% who only received a standard letter. This demonstrated that additional communication which helps to maintain an on-going relationship between the dentist and the patient is one way of increasing retention in dental services [Davies et al, 1987].

2.6.3 Dental Attendance

A review by Reisine [1987] concluded that although studies have shown that there are high levels of dental caries worldwide, only a small fraction of the population will visit a dental practice on a regular basis. A survey of 3678 Australian adults to determine the link between socioeconomic status and dental attendance indicated that regular attendance with dental services increased the quality of life with regards to oral health [Sanders, Spencer and Slade, 2006]. This echoes previous findings by McGrath and Bedi [2001] and Richards and Ameen [2002] on the quality of life of British adults with regards to dental attendance.

In a report published in 2004 on the use of dental services in Scotland, it was reported that only 14% of dental patients had attended a dental practice at least once a year in the previous six years. In comparison, 35% of patients had only attended a dental practice once within the same time period [ISD Scotland, 2004].

According to Gift [1984], the factors that are associated with an individual's engagement with dental services can be grouped into four general categories: socio-demographics; attitudes and perceptions towards dentistry; the accessibility of dental services; and current health status.

2.6.3.1 Socio-demographics

Retention rates are higher amongst the most privileged within society whereas those from poorer socioeconomic circumstances are traditionally linked to poor retention [Donaldson et al, 2008]. This is supported in a 2006 study by Jamieson and Thomson. Of 600 surveys that were sent to households, 431 responses from adults in New Zealand were analysed to investigate inequalities in dental care. The study found that deprivation, whether based on the area deprivation score or the individual household socioeconomic score, had an slight correlation with dental attendance. Although it should be noted that this finding was not statistically significant ($p= 0.36$).

It has been suggested that retention rates are lower amongst minority groups [Milgrom et al, 1998]. Children from minority ethnic groups were twice as likely to irregularly attend a dental practice in comparison with those from majority ethnic groups. It was suggested that this was due to the most deprived groups in society, including minority ethnic groups, having with negative opinions of dentistry which

itself is linked with poor oral health [Riley, Gilbert and Heft, 2006]. A study of 238 Somali children aged between 4 and 14 living in a city in the United Kingdom reported that of those children whose mother spoke English, 57% had attended a dentist in the prior twelve months, compared with only 45% of children whose mother could not speak English. [Rodd, Davidson, Bateman and Lunn, 2002].

Adults who work in manual occupations, which is traditionally linked with lower socioeconomic status [Smith et al, 1998], were more likely to have only attended a dentist when requiring treatment when compared to those who work in non-manual occupations who are more likely to attend a dentist for frequent check-ups [Craft and Groucher,1980].

2.6.3.2 Attitudes and Perceptions of Dentistry

There is a large amount of evidence that supports the conclusion that a patients perception or fear of dentistry plays a substantial role in the retention rates of patients within dental services and that this extends to parents and carers fears influencing their child's attendance [Meng et al, 2007]. A survey of children in Norway identified fear as the most frequent for failing to keep an appointment [Skaret et al, 2000], although Shuller, Willumsen and Holst [2003], argue that there is no difference in engagement with dental services between groups on opposite ends of the fear scale. Parents with fear of dental services, which leads to a child being kept away or missing dental appointments, has been linked to an increase in the risk of early childhood caries [Wigen, Skaret and Wang, 2009]. A study in Jordan [Taani, 2002] of the correlation between fear and dental attendance found that the main reason for non-attendance was because 'treatment was not required' (42.2%) rather than anxiety. However a study in Australia [Armfield, Stewart and Spencer, 2007] found that patients with high levels only attended a dental appointment if they were suffering from oral pain. Thomson et al [1996] found that persons with high levels of fear were more likely to postpone or cancel treatment. Poor oral health, particularly among young adults, has been linked to fear of the dentist [Armfield et al, 2009], whilst females from lower socioeconomic groups are more likely to have higher levels of fear [Armfiel, Slade and Spencer, 2006].

2.6.3.3 Accessibility of Dental Services

Accessibility of dental services has an effect on the utilisation of dental services [Gibson, 2003]. Access to services can often be hindered by factors such as finance,

transport and current health status [Zittel-Palamara et al, 2005]. Traditionally, children living in a rural setting have poorer access to dental services than those who are living in an urban setting, which leads to a decreased utilisation of dental services [Vargas, Ronzio and Hayes, 2008]. Moles, Frost and Grundy [2001] analysed the population to dentist ratio in England and Wales using data from the 1991 census. The results showed that the ratio of population to dentist was higher in those areas with large numbers of persons under the age of 15. To improve the ratio of NHS dentists to population in Scotland, the Scottish government introduced salaried dental practitioners in areas of deprivation and rural settings as well as using mobile clinics [Newton, Williams and Bower, 2007]. Access to dental services is improved by the use of social workers, HVs and their equivalents. [Zittel-Palamara et al, 2005].

2.6.3.4 Current Health Status

A study on the influence of a person's health status in the previous twelve months with regards to dental attendance found that those with poor health, which is generally related to lower socioeconomic status, were the least likely to attend [Manski and Magder, 1998]. Patients who are pregnant, [Children's Dental Health Project, 2010], have 'special health care needs' [Butani, Gansky and Weintraub, 2009], smoke tobacco [Lopez and Baelum, 2007] or have other on-going health issues, are less likely to have regular visits with a dentist and will therefore have poorer oral health.

2.6.3.5 Other Factors and Trends

A random sample of 177 families in England was studied to compare the dental attendance of mothers and that of their children. It was reported that of the sample studied, 97% of children had attended a dental practice in the previous 12 months if their mothers had also attended within the time period. This was significantly higher than the figure of 64% for children whose mothers had not attended [Gratix, Taylor, Lennon, 1990]. They found that the odds of attendance are higher for children whose mother is currently attending a dental practice although the results also indicate that a child's dental attendance is not completely reflective of that of their mothers.

A recent study assessing the use of Short Message Service (SMS) to increase dental attendance was conducted in Scotland [Perry, 2011]. Dental attendance records were audited for 300 appointments across two dental practices. Half of the patients were sent a reminder of their appointment automatically by SMS using "Kodak R4" practice management software. The SMS contained details of the forthcoming appointment whilst also requesting that patients contact their dental practice if they were not going to be able to attend the appointment. Attendance was found to increase significantly when patients were sent a reminder by SMS with Perry concluding that due to the income lost by a practice when a patient failed to attend an appointment, this method was a cost-effective way of increasing attendance.

An audit of attendance at four dental practices in Lanarkshire that were participating in Childsmile Practice was undertaken by the Lanarkshire Dental Audit Committee. It investigated the factors that were linked to attendance at Childsmile appointments [Watters, 2010]. The results of the audit indicated that the number of appointments which were not kept were higher when the child was referred to the dental practice by a DHSW (29.7%) when compared to a direct referral from the dental practice (10.2%). When a telephone reminder was provided to the family from the dental practice around 90% of children referred by the dental practice attended the appointment, whereas 85% of those referred by the DHSW attended. While the number of children who were not provided with a reminder and were referred directly from the practice was too low for analysis, the number of appointments kept fell to 54% for those referred by a DHSW when no reminder was provided. The audit also reported that most of the children who were scheduled for an appointment were the first sibling from the family to be given a Childsmile Practice appointment and whilst there was not a substantial number of appointments scheduled which contained other siblings that had already attended Childsmile Practice, the failed to attend rates were low for this group. Whether or not the appointment was scheduled for the morning or the afternoon was not found to influence retention. This audit provides a good 'pilot' investigation into the attendance in Childsmile. However, there is a need to explore the issues that are related to retention of children in more detail.

2.6.4 Attendance Models

Andersen's model [Andersen and Newmen, 1973] is used to explain the key categories that are linked to engagement with dental services namely *"Predisposing ->Enabling ->Need ->Use"*, with each factor predicting the subsequent factor [Resine, 1987]. The predisposing factors are: (i) health attitudes, if it is known that the risk of a disease is high and treatment of it is effective then there will be a substantial uptake on the use of the service [Becker, Drachman and Kirscht, 1972]; (ii) social structure, a person's status within society accounting for social group, employment and level of education; and socio-demographic factors (including age, sex, race and education) [Andersen and Newman, 1973]. According to Andersen, the factors that are linked to enabling access to dental services can be divided into two overarching categories. These are being able to afford the cost of treatment and being able to access local dental services. The 'need factor' considers a person's own perception of their current state of health. Andersen concluded that the utilisation of oral health services would be lower than that of other health services due to the related diseases not being life-threatening and therefore it is the first two categories of his model that are most relevant to retention within dentistry. However, Hobdell [1995] argues that although there is a need for dental services in deprived communities, and sometimes even dental services available to meet this need, it remains a challenge to get those who do need the service to actually attend.

2.7 Summary of Literature Review

Dental caries, which is caused by acid produced as a by-product of a metabolism between sugar and bacteria, is a prevalent disease in children both worldwide and in Scotland [WHO, 2003] that lowers the quality of life of sufferers [Low, Tan and Schwartz, 1999]. Studies have shown that there is a link between deprivation and dental caries [Sweeney, Nugent and Pitts, 2010]. Data from oral health inspections of children in Scotland from 1987 until 2009 have identified a correlation between dental caries and deprivation status indicating that oral health inequalities exist in Scotland. Both oral health and the gap in absolute inequality have improved in recent years [McMahon et al, 2011].

Oral health interventions offer preventive treatment for dental caries. Interventions include attending a dentist on a regular basis where trained dental staff can provide the following: advice on (and demonstrate) techniques for regular toothbrushing and the use of fluoride toothpaste; offer tailored advice and support on nutrition and diet; apply fluoride varnish twice a year to children from the age of two [SIGN, 2005]. Interventions are best adapted to suit the needs of those requiring the service and a combination of interventions, rather than a single intervention, will provide the most positive results [Kay and Locker, 1998; Weintraub et al, 2006]. Childsmile is one such oral health programme that offers a range of oral health interventions to improve the oral health of children in Scotland. Although many public health programmes aim to reduce health inequalities, there is a risk that they may instead widen the inequalities if the service is taken up by those who least need it [Macintyre, 2007].

Families that reside in areas of deprivation are less likely to be retained on public health programmes [Ingoldsby, 2010]. Methods that have improved retention rates in general public health programmes have included: maintaining a positive and ongoing relationship with participants [Goncy, Roley and van Dulmen, 2009]; regular communication and multiple appointment reminders [Armisted et al, 2004]; financial compensation [Bruzzese et al, 2009]; and ensuring that the programme being delivered meets the perceived needs of the participants [Ingoldsby, 2010].

There is a substantial amount of literature that is concerned with retention in general public health programmes. However there is a shortage of literature available on retention within dental public programmes, particularity for children and infants. From the literature available, it was identified that the rates of retention are low in dental public health programmes although methods such as financial support to both the participant and the provider [Rozier et al, 2003], and additional communication including the use of SMS [Perry, 2011] have been shown to increase the retention rates.

Retention literature for both general and dental public health programmes for children was focused on short periods of retention of 1 year or less. There is a lack of research available on retention in longitudinal studies for longer periods of time e.g. being retained after two years [Ingoldsby, 2010].

Literature was available on the factors that were associated with general dental attendance. Accessibility of dental services, socioeconomic status, attitudes and perceptions of dentistry and current health status are the key factors that were identified as impacting on an individual's continued engagement with dental services [Gift, 1984].

There were no research papers available on children's dental attendance in Scotland although there was an audit of attendance at four dental practices delivering Childsmile that concluded children who were referred directly from the practice were less likely to fail to attend an appointment than those who were referred into the practice by a DHSW [Watters, 2010].

Chapter 3 – Research Aims and Objectives

3.1 Aims

This study has of two overarching aims. The first is to explore (a) patient factors, (b) dental practice profiles, and (c) the interaction between patient and dental practice factors, to identify those factors that were associated with continuous attendance in the Childsmile Practice Oral Health Programme with a view to producing a model that predicts children's retention in Childsmile.

The second aim is to create a prediction model that can be used for further analysis of attendance and retention patterns in future cohorts in Childsmile Practice, and can be adapted for additional development and research to benefit the Childsmile programme.

3.2 Hypotheses

Based on the findings of the literature review, the study will specifically be testing the following hypotheses:

That socioeconomic status (measured by area-based deprivation) assigned to both the patients and the location of the dental practices delivering Childsmile will have a significant influence on whether or not a child is retained in Childsmile.

Accessibility, defined by both the location of the dental practice delivering Childsmile and the location of the children in the programme will significantly impact on rates of retention.

Children whose parents have poor oral health will be less likely to be retained.

There are other factors in addition to deprivation, accessibility and the oral health status of the child's parent, including a combination of factors, which will predict retention.

3.3 Objectives

3.3.1 Research Questions

To review the data available from the Childsmile programme at the cut-off date of the study (January 2011) and to develop a database of individual Childsmile patient records to ask the following questions:

1. Are a patient's deprivation status and/or their accessibility to dental services (the two factors identified from the data available for analysis as being the key categories that effect an individual's engagement with dental services) the main determinants of retention of a Childsmile patient in a dental practice?

2. If deprivation or accessibility are not the main determinant of retention, what variables are the main determinants and are there combinations of variables that are associated with retention?

3. Do factors linked to the oral and general health of the parents or carers have any bearing on the participant's likelihood of retention?

4. What are the important patient factors that were associated with retention?

5. Do factors associated with the Childsmile dental practice delivering Childsmile influence retention?

6. To what extent do retention rates change over time?

7. To what extent do retention rates vary across health boards and Community Health Partnership areas?

8. Does dental health support worker input following patient's failure to attend appointments improve retention?

9. Are there any other factors not available for analysis that may be influencing retention?

The secondary aim is to create a model that can be used for future research on attendance and retention patterns in Childsmile.

1. Did the model produce outcomes amenable to change if implemented by Childsmile?

2. Did the model provide any potential research questions for future analysis?

3. Can the model be modified to support additional research and analysis linked to attendance and retention on Childsmile Practice?

Chapter 4 – Methods

4.1 Ethical Approval

Ethical approval for this research was encompassed by the University of Glasgow's Faculty of Medicine Ethics Committee as part of the overall Childsmile evaluation project entitled *Evaluation and development of Childsmile-the national oral health demonstration programme for Scotland* that was approved on 21 December 2009.

4.2 Funding

The expense required for this study was the purchase of a user's licence for the Statistical Analysis Software (SAS) that was paid for by the University of Glasgow Dental Public Health Unit. The data used in this study were provided at no additional cost by Childsmile as part of the continuing evaluation and research of Childsmile funded by the Scottish Government Health Department.

4.3 Study Population and Recruitment

From June 2006 until June 2009 Childsmile Practice ran exclusively in three Scottish health boards, Greater Glasgow & Clyde (GGC), Lanarkshire (LAN) and Ayrshire and Arran (A&A). The three health boards are in the West of Scotland and consist of both large rural and urban communities. The combined population of all three boards in 2009 was 2,128,401 with 18% being children [Scottish Neighbourhood Statistics, 2009]. SIMD 2009 reported that these three health boards had the largest proportions of their data-zones within the 15% most deprived data-zones (30% GGC, 20% LAN and 17% A&A). These health boards also have the greatest proportion of the 15% most deprived data-zones in Scotland with 68% (45% GGC, 13% LAN, and 10 A&A) [Scottish Government, 2009].

Between 1 July 2006 and 31 December 2009, health visitors (HVs) referred 22,684 (10,312 GGC, 9,433 LAN and 2,939 A&A) children born on or after 1st January 2005 to a Childsmile dental health support worker (DHSW). The majority of referrals (87%) were for children that resided in one of the three most deprived SIMD quintiles.

Between 01 July 2006 and 31 December 2009, 18,227 children born on or after 01 January 2005 were scheduled an initial appointment at a Childsmile dental practice: 7,202 in GGC; 6,948 in LAN; 2,832 in A&A; plus 678 from other health boards and 567 where the health board was unknown due to an incomplete, incorrect or missing postcode. Again, the majority of the children (80%) were known to live in one of the three most deprived SIMD quintiles.

Of the 18,277 patients who were scheduled an initial appointment with a Childsmile dental practice, 2,918 (46% GGC, 34% LAN and 14% A&A plus 2% from other health boards and 3% where the health board was unknown) never attend an initial appointment. Of these children, 87% were known to reside in one of the three most deprived quintiles. A total of 15,310 children (38% GGC, 39% LAN and 16% A&A plus 4% from other health boards and 3% where the health board was unknown) did attend an initial appointment with 79% of the children known to be residing in one from the three most deprived quintiles.

The study only analysed the Childsmile records of those patients who were known to reside in GGC, LAN or A&A health boards, as these were the only health boards that were active for the full duration of the initial demonstration phase. The 14,213 (2,627 GGC, 2,741 LAN and 1,290 A&A) children who attended their initial appointment and who resided in one of aforementioned health boards formed the cohort for the study, with 82% of the cohort residing in one of the three most deprived quintiles.

4.4 Outcome Variable

The outcome variable modelled was 'Retained Within 12 months'. This was defined as a patient who attended a first visit with a Childsmile Dental Practice between 01 July 2006 and 31 December 2009 and then had at least one kept appointment in the subsequent 12 months. For example, a patient who first attended in 01 July 2006 had until 01 July 2007 to attend a subsequent appointment to be classed as retained. Although it was possible for retention to have been analysed over a longer period of time, for example 24 months, if a patient does not attend a dental practice within 12 months, the financial reimbursements that the dental practice had been receiving for that child would cease as they were no longer deemed to be enrolled in the Childsmile Practice programme. By defining retention as attendance within 12 months of the first kept appointment, this creates consistency with the

methods that are already in use with regards to continuous attendance in Childsmile Practice. Moreover, the results over a 12 month retention period would operationally be more relevant for those providing Childsmile as this would allow Childsmile to attempt to recapture those children who have dropped out after 12 months. A period longer than 12 months would increase the risk of not being able to be recapture participants due to any change in personal details they may have since had.

4.5 Database Management

4.5.1 Description of Data Forms

Between 01 July 2006 and 31 December 2010, there were seven different data forms used to collect data relevant to Childsmile Practice: 'Health Visitor Caries Risk Assessment' (HVCRA) form,' Invitation to Childsmile' form, 'DHSW First Visit' form, 'Record of Child/Parent Contact' form, 'DHSW (Childsmile Practice)' form, 'DHSW Courtesy Visit' form and the 'GP17' form. The data to be collected differed on the 'Record of Child/Parent Contact' depending on the role of the person that was completing the form i.e. a dental health support worker (DHSW) or a dental nurse. The data that was collected on the 'HVCRA' form was limited after 01 July 2009. None of the forms were used for the full duration of this time period and in the case of the 'DHSW First Visit' form and the 'Record of Child/Parent Contact' form, part or all of the functions of these forms were replaced by the subsequent 'DHSW (Childsmile Practice)' and 'GP17' forms (See Figures 4-1 and 4-2). A full explanation of each form, any variation in data collected and an explanation of which functions were incorporated into other forms are detailed in sections 4.5.1.1 to 4.5.2.7.

Figure 4-1: Childsmile Data Form Gantt Chart

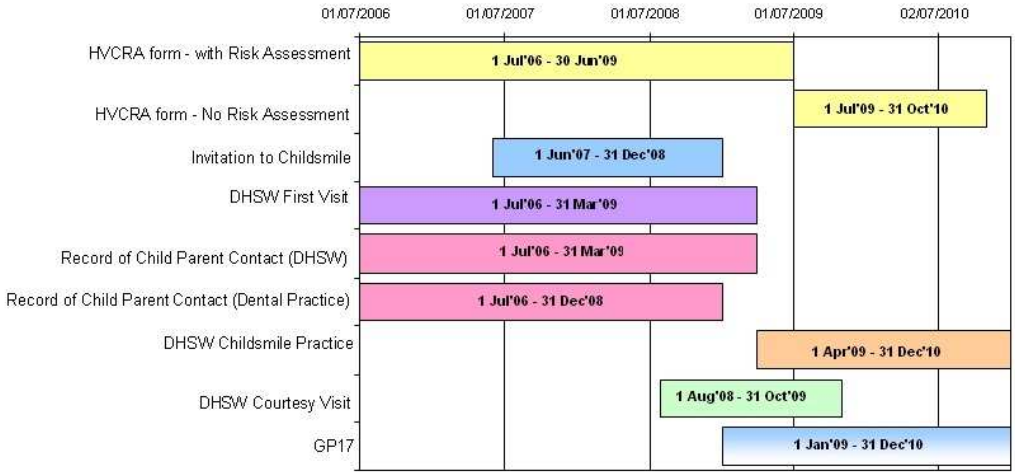
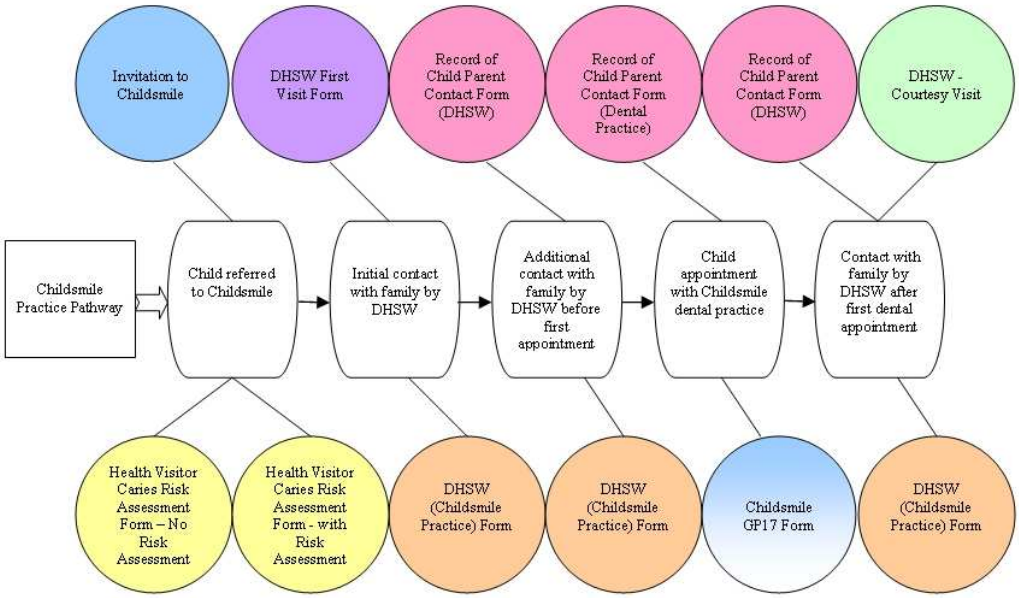


Figure 4-2: Childsmile Data Form Flowchart



4.5.1.1 Health Visitor Caries Risk Assessment Form (1 July 2006 - 31 October 2010)

This form was completed by a HV and used firstly as a tool to assess a child's risk of dental caries and secondly to refer a child, if required, to a DHSW. The form includes four caries risk indicators: the child lives in an area of high deprivation; someone in the household smokes; the reason for the parent/carer's last dental visit was to obtain relief of pain; after considering all other known caries risk factors, this child may be more likely to get tooth decay. The 'child is not exclusively breastfed' was initially used as a fifth indicator but this was withdrawn from the HVCRA form early in the process and is not included in this study. If any one of the four indicators identified that a child was at risk of dental caries, the forms guidelines specified that the child was be invited into the Childsmile programme, however the parent/carer could decline the invitation. If there were no risks identified, the parent could still request an invitation into the Childsmile programme. From July 2009, all children visited by a HV were to be referred into Childsmile Practice and only those children judged by the HV to require additional support prior to engagement with dental services were referred to a DHSW. The caries risk indicators were no longer recorded and the primary purpose of the form became to communicate to the DHSWs those families referred to them by the HV for additional support.

4.5.1.2 Dental Health Support Worker – First Visit Form (1 July 2006 – 31 March 2009)

After the initial referral from the HV, this form was used to record the first contact made between a DHSW and the child. The primary purpose of this form was to record the facilitation of a child with a Childsmile dental practice appointment. A family could opt out of Childsmile at this stage and the reason for not wanting to participate would be recorded. The data from this form were not available to use for this study. This form was completed by the DHSW that contacted the child.

4.5.1.3 Invitation to Childsmile Form (1 June 2007 – 31 December 2008)

This form was completed by the Childsmile dental practice when a child was referred directly into Childsmile Practice by a dental care practitioner (DCP) and included five questions to identify if a child had an increased risk of developing dental caries (see appendix 4). The data from the form was not available to use for this study.

4.5.1.4 Record of Child/Parent Contact Form (1 July 2006 – 31 March 2009)

This purpose of this form was to record all further Childsmile activity that a child had after the initial DHSW contact. These contacts could either have been with a DHSW at the family home or at a clinic, or alternatively, with a Childsmile trained DCP at a Childsmile dental practice appointment. These forms recorded both the kept and failed appointments as well as any oral health interventions that were delivered at the appointment. If a child failed to attend a Childsmile dental appointment, the form could be used to refer the child back to the DHSW. Between January and March of 2009, this form was only used to record DHSW appointments. This form was completed by either the DHSW or by dental practice staff depending on the setting of the contact.

4.5.1.5 DHSW (Childsmile Practice) Form (1 April – 31 Dec 2010)

Completed by a DHSW, this form collated the DHSW contact elements of the 'Dental Health Support Worker – First Visit' form and the 'Record of Child/Parent Contact' form meaning that all DHSW contacts were recorded on a single form. The form recorded the facilitation of a child with a Childsmile dental practice appointment as well as any oral health interventions that were delivered by the DHSW at the contact. A family could opt out of Childsmile at this stage and the reason for not wanting to participate was recorded.

4.5.1.6 GP17 Form (1 Jan 2009 – 31 December 2010)

Completed by staff in dental practices, the 'GP17' form had historically been used to record non-Childsmile dental activity in dental services throughout Scotland. From January 2009, the 'GP17' was also used to record all Childsmile activity within dental services, thus replacing this element that was previously recorded on the 'Record of Child/Parent Contact' form. Both kept and non-kept appointments were recorded. Childsmile activity was recorded by entering a Childsmile fee claim code for each of the three Childsmile interventions (dietary advice, tooth-brushing and fluoride advice and fluoride varnish application) that was delivered as well as a code to record appointments that the patient did not attend.

4.5.1.7 DHSW Courtesy Visit Form (1 August 2008 – 31 October 2009)

The 'DHSW Courtesy Visit' Form was used by the DHSW when they contacted a family after their initial appointment with a Childsmile Dental Practice. The form recorded the answers to the questions that were asked by the DHSW about the family's experience at their first Childsmile Practice appointment as well as whether or not a second appointment to the dental practice had been scheduled. This form ceased to be used in October 2009 and the data from these forms were not available for use in this study.

4.5.2 Data Entry and Quality

4.5.2.1 Available Data

The only data that were available for this study were from the 'HVCRA', 'Record of Child Patient Contact', 'DHSW (Childsmile Practice)' and the 'GP17' forms. At the time of this study, data from the other aforementioned forms had not yet been entered by the Childsmile Central Evaluation Research Team (CERT) which was responsible for the data entry of all Childsmile forms except the 'GP17' forms. The 'GP17' forms were entered by Practitioner Services Division (PSD) which is a division of National Services Scotland (NSS).

4.5.2.2 Data Entry

The forms that were collected by CERT were entered onto Microsoft Access Databases with each type of form having a separate database. Each individual form generated a new record; if there were more than one of a specific type of form for a patient, each subsequent form resulted in an additional record being produced

for the patient. These databases were available for extraction as a Microsoft Excel spread-sheet with each row representing one record.

The ‘GP17’ forms were scanned by PSD into the Management Information and Dental Accounting System and those records that contained Childsmile claims were extracted into a Microsoft Excel spreadsheet. Each individual claim was on a separate row. Therefore, if there were two or more Childsmile claims on an individual form that would result in two or more rows of data for a child dependant on the number of claims made for that appointment.

4.5.2.3 Data Quality

The data that were received by CERT for data entry were first checked for any missing or incorrect data. The persons responsible for completing the forms (HV, DHSW or dental practice staff) were contacted if there were any data errors and the corrected data were then entered onto the database.

Data entered by CERT was subjected to a 10% random check to ensure data entry accuracy. Around 1% of forms were found to have an inaccuracy when entered onto the database although in most cases, this was accounted for by spelling mistakes of the patients name and address which has no bearing on this study.

4.5.2.4 CHI Number

The Community Health Index number (CHI) is a unique ten-digit identification number assigned to each NHS patient in Scotland. The first six digits are generated by the child’s date of birth with four additional numbers added. The ninth digit indicates the sex of the patient [NHS Greater Glasgow and Clyde, 2011].

All forms except the GP17 were to have the CHI number entered at the time of completion. If the CHI was missing or incorrect, CERT would use a CHI lookup database provided by NHS Scotland to ascertain the correct CHI number. The ‘GP17’ forms that were scanned by PSD were assigned a CHI number by the Information Services Division (ISD) of NSS who linked each record, using the child’s name, date of birth and postcode, with the CHI lookup database.

The CHI number was used to link the various forms used in this study so that as accurate as possible record of each patient's Childsmile Practice history could be analysed.

Of the data available, 2% of 'Records Child/Parent Contact' forms, 1% of 'HVCRA' forms, less than 1% of 'DHSW (Childsmile Practice)' forms, and 5% of 'GP17' claims could not be assigned a CHI number. As the CHI number was necessary to link the data in the study, all records without a CHI number were excluded from the study. Therefore the full Childsmile Practice record may not have been accurate for every child. This also meant that there was a small possibility that a child classed as not being retained may actually have been retained. However due to the large number of patients involved in the study, this will not have made a significant impact.

4.5.2.5 Scottish Index of Multiple Deprivation

A look-up file provided by ISD allowed each patient and dental practice with a valid postcode to be matched to their corresponding SIMD quintile score. As well as assigning a SIMD score, the lookup file allowed the health board, Community Care Partnership (CHP), data-zone and urban/rural classification of both the patient and dental practice location to be determined.

The SIMD score is an area level deprivation scored calculated using seven indicators of deprivation [ISD Scotland, 2010a]. These are: the number of persons living within an area receiving financial support from the government; the number of persons that are currently unemployed or unable to work; if an area had lower than expected health levels or death rates; the range of educational qualifications in the area; the cost, time and difficulty of accessing standard services such as public transport; the level of crime reported in an area; and the quality of housing. [Scottish Government, 2009].

All of the dental practice postcodes and 96% of the patient postcodes were valid and were therefore assigned a SIMD score.

4.5.2.6 Childsmile Dental Practice Payments

Dental practices are paid for participating in Childsmile. From the inception of Childsmile in 2006 until it joined the Statement of Dental Remuneration (SDR) (the standard method of NHS dental payments in Scotland) in October 2011, payments

to dental practices for Childsmile Practice activity were calculated and paid separately from any claims made via the SDR. Prior to joining the SDR, Childsmile had two separate payment systems (Appendix 1).There are two notable changes to the Childsmile payment system; In the first payment system (July 2006 until December 2008), dental practices were paid a higher fee for enrolling older children in Childsmile. This payment changed in the second system introduced in January 2009. Practices were paid the same fee for each child regardless of their age. However under the new system, dental practices were paid an additional fee if the child lived in one of the three most deprived SIMD quintiles. The second notable change was that during the first system, dental practices would continue to receive an enrolment fee after a child had attended their first Childsmile Practice appointment regardless of whether or not the child returned for a subsequent appointment. From 2009 onwards, a child must attend a Childsmile Practice appointment at least once every 12 months for the dental practice to continue receiving an enrolment fee. As well as being paid for fluoride varnish applications (FVAs), a maximum of two per year per child, dental practices were also paid a fee in their first year of delivering Childsmile although this was dependant on their level of Childsmile activity.

4.6 Database Assembly

All data linkage was completed using SAS version 9.2 software (www.sas.com). Each individual dataset was uploaded into the software. A computer programme was then written to link each of the datasets together. To complete the linkage, each data set had to be made compatible for linkage with the other data sets. This was done by ensuring similar variables were in the same format, particularly in the case of data from the 'Record of Child/Parent Contact' and 'GP17' forms where similar data were collected at different periods and in differing formats. After the data to be used in the study were made compatible, the data were then linked using the CHI number. The multiple rows of data for each individual child were transposed so that there was only one row of data per child. The variables in the data were then manipulated using the SAS software so that the covariates required for the study were available for analysis.

4.7 Database Covariates

The following covariates will be explanatory variables suitable for examination as possible predictors of retention. The covariates are grouped into three groups that best characterise the variables. These are: ‘Practice Profile’, ‘Practice Interaction’ and ‘Patient Profile’.

4.7.1 Practice Profile

The six covariates in this group were grouped together as they provided information on the practices delivering Childsmile. These were analysed to determine what characteristics of the practices attended by the patients significantly influenced retention.

Unless stated otherwise, data for covariates in this group were from the ‘Record of Child/Parent Contact’ and ‘GP17’ forms.

4.7.1.1 Type of Dental Practice

This variable has two levels: non-salaried General Dental Service (GDS) and salaried GDS/Community Dental Service (CDS). A non-salaried GDS, commonly referred to as a ‘High Street dentist’, is an independent dental practice offering dental treatment as part of the NHS with dentists receiving an individual fee for every treatment it delivers. A salaried GDS offers a similar service as a non-salaried GDS except that salaried GDS services are tailored towards the needs of the local community. A salaried dental practice does not receive a fee for each treatment they deliver [ISD Scotland, 2010b]. A salaried CDS provides a similar tailored service as a salaried GDS except this service is targeted towards those that cannot access a GDS service i.e. those with disabilities or living in an area with an insufficient number of GDS practices [ISD Scotland, 2010c]. Salaried dental service clinics can be based at a permanent location or can be mobile, particularly in rural areas [Levin et al, 2010].

As there were a low number of salaried GDS and CDS practices and because unlike non-salaried services there was no additional financial incentive for providing Childsmile treatments, both types of practices were combined for the analysis. Every child in the study was assigned to a practice within one of these categories.

4.7.1.2 Practice Start Date

The practice start date was calculated as the year that a dental practice first recorded Childsmile activity. Every child in the study was assigned to a practice with a known start date.

4.7.1.3 Practice SIMD

Practice SIMD is the score assigned to a dental practice location based on its postcode. The SIMD score is ranked 1 to 5 with 1 being the most deprived and 5 being the least deprived. The SIMD score was available for all the practices in the study.

4.7.1.4 SIMD Profile of Childsmile Patients Attending a Practice

The SIMD profile of Childsmile patients attending a practice was calculated as the average SIMD score of all the children who had attended at least one Childsmile Practice appointment at that practice. The SIMD score of the child was based on the postcode of their residence. Due to low numbers of children who attended a practice with a SIMD profile of 4 or 5, these two least deprived levels were pooled together. Although the number of children in this pooled level remained low, it was not pooled with those attending a dental practice with a SIMD profile of 3 as Childsmile Practice was targeted at children living within one of the three most deprived quintiles and therefore SIMD 4 and 5 were outwith the target group and were therefore not suitable to be pooled with SIMD 3. A SIMD profile was generated for every dental practice.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form with the SIMD lookup file.

4.7.1.5 Urban/Rural Classification of Practice

This indicates the Urban/Rural Classification of a dental practice's location based on its postcode. These are six classifications with 'Large Urban Area' being the least remote and 'Remote Rural' being the most remote. There were low numbers in the 'Accessible Small Towns' and the 'Urban Small Towns' classifications so these were pooled to create the category 'Small Towns' as were 'Accessible Rural' and 'Remote Rural' which were also pooled to create the category 'Rural'. In both new categories, the majority of children attended a dental practice that was

accessible rather than remote. An urban/rural classification was assigned to each dental practice.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form with the SIMD lookup file.

4.7.1.6 Total Number of Childsmile Patients in Practice

This was calculated as the total number of unique children that were provided with Childsmile Practice interventions at least once at a specific dental practice. The total number of individual children that had attended at least once was assigned to every dental practice in the study.

4.7.2 Practice Interaction

These ten covariates were grouped together as they described the interactions between the participants and the dental practices. These covariates were analysed to determine if the interactions between the participants and the practices significantly influenced retention.

Unless stated otherwise, data for covariates in this group were from the 'Record of Child/Parent Contact' and 'GP17' forms.

4.7.2.1 Fluoride Varnish Application at First Kept Appointment

This covariate indicates whether or not a child received a FVA when they attended their first Childsmile appointment. As dental practices were eligible to claim a fee for a FVA, it would be expected that the number of FVAs recorded would be highly accurate.

4.7.2.2 Supplementary Contact

Although Childsmile Practice is normally delivered by a trained Childsmile dental nurse, there may be instances where the patient also received supplementary contact with either a dentist or dental hygienist. This data were only collected on the 'Record of Child/Parent Contact' form and therefore it is unknown whether or not a child received supplementary contact with a dentist or dental hygienist once Childsmile dental practice data were recorded on the 'GP17' form. Because of this, it was unknown for the majority of Childsmile appointments if supplementary contact was provided.

4.7.2.3 Toothbrushing Advice Given at First Kept Appointment

This covariate indicates whether or not a child was given toothbrushing and fluoride advice when they attended their first Childsmile appointment. Whilst this intervention was to be delivered at all first appointments (unlike FVAs), there was no financial incentive to record this intervention and it is therefore possible that practices did not claim for this intervention.

4.7.2.4 Dietary Advice Given at First Kept Appointment

This covariate indicates if a child was given dietary advice when they attended their first Childsmile appointment. Whilst this intervention should be delivered at all first appointments (unlike FVAs), there was no financial incentive to record this intervention and it is therefore possible that practices did not claim for this intervention, although as this intervention was recorded in 93% of cases it would indicate that the data for this covariate is highly accurate.

4.7.2.5 Year of First Appointment

The year of the first appointment was the year Childsmile dental practice activity was first recorded for an individual child, regardless of whether or not the appointment was kept or not. If the appointment was kept, it would initiate the first instalment of an annual fee being paid to the dental practice for the child. Therefore it would be expected that this covariate would be highly accurate. It is possible however that a practice may not have completed a form if the first appointment was not attended as this would not have generated a payment for them.

4.7.2.6 Year of First Kept Appointment

The year of the first kept appointment was the year that an individual child first attended a Childsmile appointment. As the payment of an annual fee to the dental practice is initiated when a patient first attends a Childsmile appointment, it would be expected that this covariate would be highly accurate.

4.7.2.7 Result of First Scheduled Appointment

This is the result of the first recorded Childsmile appointment at a Dental Practice. The result is either that the child attended their first Childsmile appointment or that they FTA it. Due to the financial incentive for a dental practice to indicate that a child attended their first scheduled appointment it would be expected that

this covariate would be accurate although is it possible that a practice may not have completed a form is the first appointment was not attended as this would not generate a fee.

4.7.2.8 Result of Last Scheduled Appointment

This is the result of the last recorded Childsmile appointment at a Dental Practice. The result is either that the child attended their last scheduled Childsmile appointment or that they FTA it. From 2009 onwards, a child must have attended an appointment at least once within a twelve month period for the dental practice to continue receiving an annual fee. This therefore provided a financial incentive to record all kept appointments. As there was no financial incentive to record a FTA it is possible that practices did not always complete a form for these appointments.

4.7.2.9 Year of first appointment (Outcome 'Failed to Attend')

This is the year of a child's first appointment that resulted in a FTA. As a FTA appointment has no financial bearing for a dental practice, there is a possibility that some FTAs were not recorded. As there were low number of patients whose first FTA appointment was in the early years of Childsmile, data from 2006 and 2007 were pooled as one category for the analysis.

4.7.2.10 Data-zone (Child Versus Practice)

This covariate indicates whether or not a child lives within the same data-zone as the dental practice that they attended. A data-zone is a geographical area that consists of between 500 to 1000 persons which represents local boundaries and neighbourhoods based on the 2001 Census [Scottish Government, 2005]. The data-zone was known for each child and practice in this study.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form with the SIMD lookup file.

4.7.3 Patient Profile

These eighteen covariates were grouped together as they provided information on the individual children that are being analysed in this study. These covariates were analysed to determine if the characteristics of the patients had a significant influence on retention in Childsmile Practice.

Unless stated otherwise, data for covariates in this group were from the ‘Record of Child/Parent Contact’ and ‘GP17’ forms.

4.7.3.1 Age at First Appointment

This covariate determines the age of the child at their first scheduled Childsmile appointment regardless of whether the appointment was kept or not. If the appointment was kept, it would initiate an annual fee being paid to the dental practice for the child. It is therefore expected that this covariate would be highly accurate although is it possible that a practice may not have completed a form if the first appointment was not kept as this would not generate a fee.

4.7.3.2 Age at First Kept Appointment

The age at the first kept appointment was the age that an individual child first attended a Childsmile appointment. As the payment of an annual fee to the dental practice is initiated when a patient first attends a Childsmile appointment, it would be expected that this covariate would be highly accurate.

4.7.3.3 Sex

This covariate indicates the gender of the child. As the gender was indicated by the CHI number and only records with valid CHI numbers were analysed in this study, the correct sex was known for every child in the study.

Data for this covariate were available from the Record of Child/Parent Contact form and the GP17 form.

4.7.3.4 Year of Birth

This covariate indicates the year that each child in the study was born. As the year of birth was indicated by the CHI number and only records with valid CHI numbers were analysed in this study, the correct year of birth was known for each child in the study. Due to low numbers of children in Childsmile Practice that were born in 2005, this category was pooled with those children who were born in 2006.

4.7.3.5 Age at First Failed to Attend Appointment

This was the age that a child had their first recorded FTA appointment. As a FTA appointment has no financial bearing for a dental practice, there is a possibility that some data corresponding to FTAs were missing.

4.7.3.6 SIMD of Patient

The SIMD score assigned to the each child was based on the postcode of their regular place of residence. The SIMD score is ranked 1 to 5 with 1 being the most deprived and 5 being the least deprived. An SIMD score was available for all children in the study.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the SIMD lookup file.

4.7.3.7 Urban/Rural Classification of Patient

This indicates the Urban/Rural Classification of the participant's regular place of residence. These are six classifications with 'Large Urban Area' being the least remote and 'Remote Rural' being the most remote. There were low numbers of children within the 'Accessible Small Towns' and the 'Urban Small Towns' categories so these were pooled to create the category 'Small Towns'. 'Accessible Rural' and 'Remote Rural' were also pooled to create the category 'Rural'. In both of these new categories, the majority of children's regular place of residence was previously classed as accessible rather than remote. The urban/rural classification of the place of residence was assigned to each child in the study.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the SIMD lookup file.

4.7.3.8 Age of Mother

This covariate is the age of the mother when their child was initially visited by a HV and a HVCRA form completed. Where available, the age of mother is accurate, although for the majority of children in the study, the age of the mother was unknown. Note that the age of the mother was expected to be connected with the child's SIMD score.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.9 Caries Risk Assessment: Deprived

This covariate indicates whether or not a child was assessed as living in the most deprived SIMD quintile when assessed by a HV completing a caries risk assessment (CRA). The majority of children in the study did not receive a CRA .

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.10 Caries Risk Assessment: Smoker

This covariate indicates whether or not a child was assessed as residing in a household with a smoker when assessed by a HV completing a CRA.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.11 Caries Risk Assessment: Pain

This covariate indicates whether or not the child's parent's/carer's last visit to a dental practice was to receive dental treatment for pain relief prior to being assessed by a HV when completing a CRA.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.12 Caries Risk Assessment: Decay Likely

This covariate indicates whether or not the participants in this study were deemed by a HV when completing a CRA as being at an increased risk of dental caries after all other known risk-factors had been considered.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.13 Caries Risk Assessment: Risk Total

This covariate indicates the total number of caries risk factors identified for each child with given a CRA by a HV.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.14 Health Visitor Referral

This covariate indicates whether or not a child was referred to Childsmile by a HV. The number of children referred to Childsmile via a HV should be accurate due to the high number of HVCRA forms completed.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the HVCRA form.

4.7.3.15 Dental Health Support Worker Contact

This covariate indicates whether or not a child had contact with a DHSW after the child's initial dental appointment regardless of the result of the appointment. DHSWs are employed by Childsmile and the recording of this information is part of their job specification and it is therefore expected that the number of known contacts by DHSWs should be highly accurate.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the DHSW (Childsmile Practice) form.

4.7.3.16 Dental Health Support Worker Contact after 'Failed to Attend'

This covariate indicates whether or not a child had contact with a DHSW after the child had FTA an appointment, after having already attended an initial appointment with Childsmile.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form to the DHSW (Childsmile Practice) form.

4.7.3.17 Health Board

The health board assigned to the each child was based on the postcode of their regular place of residence. A health board was assigned to every child in the study.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form with the SIMD lookup file.

4.7.3.18 Community Health Partnership

The Community Health Partnership (CHP) are smaller local bodies within health boards that direct local health services to best suit the needs of their local community [Community Health Partnerships, 2010]. A CHP was assigned to every child based on the postcode of their regular place of residence.

Data for this covariate were available by linking the Record of Child/Parent Contact form and the GP17 form with the SIMD lookup file.

4.8 Statistical Analysis

4.8.1 Variable Tabulation

Each variable was tabulated into categories, with the percentage of retentions given for each category. Continuous variables were be split into five categories as partitioned by the quintiles when possible, or alternatively into any commonly used or a-priori categories that were considered to be sensible.

4.8.2 Univariate Analysis

Each variable was analysed univariately by logistic regression. Odds-ratios were calculated using suitable referent categories. Wald p-values and 95% confidence intervals were given for each odds-ratio. Likelihood ratio test p-values were created for each variable as a whole (ie using multiple degress of freedom for each odds-ratio within the variable). The predictive ability of each variable was calculated using the "c-index". These results are labelled ‘type 3 results’ in the tables in chapter 5. Only variables that were univariately significant at the 5% level were considered for further use in the models.

4.8.3 Prediction Models

A prediction model was created by using both a forward and a backward stepwise selection algorithm in logistic regression for each of the three groups. At the outset of the forward stepwise selection algorithm, there were no variables in the model. Variables were added in sequence with the most significant added first to the model. The remaining variables were then considered for inclusion with the variable that best increased the predictability of the model added next. This

process was repeated until no further variables could be added to the model to increase its predictability. At the onset of the backward stepwise selection algorithm, every variable was already within the model and they were then removed in sequence with the variable with the least significant impact of the model removed first. This was repeated until no further variables could be removed from the model without significantly altering its predictability [Cordell & Clayton 2001]. As both a forward and backward fitting algorithm was performed for each group, the method that produced the least number of variables that were found to be independently significant of the other variables in their relevant group was preferred. The 'winning candidates' from each group were then collated into another group where a further forward and backward fitting algorithm was performed on these variables to create a further model. A similar exercise had been performed by Wilford et al [2008] when creating a prediction model to assess if employees would return to work after being absent for sickness.

As the 'winning candidates' model that was generated contained a high number of variables, an additional model was produced only using the univariately significant variables that the Childsmile programme could potentially have an influence on with regards to improving retention within Childsmile Practice. Only the most significant of the 'age' variables (Age at First Kept Appointment) was put forward for this model. Variables in this model were also the most complete and accurate of all the univariately significant variables that were available for this study.

The models were assessed by the c-index and a Receiver Operating Characteristic (ROC) plot. The c-index is equal to the area under the curve of the ROC plot, a term that comes from the operational research field and is used in the analysis of diagnostic tests in medicine. Note that a variable with no predictive ability has a c-index of 0.5. The maximum c-index is 1.00 which indicates perfect discrimination. [Harrell et al, 1984; Hosmer and Lemeshow, 1989; Altman and Bland, 1995].

A logistic regression model regresses the 'logit' of the probability of retention, i.e. log(P(retention)/(1-P(retention)). This can be inverted to work out the probability of retention for each child in the dataset, i.e. p(retention) $=1/(1+e^{X\beta})$, where Xβ is the sum of the parameter estimates for each variable in the Childsmile Model. Once the probability of retention was calculated for each child, a histogram of the retention probabilities was produced, as was as a boxplot comparing the estimated

probability of retention for those children who were actually retained against those who were not.

Chapter 5 – Results

5.1 Outcome Variable

Table 5-1 demonstrates that under half of the children who first attended a Childsmile Practice appointment between 2006 and 2009 attended a subsequent Childsmile Practice in the twelve months following their initial appointment.

Table 5-1 Frequency of the outcome variable 'Retained Within 12 Months' (July 2006-December 2010)

Total Number of Children in Programme	14213	
Retained Within 12 Months	6658	(47%)

5.2 Variable Descriptions

Table 5-2 describes the frequency of the categories within each variable prior to the pooling of the smaller categories and the subsequent analysis.

Table 5.2 Frequency of categories within each variable analysed

Variable	Numbers	(%)
Type of Dental Practice		
Non-Salaried GDS	12778	(90%)
Salaried GDS/CDS	1435	(10%)
Practice Start Date		
2006	7558	(53%)
2007	3946	(28%)
2008	1194	(8%)
2009	1515	(11%)
Practice SIMD		
1 (most deprived)	6980	(49%)
2	4285	(30%)
3	1527	(11%)
4	897	(6%)
5 (least deprived)	524	(4%)
SIMD Profile of Childsmile Patients Attending a Practice		
1 (most deprived)	1828	(13%)
2	7503	(53%)
3	4710	(33%)
4	171	(1%)
5 (least deprived)	1	(<1%)

Table 5-2 Continued

Variable	Numbers	(%)
Urban/Rural Classification of Practice		
Large Urban Area	8147	(57%)
Other Urban Area	4655	(33%)
Accessible Small Towns	1290	(9%)
Remote Small Towns	0	(0%)
Accessible Rural	78	(<1%)
Remote Rural	43	(<1%)
Total Number of Childsmile Patients in Practice		
< 101 Patients	5131	(36%)
101-200 Patients	4742	(33%)
201-300 Patients	2738	(19%)
> 300 Patients	1602	(11%)
Fluoride Varnish Application at First Kept Appointment		
Yes	1082	(8%)
No	13131	(92%)
Supplementary Contact		
Contact	908	(6%)
No Contact	6171	(43%)
Unknown	7134	(50%)
Toothbrushing Advice given at First Kept Appointment		
Yes	12132	(85%)
No	2081	(15%)
Dietary Advice Given at First Kept Appointment		
Yes	13251	(93%)
No	962	(7%)
Year of First Appointment		
2006	562	(4%)
2007	2886	(20%)
2008	3705	(26%)
2009	7060	(50%)
Year of First Kept Appointment		
2006	520	(4%)
2007	2819	(20%)
2008	3685	(26%)
2009	7189	(51%)
Result of First Scheduled Appointment		
Attended	13051	(92%)
FTA	1162	(8%)

Table 5-2 Continued

Variable	Numbers	(%)
Result of Last Scheduled Appointment		
Attended	12048	(85%)
FTA	2165	(15%)
Year of first appointment (Outcome 'Failed to Attend')		
2006	85	(<1%)
2007	384	(3%)
2008	386	(3%)
2009	307	(2%)
No FTA	13051	(92%)
Data-zone (Child Versus Practice)		
In Data-zone	5381	(38%)
Not in Data-zone	8832	(62 %)
Age at First Appointment		
< 6 months	5951	(42%)
6-11 months	3539	(25%)
12-23 months	2246	(16%)
24-35 months	1259	(9%)
> 35 months	1218	(9%)
Age at First Kept Appointment		
< 6 months	5749	(40%)
6-11 months	3680	(26%)
12-23 months	2365	(17%)
24-35 months	1297	(9%)
> 35 months	1122	(8%)
Sex		
Male	7366	(52%)
Female	6847	(48%)
Year of Birth		
2006	3908	(27%)
2007	4394	(31%)
2008	3932	(28%)
2009	1979	(14%)
Age at First Failed to Attend Appointment		
< 6 months	859	(6%)
6-11 months	1081	(8%)
12-23 months	1325	(9%)
24-35 months	546	(4%)
> 35 months	238	(2%)
No FTA	10164	(72%)

Table 5-2 Continued

Variable	Numbers	(%)
SIMD of Patient		
1 (most deprived)	6377	(45%)
2	3284	(23%)
3	2051	(14%)
4	1545	(11%)
5 (least deprived)	956	(7%)
Urban/Rural Classification of Patient		
Large Urban Area	7766	(55%)
Other Urban Area	4048	(28%)
Accessible Small Towns	1247	(9%)
Remote Small Towns	4	(<1%)
Accessible Rural	1088	(8%)
Remote Rural	60	(<1%)
Age of Mother		
21	942	(7%)
21-25	1794	(13%)
26-30	1970	(14%)
31-35	1482	(10%)
> 35	829	(6%)
Unknown	7196	(51%)
Caries Risk Assessment: Deprived		
Yes	5301	(37%)
No	1310	(9%)
No CRA	7602	(53%)
Caries Risk Assessment: Smoker		
Yes	3026	(21%)
No	3585	(25%)
No CRA	7602	(53%)
Caries Risk Assessment: Pain		
Yes	1742	(12%)
No	4869	(34%)
No CRA	7602	(53%)
Caries Risk Assessment: Decay Likely		
Yes	3542	(25%)
No	3069	(22%)
No CRA	7602	(53%)

Table 5-2 Continued

Variable	Numbers	(%)
Caries Risk Assessment: Risk Total		
1 (least risks)	2453	(17%)
2	1967	(14%)
3	1540	(11%)
4 (total risks)	651	(5%)
No CRA (risks unknown)	7602	(53%)
Health Visitor Referral		
Yes	6695	(47%)
No	7518	(53%)
Dental Health Support Worker Contact		
Yes	427	(3%)
No	13786	(97%)
Dental Health Support Worker contact after 'Failed to Attend'		
Yes	123	(1%)
No	3926	(28%)
No FTA	10164	(72%)
Health Board		
Lanarkshire	5943	(42%)
Greater Glasgow & Clyde	5862	(41%)
Ayrshire & Arran	2408	(17%)
Community Health Partnership		
North Lanarkshire	3768	(27%)
South Lanarkshire	2384	(17%)
East Glasgow	1112	(8%)
East Ayrshire	1027	(7%)
North Glasgow	1020	(7%)
North Ayrshire	964	(7%)
South West Glasgow	920	(6%)
Inverclyde	780	(5%)
South East Glasgow	692	(5%)
Renfrewshire	646	(5%)
South Ayrshire	417	(3%)
West Glasgow	268	(2%)
Other	215	(2%)

5.3 Univariate Logistic Analysis of Factors Related to Retention

All the variables in 5.2 are described in turn in sections 5.3.1 to 5.3.34 after they were univariately analysed.

5.3.1 Univariate Logistic Regression of 'Type of Dental Practice'

The variable 'Type of Dental Practice' has two levels: 'Non-Salaried GDS' and 'Salaried GDS/CDS'. Those that attended a 'Non-Salaried GDS' practice were the referent level in this analysis.

Table 5-3 Univariate Logistic Regression of 'Type of Dental Practice' in Relation to Retention

Type of Dental Practice	Retained	Not Retained	Total
Non-Salaried GDS	6016 (47%)	6762 (53%)	12778
Salaried GDS/CDS	642 (45%)	793 (55%)	1435
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	2.85	1	0.092	0.50

Type of Dental Practice	OR	95% CI	p-value
Non-Salaried GDS	-	Referent	
Salaried GDS/CDS	0.91	(0.82, 1.02)	0.093

As the p value in the logistic regression is 0.092, the variable 'Type of Dental Practice' is not significant in this analysis of retention although the percentage of children retained is slightly higher for those who attended a non-salaried GDS practice.

5.3.2 Univariate Logistic Regression of 'Practice Start Date'

The variable 'Practice Start Date' has four levels: '2006', '2007', '2008' and '2009'. Those that attended a practice that started in 2006 were the referent level in this analysis.

Table 5-4 Univariate Logistic Regression of 'Practice Start Date' in Relation to Retention

Practice Start Date	Retained	Not Retained	Total
2006	3720 (49%)	3838 (51%)	7558
2007	1657 (42%)	2289 (58%)	3946
2008	509 (43%)	685 (57%)	1194
2009	772 (51%)	743 (49%)	1515
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results

Type 3 Results:	Chi-Square	Df	p-value	C-index
	73.45	3	<0.001	0.54

Practice Start Date	OR	95% CI	p-value
2006	-	Referent	
2007	0.75	(0.69, 0.81)	<0.001
2008	0.77	(0.68, 0.87)	<0.001
2009	1.07	(0.96, 1.20)	0.217

The results show that the variable 'Practice Start Date' is significantly associated with retention ($p < 0.001$) and that such children who attended those dental practices that started delivering Childsmile in 2007 and 2008 had significantly lower odds of retention (OR = 0.75 and 0.77) than the rates for a child who attended a dental practice that started delivering Childsmile in 2006.The shape of

distribution is u-shaped as practices that began delivering Childsmile Practice in 2009 were the most likely to be retained with 1.07 times the odds of retention of those that attended a dental practice that started delivering Childsmile Practice in 2006 however this result was not significant ($p = 0.217$).

5.3.3 Univariate Logistic Regression of 'Practice SIMD'

'Practice SIMD' has five levels: '1', '2', '3', '4' and '5'. Patients attending a practice whose location had a SIMD score of 5 were the referent level in this analysis.

Table 5-5 Univariate Logistic Regression of 'Practice SIMD' in Relation to Retention

Practice SIMD	Retained	Not Retained	Total
1 (most deprived)	3330 (48%)	3650 (52%)	6980
2	1997 (47%)	2288 (53%)	4285
3	677 (44%)	850 (56%)	1527
4	414 (46%)	483 (54%)	897
5 (least deprived)	240 (46%)	284 (54%)	524
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	6.46	4	0.167	0.51

Practice SIMD	OR	95% CI	p-value
1 (most deprived)	1.08	(0.90, 1.29)	0.400
2	1.03	(0.86, 1.24)	0.728
3	0.94	(0.77, 1.15)	0.563
4	1.01	(0.82, 1.26)	0.898
5 (least deprived)	-	Referent	

The univarite logistic regression result indicated that the variable 'Practice SIMD' is not significant in relation to retention (p= 0.167). The odds ratios are quite level

indicating unity i.e. that retention is no more likely at a dental practice with regards to the deprivation score assigned to the area that it is situated within.

5.3.4 Univariate Logistic Regression of 'SIMD profile of Childsmile Patients Attending a Practice'

The variable 'SIMD Profile of Childsmile Patients Attending a Practice' has four levels: '1', '2', '3' and '4-5' with the latter level being the combination of patients attending a dental practice with a SIMD profile of 4 and 5 as described in section 4.7.1.4. Patients attending a practice where the SIMD profile was 1 were the referent level in this analysis.

Table 5-6 Univariate Logistic Regression of 'SIMD Profile of Childsmile Patients Attending a Practice' in Relation to Retention

SIMD Profile of Childsmile Patients Attending a Practice	Retained		Not Retained		Total
1 (most deprived)	803	(44%)	1025	(56%)	1828
2	3534	(47%)	3969	(53%)	7503
3	2235	(47%)	2475	(53%)	4710
4-5 (least deprived)	86	(50%)	86	(50%)	172
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	7.85	3	0.049	0.51

SIMD Profile of Childsmile Patients Attending a Practice	OR	95% CI	p-value
1 (most deprived)	-	Referent	
2	1.14	(1.03, 1.26)	0.015
3	1.15	(1.03, 1.28)	0.010
4-5 (least deprived)	1.28	(0.93, 1.75)	0.126

With a p-value just under 5%, this analysis shows that the SIMD profile of the practice attended was slightly significant for retention in Childsmile. There is also a gradient in the data with the rates of retention increasing the less deprived the SIMD profile becomes. Whilst the increase in the odds of retention is significant for SIMD 2 (OR = 1.14) and 3 (OR = 1.15), the highest odds for retention, which was for children who attended a practice with a SIMD profile of 4-5, were not significant (p=0.126) which is due to the small number of children within this level.

5.3.5 Univariate Logistic Regression of 'Urban/Rural Classification of Practice'

After pooling together the smaller categories as discussed in section 4.7.1.5, the variable 'Urban/Rural Classification of Practice' had four levels: 'Large Urban Area', 'Other Urban Area', 'Small Town' and 'Rural'. Patients who attended a practice classified as being within a large urban area were the referent level in this analysis.

Table 5-7 Univariate Logistic Regression of 'Urban/Rural Classification of Practice' in Relation to Retention

Urban/Rural Classification of Practice	Retained	Not Retained	Total
Large Urban Area	3661 (45%)	4486 (55%)	8147
Other Urban Area	2402 (52%)	2253 (48%)	4655
Small Towns	567 (44%)	723 (56%)	1290
Rural	28 (23%)	93 (77%)	121
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	87.55	3	<0.001	0.53

Urban/Rural Classification of Practice	OR	95% CI	p-value
Large Urban Area	-	Referent	
Other Urban Area	1.31	(1.22, 1.40)	<0.001
Small Town	0.96	(0.85, 1.08)	0.509
Rural	0.37	(0.24, 0.56)	<0.001

With a low p-value of <0.001, this analysis shows that the urban/rural classification of the location of a Childsmile practice is significant for retention in Childsmile.

Children who attended a practice in an ‘Other Urban Area’ were significantly the most likely to be retained (OR = 1.31) whereas those that attended a practice in a ‘Rural setting’ were significantly the least likely to be retained. Retention rates were also lower when the attended practice was in a ‘Small Town’ but this category was insignificant. Overall, retention was higher when the practice attended was in an Urban Area (both ‘Large Urban Area’ and ‘Other Urban Area’) although retention was 7% higher in an ‘Other Urban Area’, for example the town of Hamilton, compared to a ‘Large Urban Area’, for example the city Glasgow.

5.3.6 Univariate Logistic Regression of 'Total Number of Childsmile Patients in Practice'

The variable 'Total Number of Childsmile Patients in Practice' has been split into 4 levels: '<101 patients', '101-200 patients', '201-300 patients' and '>300 patients'. Those that attended a practice with less than 101 patients were the referent level in this analysis.

Table 5-8 Univariate Logistic Regression of 'Total Number of Childsmile Patients in Practice' in Relation to Retention.

Total Number of Childsmile Patients in Practice	Retained		Not Retained		Total
< 101 Patients	2125	(41%)	2006	(59%)	5131
101-200 Patients	2263	(48%)	2479	(52%)	4742
201-300 Patients	1396	(51%)	1342	(49%)	2738
> 300 Patients	874	(55%)	728	(45%)	1602
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	119.60	3	<0.001	0.55

Total Number of Childsmile Patients in Practice	OR	95% CI	p-value
< 101 Patients	-	Referent	
101-200 Patients	1.29	(1.19, 1.40)	<0.001
201-300 Patients	1.47	(1.34, 1.62)	<0.001
> 300 Patients	1.70	(1.52, 1.90)	<0.001

This analysis shows that there were significantly more retentions for those children who attended a practice that had enrolled a greater number of Childsmile patients.

Children who attended a practice with more than 300 Childsmile patients had odds of 1.70 times the odds for retention of those who attended a practice with less than 101 patients. There is also an obvious trend as the odds of retention increase significantly as the number of Childsmile patients seen at least at once by a practice increases.

5.3.7 Univariate Logistic Regression of 'Supplementary Contact'

The variable Supplementary Contact has 3 levels: 'Contact', 'No Contact' and 'Unknown'. Those patients where it was not known if they received supplementary contact were the referent level in this analysis.

Table 5-9 Univariate Logistic Regression of 'Supplementary Contact' in Relation to Retention

Supplementary Contact	Retained	Not Retained	Total
Contact	418 (46%)	490 (54%)	908
No Contact	3007 (49%)	3164 (51%)	6171
Unknown	3233 (45%)	3901 (55%)	7134
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	15.70	2	<0.001	0.52

Supplementary Contact	OR	95% CI	p-value
Contact	-	Referent	
No Contact	1.11	(0.97, 1.28)	0.129
Unknown	0.97	(0.85, 1.12)	0.684

The results indicate that in the cases where it was known that a child had supplementary contact with a dentist or dental hygienist, the children were significantly less likely to be retained on Childsmile Practice (OR = <0.001). Although the result of the univariate regression indicates that the variable 'Supplementary Contact' is significant with regards to retention (p <0.001), none of the variables individual categories were.

5.3.8 Univariate Logistic Regression of 'Fluoride Varnish Application at First Kept Appointment'

The variable 'Fluoride Varnish Application at First Kept Appointment' has two levels: 'Yes' and 'No'. Patients who did receive a fluoride varnish application (FVA) at their first kept appointment were the referent level in this analysis.

Table 5-10 Univariate Logistic Regression of 'Fluoride Varnish Application at First Kept Appointment' in Relation to Retention

Fluoride Varnish Application at First Kept Appointment	Retained	Not Retained	Total
Yes	471 (44%)	611 (56%)	1082
No	6187 (47%)	6944 (53%)	13131
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	5.31	1	0.021	0.51

Fluoride Varnish Application at First Kept Appointment	OR	95% CI	p-value
Yes	-	Referent	
No	1.16	(1.02, 1.31)	0.021

The result of the logistic regression indicates that whether or not a child was given a FVA at their initial appointment was significant for retention in Childsmile Practice (p= 0.021). Children who did not receive a FVA at their first kept appointment had higher odds for retention (OR= 1.16) than those who did receive a FVA at their first kept appointment.

5.3.9 Univariate Logistic Regression of 'Toothbrushing Advice Given at First Appointment'

'Toothbrushing Advice Given at First Appointment' has two levels: 'Yes' and 'No'. Patients who received toothbrushing advice at their first kept appointment were the referent level in this analysis.

Table 5-11 Univariate Logistic Regression of 'Toothbrushing Advice Given at First Kept Appointment' in Relation to Retention

Toothbrushing Advice Given at First Kept Appointment	Retained	Not Retained	Total
Yes	5650 (47%)	6482 (53%)	12132
No	1008 (48%)	1073 (52%)	2081
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	2.48	1	0.115	0.50

Toothbrushing Advice Given at First Kept Appointment	OR	95% CI	p-value
Yes	-	Referent	
No	1.08	(0.98, 1.18)	0.114

After completing the univariate logistic regression, the variable 'Toothbrushing Advice Given at First Kept Appointment' was found to be univariately insignificant in relation to a child being retained within Childsmile Practice (p= 0.115) and was the least significant of the three Childsmile interventions delivered.

5.3.10 Univariate Logistic Regression of 'Dietary Advice Given at First Appointment'

This variable has two levels: 'Yes' and 'No'. Patients who did not receive dietary advice at their first kept appointment were the referent level in this analysis.

Table 5-12 Univariate Logistic Regression of 'Dietary Advice Given at First Kept Appointment' in Relation to Retention

Dietary Advice Given at First Kept Appointment	Retained		Not Retained		Total
Yes	6267	(47%)	6984	(53%)	13251
No	391	(41%)	571	(59%)	962
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	16.05	1	<0.001	0.51

Dietary Advice Given at First Kept Appointment	OR	95% CI	p-value
Yes	1.31	(1.15, 1.50)	<0.001
No	-	Referent	

Whilst both the dietary and toothbrushing advice interventions should have been delivered at all first kept appointments, the dietary advice intervention was recorded as being delivered at the first appointment in 1119 more cases than the toothbrushing advice intervention. Delivery of the dietary advice intervention was found to be univariately significant with regards to retention within Childsmile ($p < 0.001$). Children who received the intervention had significantly higher odds (OR =1.31) of being retained within Childsmile than those who did not. Compared to the two other interventions delivered at the first kept appointment, FVA (see section 5.3.8) and Toothbrushing Advice (see section 5.3.9), this was the most

significant variable with regards to retention. Children were more likely to be retained when given this intervention unlike the other two interventions where retention was higher when the intervention was not given. It was also the only intervention where retention was higher if it was delivered.

5.3.11 Univariate Logistic Regression of 'Year of First Appointment'

This variable has four levels: '2006', '2007', '2008' and '2009'. First appointments in 2009 were the referent level in this analysis.

Table 5-13 Univariate Logistic Regression of 'Year of First Appointment' in Relation to Retention

Year of First Appointment	Retained	Not Retained	Total
2006	325 (58%)	237 (42%)	562
2007	1498 (52%)	1388 (48%)	2886
2008	1618 (44%)	2087 (56%)	3705
2009	3217 (46%)	3843 (54%)	7060
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	76.49	3	<0.001	0.54

Year of First Appointment	OR	95% CI	p-value
2006	1.64	(1.38, 1.95)	<0.001
2007	1.29	(1.18, 1.41)	<0.001
2008	0.93	(0.86, 1.00)	0.060
2009	-	Referent	

The year in which a child was due to attend their first Childsmile Practice appointment at a dental practice was found to be significantly linked to retention ($p < 0.001$). The results indicate that the odds of retention for those children that started in Childsmile Practice in the first two years of the programme were significantly higher than those that started in the later in the programme. Children

starting in 2006 had an odds-ratio of 1.64 times the odds for retentions of those that started Childsmile in 2009 but note the small numbers of children seen in this first year. Whilst there was a small improvement in retention in 2009 compared to 2008 which itself was insignificant (p= 0.060), retention rates have generally decreased the later the child's first appointment date was.

5.3.12 Univariate Logistic Regression of 'Year of First Kept Appointment'

This variable has four levels: '2006', '2007', '2008' and '2009'. First kept appointments were the referent level in this analysis.

Table 5-14 Univariate Logistic Regression of 'Year of First Kept Appointment' in Relation to Retention

Year of First Kept Appointment	Retained	Not Retained	Total
2006	311 (60%)	209 (40%)	520
2007	1471 (52%)	1348 (47%)	2819
2008	1628 (44%)	2057 (56%)	3685
2009	3248 (45%)	3941 (55%)	7189
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	85.82	3	<0.001	0.53

Year of First Kept Appointment	OR	95% CI	p-value
2006	1.81	(1.51, 2.16)	<0.001
2007	1.32	(1.21, 1.44)	<0.001
2008	0.96	(0.89, 1.04)	0.320
2009	-	Referent	

The analysis of the variable 'Year of First Kept Appointment' by logistical regression indicated that the year a child first attended a Childsmile Practice appointment significantly influenced retention ($p< 0.001$). Children with a first kept appointment in 2006 had a significantly higher chance of retention (OR = 1.81) than those children who had a first kept appointment on 2009. The odds of

retention were lowest in 2008 however this was insignificant (p= 0.320) and retention rates have generally decreased over the period covered.

5.3.13 Univariate Logistic Regression of 'Year of first appointment (Outcome 'Failed To Attend')'

The years 2006 and 2007 were pooled into one category as described in section 4.7.2.9. This variable has five levels: '2006-2007', '2008', '2009' and '2010' for the analysis. First failed to attend (FTA) appointments that were in 2010 were the referent level in this analysis.

Table 5-15 Univariate Logistic Regression of 'Year of first appointment (Outcome 'Failed to Attend')' in Relation to Retention

Year of first appointment (Outcome 'Failed to Attend')	Retained	Not Retained	Total
2006-2007	192 (41%)	277 (59%)	469
2008	121 (31%)	265 (69%)	386
2009	134 (44%)	173 (56%)	307
No FTA	6211 (48%)	6840 (52%)	13051
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	49.18	3	<0.001	0.51

Year of first appointment (Outcome 'Failed to Attend')	OR	95% CI	p-value
2006-2007	-	Referent	
2008	0.66	(0.50, 0.87)	0.004
2009	1.12	(0.84, 1.50)	0.455
No FTA	1.31	(1.09, 1.58)	0.005

The low p-value of <0.001 indicates that the year when a child's first scheduled appointment resulted in a FTA is significant for retention. Whilst retention rates were highest in the 2009 for those Children whose first appointment resulted in a FTA, this was not significant (p = 0.455). The odds of retention were significantly lower when a child's first recorded FTA was in 2008 (OR= 0.66). These results vary from the results of the 'Year of First Appointment' (see section 5.3.11) and 'Year of First Kept Appointment' (see section 5.3.12), where for these two variables, retentions were significantly higher in the first two years of the programme (2006-2007). However retention remained the lowest in 2008 regardless of the category.

5.3.14 Univariate Logistic Regression of 'Result of First Scheduled Appointment'

As there were only two possible outcomes for the variable 'Result of First Scheduled Appointment' the two levels were 'Attended' and 'FTA'. FTA was the referent level in this analysis.

Table 5-16 Univariate Logistic Regression of 'Result of First Scheduled Appointment' in Relation to Retention

Result of First Scheduled Appointment	Retained		Not Retained		Total
Attended	6211	(48%)	6840	(52%)	13051
FTA	447	(38%)	715	(62%)	1162
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	36.15	1	<0.001	0.51

Result of First Scheduled Appointment	OR	95% CI	p-value
Attended	1.45	(1.29, 1.64)	<0.001
FTA	-	Referent	

The outcome of a child's first scheduled Childsmile Practice significantly influenced retention in Childsmile Practice ($p<0.001$). Children that attended their first scheduled Childsmile Practice appointment at a dental practice were significantly more likely to be retained (OR=1.45) than those who did not.

5.3.15 Univariate Logistic Regression of 'Result of Last Scheduled Appointment'

The two levels for the variable 'Result of Last Scheduled Appointment' are 'Attended' and 'FTA'. FTA was the referent level in this analysis.

Table 5-17 Univariate Logistic Regression of 'Result of Last Scheduled Appointment' in Relation to Retention

Result of Last Scheduled Appointment	Retained		Not Retained		Total
Attended	5863	(49%)	6185	(51%)	12048
FTA	795	(37%)	1370	(63%)	2165
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	106.38	1	<0.001	0.53

Result of Last Scheduled Appointment	OR	95% CI	p-value
Attended	1.63	(1.49, 1.79)	<0.001
FTA	-	Referent	

With a p-value of <0.001, the resulting outcome of a child's last scheduled Childsmile Practice appointment was found to be significant in relation to retention. This analysis shows that there were significantly more retentions when the last scheduled appointment was attended by a child. Children who attended their last scheduled appointment had an odds-ratio of 1.63 times the odds for retention of those that FTA their last scheduled appointment. 51% of children who were not retained in Childsmile Practice attended their last scheduled Childsmile Practice appointment.

5.3.16 Univariate Logistic Regression of 'Data-zone (Child versus Practice)'

This variable has two levels: 'In Data-zone' and 'Not in Data-zone'. Children's that resided in the same data-zone as the practice they initially attended were the referent level in this analysis.

Table 5-18 Univariate Logistic Regression of 'Data-zone (Child versus Practice)' in Relation to Retention

Data-zone (Child versus Practice)	Retained	Not Retained	Total
In Data-zone	2387 (44%)	2994 (56%)	5381
Not in Data-zone	4271 (48%)	4561 (52%)	8832
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	21.34	1	<0.001	0.52

Data-zone (Child versus Practice)	OR	95% CI	p-value
In Data-zone	-	Referent	
Intermediate	1.17	(1.10, 1.26)	<0.001

Whether or not the child lived in the same data-zone as the dental practice they attended significantly influenced retention ($p < 0.001$). Children that lived in a different data-zone from the practice had significantly better odds of retention (OR = 1.17) than those children that lived in the same data-zone.

5.3.17 Univariate Logistic Regression of 'Age at First Appointment'

The 'Age at First Appointment' variable has five levels: '<6 months', '6-11 months', '12-23 months', '24-35 months' and '>35 months'. Those that were older than 35 months at the first appointment were the referent level in this analysis.

Table 5-19 Univariate Logistic Regression of 'Age at First Appointment' in Relation to Retention

Age at First Appointment	Retained		Not Retained		Total
< 6 months	3088	(52%)	2863	(48%)	5951
6-11 months	1524	(43%)	2015	(57%)	3539
12-23 months	929	(41%)	1317	(59%)	2246
24-35 months	561	(45%)	698	(55%)	1259
> 35 months	556	(46%)	662	(54%)	1218
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	111.74	4	<0.001	0.55

Age at First Appointment	OR	95% CI	p-value
< 6 months	1.28	(1.13, 1.45)	<0.001
6-11 months	0.90	(0.79, 1.03)	0.117
12-23 months	0.84	(0.73, 0.97)	0.015
24-35 months	0.96	(0.82, 1.12)	0.586
> 35 months	-	Referent	

The logistic regression results suggest that the variable 'Age of First Appointment' is significant ($p < 0.001$). This analysis shows that children that were aged under 6

months when they were first scheduled with a Childsmile Practice appointment were significantly the most likely to be retained and had an odds-ratio of 1.28 times the odds for retention of those aged in the over 35 months category. Children that were aged between 12 and 23 months when they were first scheduled to attend a Childsmile appointment were significantly the least likely to be retained (OR = 0.015).

5.3.18 Univariate Logistic Regression of 'Age at First Kept Appointment'

This variable has five levels: '<6 months', '6-11 months', '12-23 months', '24-35 months' and '>35months'. Those that were aged above 35 months at their first kept appointment were the referent level in this analysis.

Table 5-20 Univariate Logistic Refression of 'Age at First Kept Appointment' in Relation to Retention

Age at First Kept Appointment	Retained	Not Retained	Total
< 6 months	3024 (53%)	2725 (47%)	5749
6-11 months	1587 (43%)	2093 (57%)	3680
12-23 months	960 (41%)	1405 (59%)	2365
24-35 months	575 (44%)	722 (56%)	1297
> 35 months	512 (46%)	610 (54%)	1122
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	138.21	4	<0.001	0.55

Age at First Kept Appointment	OR	95% CI	p-value
< 6 months	1.32	(1.16, 1.50)	<0.001
6-11 months	0.90	(0.79, 1.03)	0.138
12-23 months	0.81	(0.71, 0.94)	0.005
24-35 months	0.95	(0.81, 1.11)	0.522
> 35 months	-	Referent	

This analysis shows that the age of a child at their first kept point appointment is significant for retention (p <0.001). Children aged less than 6 months when they

first attended a Childsmile Practice appointment had an odds-ratio of 1.32 times the odds for retention of those who were aged over 35 months when they first attended and were significantly the most likely to be retained in Childsmile Practice. Children that attended for the first time when aged between 12 and 23 months were significantly the least likely to be retained. Children in the youngest age group were significantly the most likely to be retained, there was a J-shape in the data.

5.3.19 Univariate Logistic Regression of 'Age at First Failed to Attend Appointment'

The variable 'Age at First Failed to Attend Appointment' has six levels: '<6 months', '6-11 months', '12-23 months', '24-35 months', '>35 months' and 'No FTA'. Those that were aged below 6 months at their first FTA appointment were the referent level in this analysis.

Table 5-21 Univariate Logistic Regression of 'Age at First Failed to Attend Appointment' in Relation to Retention

Age at First Failed to Attend Appointment	Retained	Not Retained	Total
< 6 months	369 (43%)	490 (57%)	859
6-11 months	439 (41%)	642 (59%)	1081
12-23 months	691 (52%)	634 (48%)	1325
24-35 months	303 (55%)	243 (45%)	546
> 35 months	132 (55%)	106 (45%)	238
No FTA	4724 (46%)	5440 (54%)	10164
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	61.19	5	<0.001	0.53

Age at First Failed to Attend Appointment	OR	95% CI	p-value
< 6 months	-	Referent	
6-11 months	0.91	(0.76, 1.09)	0.298
12-23 months	1.45	(1.22, 1.72)	<0.001
24-35 months	1.66	(1.33, 2.06)	<0.001
> 35 months	1.65	(1.24, 2.21)	<0.001
No FTA	1.15	(1.00, 1.33)	0.047

This analysis shows that the age of the child when they first FTA an appointment is significant for retention ($p < 0.001$). Children who were aged between 24 and 35 months had an odds-ratio of 1.66 times the odds for retention of those aged under <6 months. Over all, children aged over one years of age when they first FTA a Childsmile Practice appointment were significantly the most likely to be retained on the programme. The results of this analysis is in contrast to the two similar variables 'Age at First Appointment' (see section 5.3.17) and 'Age at First Kept Appointment' (see section 5.3.18) where 52% and 53% of children aged under 6 months were retained compared to 43% in this variable. 55% of children aged between 24 and 35 months when they first FTA were retained compared to 45% ('Age at First Appointment') and 44% ('Age at First Kept Appointment').

5.3.20 Univariate Logistic Regression of 'Sex'

This variable has two levels: 'Male' and 'Female'. Male patients were the referent level in this analysis.

Table 5-22 Univariate Logistic Regression of 'Sex' in Relation to Retention

Sex	Retained	Not Retained	Total
Male	3450 (47%)	3916 (53%)	7366
Female	3208 (47%)	3639 (53%)	6847
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	0.00	1	0.985	0.50

Sex	OR	95% CI	p-value
Male	-	Referent	
Female	1.00	(0.94, 1.07)	0.985

This analysis shows that the sex of a child is not significant for retention in Childsmile Practice (p= 0.985) and that the rate of retention is identical regardless of sex (OR= 1.00).

5.3.21 Univariate Logistic Regression of 'Year of Birth'

After pooling the categories 2005 and 2006 as reported in section (4.7.3.4), the variable 'Year of Birth' had four levels: '2005-2006', '2007', '2008' and '2009'. Patients born in 2009 were the referent level in this analysis.

Table 5-23 Univariate Logistic Regression of 'Year of Birth' in Relation to Retention

Year of Birth	Retained	Not Retained	Total
2005-2006	1872 (48%)	2036 (52%)	3908
2007	2130 (48%)	2264 (52%)	4394
2008	1721 (44%)	2211 (56%)	3932
2009	935 (47%)	1044 (53%)	1979
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	21.55	3	<0.001	0.52

Year of Birth	OR	95% CI	p-value
2005-2006	1.03	(0.92, 1.14)	0.634
2007	1.05	(0.94, 1.17)	0.364
2008	0.87	(0.78, 0.97)	0.011
2009	-	Referent	

The result of this analysis shows that the year of birth is significant for retention rates (p = <0.001). The odds for retention are slightly better for those born between 2005 and 2007 then those born in the latter two years although children born in 2008, which had the lowest odds for retention (OR = 0.87), is the only significant category (p= 0.011).

5.3.22 Univariate Logistic Regression of 'SIMD of Patient'

The variable 'SIMD of Patient' has five levels: '1', '2', '3', '4' and '5'. Children with a SIMD score of 1 were the referent level in this analysis.

Table 5-24 Univariate Logistic Regression of 'SIMD of Patient' in Relation to Retention

SIMD of Patient	Retained	Not Retained	Total
1 (most deprived)	2915 (46%)	3462 (54%)	6377
2	1471 (45%)	1813 (55%)	3284
3	1009 (49%)	1042 (51%)	2051
4	759 (49%)	786 (51%)	1545
5 (least deprived)	504 (53%)	452 (47%)	956
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results

Type 3 Results:	Chi-Square	Df	p-value	C-index
	30.42	4	<0.001	0.52

SIMD of Patient	OR	95% CI	p-value
1 (most deprived)	-	Referent	
2	0.97	(0.89, 1.05)	0.447
3	1.15	(1.04, 1.27)	0.007
4	1.16	(1.03, 1.29)	0.010
5 (least deprived)	1.33	(1.16, 1.53)	<0.001

The logistic regression analysis of SIMD suggests that with a low p value (<0.001) a child's deprivation score is a highly significant for retention. This analysis indicates that children with an SIMD score of 5, the least deprived category, had an odds-ratio of 1.33 times the odds for retention of those living in the most deprived areas (SIMD 1). Whilst those in SIMD 2 had lower odds of retention (OR = 0.97) than those

in SIMD 1, this was not significant (p= 0.447). Apart from this one insignificant category, the results suggested a link between deprivation and retention; the odds of being retained in Childsmile Practice increased as deprivation lowered. The results of this analysis provides similar finding to the 'SIMD Profile of Childsmile Patients Attending a Practice' (see section 5.3.4) which was based on the mean SIMD of the patients attending a dental practice. In both variables, the less deprived categories indicated the highest rates of retention and similarly both variables reported the lowest rates of retention for the two most deprived categories.

5.3.23 Univariate Logistic Regression of 'Urban/Rural Classification of Patient'

'Urban/Rural Classification of Patient' has four levels: 'Large Urban Areas', 'Other Urban Areas', 'Small Towns' and 'Rural'. Those whose home is classified as rural were the referent level in this analysis.

Table 5-25 Univariate Logistic Regression of 'Urban/Rural Classification of Patient' in Relation to Retention

Urban/Rural Classification of Patient	Retained		Not Retained		Total
Large Urban Areas	3486	(45%)	4280	(55%)	7766
Other Urban Areas	2067	(51%)	1981	(49%)	4048
Small Towns	537	(43%)	714	(57%)	1251
Rural	568	(49%)	580	(51%)	1148
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	51.75	3	<0.001	0.53

Urban/Rural Classification of Patient	OR	95% CI	p-value
Large Urban Areas	-	Referent	
Other Urban Areas	1.28	(1.19, 1.38)	<0.001
Small Towns	0.92	(0.82, 1.04)	0.195
Rural	1.20	(1.06, 1.36)	0.004

With a low p value of <0.001, the results of this analysis shows that the urban/rural classification of the residence of a child was significant for retention in Childsmile.

Children who resided in an ‘Other Urban Area’ ($p < 0.001$) had an odds-ratio of 1.28 times the odds for retention of those who resided in a ‘Large Urban Area’. Those who residence was ‘Rural’ ($p = 0.004$) had an odds-ratio of 1.20 times the odds for retention of those who resided in a ‘Large Urban Area’. Odds of retention were lowest for those who lived in a ‘Small Town’ (OR= 0.92) however this was insignificant ($p = 0.195$). When compared with the urban/rural classification of the dental practice (see section 5.3.5), retention remains highest in ‘Other Urban Area’ regardless of whether this is the location of the child or the practice. However there is a contrast in the rates of retention for the ‘Rural’ category. Only 23% of children who attended a dental practice in a ‘Rural’ area were retained (table 5-7) compared to 49% of children who live in a ‘Rural’ area (table 5-25).

5.3.24 Univariate Logistic Regression of 'Age of Mother'

The variable 'Age of Mother' was grouped into 6 variables '<21', '21-25', '26-30', '31-25', '>35' and 'Unknown'. Patients whose mother was aged below 20 when referred into Childsmile by a Health Visitor (HV) were the referent level in this analysis.

Table 5-26 Univariate Logistic Regression of 'Age of Mother' in Relation to Retention

Age of Mother	Retained	Not Retained	Total
< 21	433 (46%)	509 (54%)	942
21-25	843 (47%)	951 (53%)	1794
26-30	942 (48%)	1028 (52%)	1970
31-35	743 (50%)	739 (50%)	1482
> 35	421 (51%)	408 (49%)	829
Unknown	3276 (46%)	3920 (54%)	7196
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	17.68	5	0.003	0.52

Age of Mother	OR	95% CI	p-value
< 21	-	Referent	
21-25	1.04	(0.89, 1.22)	0.610
26-30	1.08	(0.92, 1.26)	0.349
31-35	1.18	(1.00, 1.39)	0.045
> 35	1.21	(1.01, 1.46)	0.043
Unknown	0.98	(0.86, 1.13)	0.798

The p value of the variable 'Age of Mother' (0.003) indicates that the age of the child's mother when the child referred into Childsmile from a HV was significant for retention within Childsmile. There were significantly more retentions for children in Childsmile with older mothers. Children with a mother aged over 35 years had an odds-ratio of 1.21 times the odds for retention of those whose mother was aged below 21. There is a gradient in the data as the odds of retention increased as the age of the mother increased. Overall children whose mothers are over the age of 30 were significantly the most likely to be retained in Childsmile.

This variable was then re-analysed adjusting for the SIMD score of the patient. This was done to ascertain if the age of the mother was a proxy for SIMD, i.e. that young mothers with toddlers are generally more deprived than older mothers and therefore their children would be less likely to be retained.

Table 5-27 Logistic Regression of 'Age of Mother' in Relation to Retention (Adjusted for SIMD of Patient)

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	17.46	5	0.004	0.53

Age of Mother	**OR**	**95% CI**	**p-value**
< 21	-	Referent	
21-25	1.04	(0.89, 1.22)	0.622
26-30	1.05	(0.90, 1.23)	0.522
31-35	1.18	(0.97, 1.34)	0.124
> 35	1.16	(0.96, 1.40)	0.119
Unknown	0.95	(0.83, 1.09)	0.454

Although the odds ratio are only slightly lower after adjusting for the SIMD of the patients, no individual category was significant suggesting that 'Age of Mother' is a partly a proxy for deprivation i.e. that younger mothers are more likely to be from

a deprived area which had previously indicated lower retention (see section 5.3.22).

5.3.25 Univariate Logistic Regression of 'Caries Risk Assessment: Deprived'

This variable has three levels: 'Yes', 'No' and 'No CRA'. Patients who were risk assessed as not being deprived were the referent level in this analysis. Children who were not given a caries risk assessment (CRA) could not be assigned to a 'Yes' or 'No' category.

Table 5-28 Univariate Logistic Regression of 'Caries Risk Assessment: Deprived' in Relation to Retention

Caries Risk Assessment: Deprived	Retained		Not Retained		Total
Yes	2572	(49%)	2729	(51%)	5301
No	590	(45%)	720	(55%)	1310
No CRA	3496	(46%)	4106	(54%)	7602
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	9.92	2	0.007	0.51

Caries Risk Assessment: Deprived	OR	95% CI	p-value
Yes	1.15	(1.02, 1.30)	0.024
No	-	Referent	
No CRA	1.04	(0.92, 1.17)	0.526

After performing a logistic regression analysis on the variable 'Caries Risk Assessment: Deprived', it was found that this variable was significant with regards to retention (p= 0.007). The results denoted that those assessed as living in an area of deprivation by a HV had an odds-ratio of 1.15 times the odds for retention of

those who were assessed as not living in an area of deprivation. This differs from the findings of the 'SIMD of Patient' variable where children from the three most deprived areas were the least likely to be retained. The assignment of whether or not the child resided in an area of deprivation in the 'Caries Risk Assessment: Deprived' variable was done by a HV and may have been based on 'local knowledge' rather than using an SIMD lookup as was used for the 'SIMD of Patient' variable. It is therefore possible that the assignment of deprivation status in the 'Caries Risk Assessment: Deprived' variable is incorrect.

To investigate the conflicting results between 'SIMD of Patient' and 'Caries Risk Assessment: Deprived', a cross tabulation of frequencies was completed. The guidelines in completing the CRA form instructed that a HV should indicate that a child was deprived if they were living in the most deprived SIMD quintile, SIMD 1 (see appendix 2).

Table 5-29 Cross Tabulation of SIMD of Patient and Caries Risk Assessment: Deprived Variables

SIMD of Patient	Caries Risk Assessment: Deprived	Caries Risk Assessment: Not Deprived	Total
1 (most deprived)	3237 (91%)	334 (9%)	3571
2	1090 (73%)	413 (27%)	1503
3	555 (66%)	285 (34%)	840
4	278 (59%)	196 (41%)	474
5 (least deprived)	141 (63%)	82 (37%)	223

Although the results of the logistic regression suggested that children who were assessed as residing in an area of deprivation by an HV were more likely to be retained in Childsmile than those who did not, the results of the cross-tabulation highlighted that there were children incorrectly assessed by a HV, i.e. there were children who did not reside in an area of deprivation, including those that lived in the least deprived SIMD quintile that were assessed as living in an area of deprivation.

5.3.26 Univariate Logistic Regression of 'Caries Risk Assessment: Smoker'

This variable has three levels: 'Yes', 'No' and 'No CRA'. Patients who reside with a smoker when risk assessed were the referent level in this analysis. Children with no CRA could not be assigned to a 'Yes' or 'No' category.

Table 5-30 Univariate Logistic Regression of 'Caries Risk Assessment: Smoker' in Relation to Retention

Caries Risk Assessment: Smoker	Retained	Not Retained	Total
Yes	1368 (45%)	1658 (55%)	3026
No	1794 (50%)	1791 (50%)	3585
No CRA	3496 (46%)	4106 (54%)	7602
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	20.19	2	<0.001	0.52

Caries Risk Assessment: Smoker	OR	95% CI	p-value
Yes	-	Referent	
No	1.21	(1.10, 1.34)	<0.001
No CRA	1.03	(0.95, 1.12)	0.467

The variable 'Caries Risk Assessment: Smoker' is significant (p <0.001) in relation to retention. This analysis shows that there were significantly higher odds for retention for those who were assessed by a HV as not residing with a smoker. Those assessed as not residing with a smoker had an odds-ratio of 1.21 times the odds for retention of those who did.

This variable was then re-analysed adjusting for the SIMD score of the patient. This was done to ascertain if living with a smoker was a proxy for SIMD, i.e. that parents or carers who smoked were more likely to live in area of high deprivation.

Table 5-31 Logistic Regression of 'Caries Risk Assessment: Smoker' in Relation to Retention (Adjusted for SIMD of Patient)

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	17.46	2	<0.0001	0.54

Caries Risk Assessment: Smoker	OR	95% CI	p-value
Yes	-	Referent	
No	1.20	(1.09, 1.32)	0.0002
No CRA	1.05	(0.91, 1.08)	0.8107

After adjustment for the SIMD of the patient, children whose parents did not smoke remained significantly more likely to be retained within Childsmile Practice. The odds ration lowered from 1.21 to 1.20 after the adjustment indicating that SIMD had very little impact on this variable.

5.3.27 Univariate Logistic Regression of 'Caries Risk Assessment: Pain'

'Caries Risk Assessment: Pain' consists of three levels: 'Yes', 'No' and 'No CRA'. Patients whose parents or carers last attendance at a dental practice was to receive pain relief when risk assessed were the referent level in this analysis. Children with no CRA could not be assigned to a 'Yes' or 'No' category.

Table 5-32 Univariate Logistic Regression of 'Caries Risk Assessment: Pain' in Relation to Retention

Caries Risk Assessment: Pain	Retained	Not Retained	Total
Yes	774 (44%)	968 (56%)	1742
No	2388 (50%)	2481 (50%)	4869
No CRA	3496 (46%)	4106 (54%)	7602
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	15.78	2	<0.001	0.52

Caries Risk Assessment: Pain	OR	95% CI	p-value
Yes	-	Referent	
No	1.20	(1.08, 1.34)	<0.001
No CRA	1.06	(0.96, 1.18)	0.240

With a p-value of <0.001, the variable 'Caries Risk Assessment: Pain' was found to have a significant impact on retention within Childsmile Practice. After completion of a univariate logistic regression on the variable 'Caries Risk Assessment: Pain', the results signify that at the time of a CRA being completed by a HV, those

children whose parents last attended a dental practice for pain relief were significantly less likely to be retained on Childsmile Practice ($p < 0.001$).

5.3.28 Univariate Logistic Regression of 'Caries Risk Assessment: Decay Likely'

This variable has three levels: 'Yes', 'No' and 'No CRA'. Patients who were risk assessed at risk of tooth decay were the referent level in this analysis. Children with no CRA could not be assigned to a 'Yes' or 'No' category.

Table 5-33 Univariate Logistic Regression of 'Caries Risk Assessment: Decay Likely' in Relation to Retention

Caries Risk Assessment: Decay Likely	Retained		Not Retained		Total
Yes	1642	(46%)	1900	(54%)	3542
No	1520	(50%)	1549	(50%)	3069
No CRA	3496	(46%)	4106	(54%)	7602
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	11.44	2	0.003	0.51

Caries Risk Assessment: Decay Likely	OR	95% CI		p-value
Yes	-	Referent		
No	1.14	(1.03,	1.25)	0.010
No CRA	0.99	(0.91,	1.07)	0.716

As well as showing that the variable 'Caries Risk Assessment: Decay likely' is univariately significant (p= 0.003), the results of the logistic regression reveal that children assessed as not having an increased risk of tooth decay had an odds-ratio of 1.14 times the odds for retention of those who were assessed at having an increased risk of tooth decay and were significantly more likely to be retained within Childsmile (p = 0.010).

5.3.29 Univariate Logistic Regression of 'Caries Risk Assessment: Risk Total'

This variable has four levels: '1', '2', '3' and '4'. Patients that were assessed as having 4 risks were the referent level in this analysis. Children with no CRA have no known risk factors due to not being assessed by a HV.

Table 5-34 Univariate Logistic Regression of 'Caries Risk Assessment: Risk Total' in Relation to Retention

Caries Risk Assessment: Risk Total	Retained	Not Retained	Total
1 (least risks)	1228 (50%)	1225 (50%)	2453
2	947 (48%)	1020 (52%)	1967
3	714 (46%)	826 (54%)	1540
4 (most risks)	273 (42%)	378 (58%)	651
No CRA (risks unknown)	3496 (46%)	4106 (54%)	7602
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	20.23	4	<0.001	0.52

Caries Risk Assessment: Risk Total	OR	95% CI	p-value
1 (least risks)	1.39	(1.17, 1.65)	<0.001
2	1.29	(1.07, 1.54)	0.006
3	1.20	(0.99, 1.44)	0.057
4 (most risks)	-	Referent	
No CRA (risks unknown)	1.18	(1.00, 1.39)	0.047

The number of caries risks factors identified by the HV was found to have a significant effect on retention (P <0.001). After performing a logistic regression on

the variable ‘Caries Risk Assessment: Risk Total’ the results demonstrate that there is a clear trend; the odds of being retained in Childsmile decrease as the total number of risk factors identified by a HV increase. Children with only one risk had an odds-ratio of 1.39 times the odds for retention of those who were assessed as having four risk factors and were significantly the most likely to be retained within Childsmile Practice.

Apart from ‘Caries Risk Assessment: Deprived’ which was found to be inaccurate, the presence of a caries indicator was found to lower the odds of retention.

5.3.30 Univariate Logistic Regression of 'Health Visitor Referral'

This variable has two levels: 'Yes' and 'No'. Patients who were not referred into Childsmile by a HV were the referent level in this analysis.

Table 5-35 Univariate Logistic Regression of 'Health Visitor Referral' in Relation to Retention

Health Visitor Referral	Retained	Not Retained	Total
Yes	4655 (47%)	5178 (53%)	9833
No	2003 (46%)	2377 (54%)	4380
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	3.16	1	0.076	0.51

Health Visitor Referral	OR	95% CI	p-value
Yes	1.07	(0.99, 1.15)	0.076
No	-	Referent	

The analysis of the variable 'Health Visitor Referral' by logistic regression found that those referred to Childsmile Practice by a HV had an odds-ratio of 1.07 times the odds for retention of those who were referred into Childsmile Practice by another source. The result also indicated that the variable 'Health Visitor Referral' is univariately not significant (p= 0.076) with regards to retention.

5.3.31 Univariate Logistic Regression of 'Dental Health Support Worker Contact'

This variable has two levels: 'Yes' and 'No'. Patients that have received additional support from a Dental Health Support Worker (DHSW) after initially attending a dental practice were the referent level in this analysis.

Table 5-36 Univariate Logistic Analysis of 'Dental Health Support Worker Contact' in Relation to Retention

Dental Health Support Worker Contact	Retained		Not Retained		Total
Yes	179	(42%)	248	(58%)	427
No	6479	(47%)	7307	(53%)	13786
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	4.31	1	0.038	0.50

Dental Health Support Worker Contact	OR	95% CI	p-value
Yes	-	Referent	
No	1.23	(1.01, 1.49)	0.039

This analysis shows that DHSW contact is significant with regards to retention within Childsmile Practice. Those who did not receive additional support from a DHSW were significantly more likely to be retained and had an odds-ratio of 1.23 times the odds for retention of those who did receive additional support.

5.3.32 Univariate Logistic Regression of 'Dental Health Support Worker Contact after Failed to Attend'

This variable has three levels: 'Yes', 'No' and 'No FTA'. Patients that have received additional support from a DHSW after failing to attend a dental practice were the referent level in this analysis.

Table 5-37 Univariate Logistic Analysis of 'Dental Health Support Worker Contact after Failed to Attend' in Relation to Retention

Dental Health Support Worker Contact after FTA	Retained	Not Retained	Total
Yes	43 (35%)	80 (80%)	123
No	1891 (48%)	2035 (52%)	3926
No FTA	4724 (46%)	5440 (54%)	10164
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	10.42	2	0.005	0.51

Dental Health Support Worker Contact after FTA	OR	95% CI	p-value
Yes	-	Referent	
No	1.73	(1.19, 2.52)	0.004
No FTA	1.62	(1.11, 2.35)	0.012

Similarly to the variable 'Dental Health Support Worker Contact' in section 5.3.31, the analysis shows that the DHSW Contact after a FTA is significant with regards to retention (p= 0.005). It also indicated that those who did not receive additional DHSW support were significantly more likely to be retained (p= 0.004) after they had FTA a dental appointment and that they had higher the odds retention (OR = 1.73) than those who had received additional support.

5.3.33 Univariate Logistic Regression of 'Health Board'

This variable has 3 levels: 'Ayrshire & Arran', 'Greater Glasgow & Clyde' and 'Lanarkshire'. Patients that reside within 'Greater Glasgow & Clyde' (GGC) were the referent level in this analysis.

Table 5-38 Univariate Logistic Analysis of 'Health Board' in Relation to Retention

Health Board	Retained	Not Retained	Total
Lanarkshire	2741 (46%)	3202 (54%)	5943
Greater Glasgow & Clyde	2627 (45%)	3235 (55%)	5862
Ayrshire & Arran	1290 (54%)	1118 (46%)	2408
Total	6658 (47%)	7555 (53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	54.47	2	<0.001	0.53

Health Board	OR	95% CI	p-value
Lanarkshire	1.06	(0.98, 1.14)	0.138
Greater Glasgow & Clyde	-	Referent	
Ayrshire & Arran	1.42	(1.29, 1.56)	<0.001

This analysis shows that the health board in which a child resides is significant for retention (p <0.001). Those residing in 'Ayrshire & Arran' (A&A) were significantly the most likely to be retained and had an odds-ratio of 1.42 times the odds for retention of those living in GGC where retention within Childsmile Practice is lowest.

5.3.34 Univariate Logistic Regression of 'Community Health Partnership'

This variable has 13 levels which are the names of the Community Health Partnerships (CHP) in which the patients reside. Those that reside within 'North Lanarkshire' were the referent level in this analysis.

Table 5-39 Univariate Logistic Analysis of 'Community Health Partnership' in Relation to Retention

Community Health Partnership	Yes		No		Total
North Lanarkshire	1694	(45%)	2074	(55%)	3768
South Lanarkshire	1142	(48%)	1242	(52%)	2384
East Glasgow	517	(46%)	595	(54%)	1112
East Ayrshire	586	(57%)	441	(43%)	1027
North Glasgow	470	(46%)	550	(54%)	1020
North Ayrshire	503	(52%)	461	(48%)	964
South West Glasgow	370	(40%)	550	(60%)	920
Inverclyde	362	(46%)	418	(54%)	780
South East Glasgow	251	(36%)	441	(64%)	692
Renfrewshire	307	(48%)	339	(52%)	646
South Ayrshire	201	(48%)	216	(52%)	417
West Glasgow	139	(52%)	129	(48%)	268
Other	116	(54%)	99	(46%)	215
Total	6658	(47%)	7555	(53%)	14213

Logistic Regression Results				
Type 3 Results:	**Chi-Square**	**Df**	**p-value**	**C-index**
	118.75	12	<0.001	0.55

Table 5-39 continued

Community Health Partnership	OR	95% CI	p-value
North Lanarkshire	-	Referent	
South Lanarkshire	1.14	(1.03, 1.26)	0.015
East Glasgow	1.07	(0.93, 1.22)	0.335
East Ayrshire	1.62	(1.41, 1.86)	<0.001
North Glasgow	1.05	(0.92, 1.21)	0.470
North Ayrshire	1.33	(1.16, 1.54)	<0.001
South West Glasgow	0.81	(0.70, 0.94)	0.004
Inverclyde	1.06	(0.91, 1.24)	0.440
South East Glasgow	0.70	(0.59, 0.83)	<0.001
Renfrewshire	1.13	(0.95, 1.33)	0.226
South Ayrshire	1.16	(0.95, 1.43)	0.144
West Glasgow	1.33	(1.04, 1.71)	0.029
Other	1.44	(1.09, 1.89)	0.010

The logistic regression indicates that the CHP in which a child resides is significant for retention. Those residing in East Ayrshire where retention rates are significantly the highest (p = <0.001) had an odds-ratio of 1.62 times the odds for retention of those living in North Lanarkshire, the CHP where retention rates within Childsmile Practice were the lowest.

5.3.35 Univariately Significant Variables

The variables in each group were sorted by their predictability. Variables that were not significant and would therefore not take part in any further analysis are highlighted at the bottom of each table (tables 5-40, 5-41 and 5-42).

Table 5-40 Practice Profile of Variables ranked by Predictive Ability (C-Index)

Variable	Chi-Square	Df	p	C-index
Total Number of Childsmile Patients in Practice	119.60	3	<0.001	0.55
Practice Start Date	73.45	3	<0.001	0.54
Urban/Rural Classification of Practice	87.55	3	<0.001	0.53
SIMD Profile of Childsmile Patients Attending a Practice	7.85	3	0.049	0.51
Type of Dental Practice	2.85	1	0.092	0.50
Practice SIMD	6.46	4	0.167	0.51

Table 5-41 Practice Interaction of Variables ranked by Predictive Ability (C-Index)

Variable	Chi-Square	Df	p	C-index
Year of First Appointment	76.49	3	<0.001	0.54
Year of First Kept Appointment	85.82	3	<0.001	0.53
Result of Last Scheduled Appointment	106.38	1	<0.001	0.53
Data-zone (Child Versus Practice)	21.34	1	<0.001	0.52
Supplementary Contact	15.70	2	<0.001	0.52
Dietary Advice Given at First Kept Appointment	16.05	1	<0.001	0.51
Result of First Scheduled Appointment	36.15	1	<0.001	0.51
Year of first appointment (Outcome 'Failed to Attend')	49.18	3	<0.001	0.51
Fluoride Varnish Application at First Kept Appointment	5.31	1	0.021	0.51
Toothbrushing Advice given at First Kept Appointment	2.48	1	0.115	0.50

Table 5-42 Patient Profile of Variables ranked by Predictive Ability (C-Index)

Variable	Chi-Square	Df	P	C-index
Age at First Kept Appointment	138.21	4	<0.001	0.55
Age at First Appointment	111.74	4	<0.001	0.55
Community Health Partnership	118.75	12	<0.001	0.55
Age at First Failed to Attend Appointment	61.19	5	<0.001	0.53
Urban/Rural Classification of Patient	51.75	3	<0.001	0.53
Health Board	54.47	2	<0.001	0.53
Year of Birth	21.55	3	<0.001	0.52
Caries Risk Assessment: Risk Total	20.23	4	<0.001	0.52
SIMD of Patient	30.42	4	<0.001	0.52
Caries Risk Assessment: Pain	15.78	2	<0.001	0.52
Caries Risk Assessment: Smoker	20.19	2	<0.001	0.52
Age of Mother	17.68	5	0.003	0.52
Caries Risk Assessment: Decay Likely	11.44	2	0.003	0.51
Dental Health Support Worker contact after Failed to Attend	10.42	2	0.005	0.51
Caries Risk Assessment: Deprived	9.92	2	0.007	0.51
Dental Health Support Worker Contact	4.31	1	0.038	0.50
Health Visitor Referral	3.16	1	0.076	0.51
Sex	0.00	1	0.985	0.50

After analysing the variables in each of the Patient Profile, Practice Interaction and Patient Profile groups univariately, the variables ‘Type of Dental Practice’ and ‘Practice SIMD’ from the Patient Profile group (Table 5-40); ‘Toothbrushing Advice given at First Kept Appointment’ from the Practice Interaction Group (Table 5-41); and ‘Health Visitor Referral’ and ‘Sex’ from the Patient Profile group (Table 5-42) were no longer considered for further use in the models due to not being univariately significant at the 5% level. The remaining variables in these groups had p-values less than or equal to 0.05 and were therefore considered to be univariately significant and considered for use in the models.

5.4 Prediction Models

The stepwise fitting routines by logistic regression shown in sections 5.4.1 to 5.4.5 are cumulative and therefore the χ^2, p value and c-index are adjusted by the variables already entered by the algorithm. By definition, the variable in the first step is not adjusted.

5.4.1 Practice Profile Model

Each univariately significant variable in the Practice Profile group (section 5.3.35) was firstly subjected to a forward stepwise fitting routine by logistic regression. This is summarised below in Table 5-43:

Table 5-43 Forward Model Fitting for Variable Group: Practice Profile

Step	Variable	Df	χ^2	p	C-index
1	Total Number of Childsmile Patients in Practice	3	119.34	<0.0001	0.55
2	Practice Start Date	3	54.16	<0.0001	0.56
3	Urban/Rural Classification of Practice	3	53.30	<0.0001	0.57
4	SIMD Profile of Childsmile Patients Attending a Practice	3	19.49	0.0002	0.57

A backward stepwise fitting routine by logistic regression was then subjected to each univariately significant variable in the Practice Profile group. Both the forward and backward methods produced the same model.

All four variables that were entered into this model were independently significant of each other. The final model for this group was as follows:

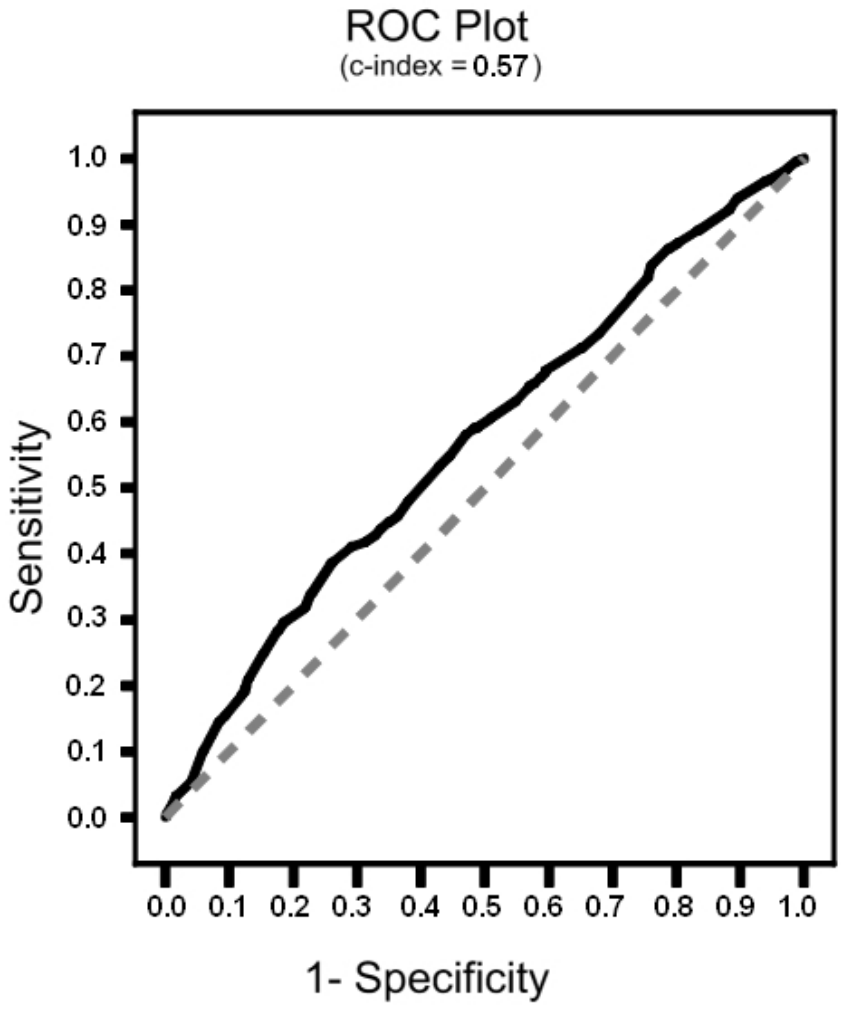
Table 5-44 Final Model for Variable Group: Practice Profile

Variable	OR	95% CI	p
Total Number of Childsmile Patients in Practice			**<0.0001**
< 101 Patients	-	Referent	
101-200 Patients	1.27	(1.17, 1.38)	<0.0001
201-300 Patients	1.42	(1.28, 1.58)	<0.0001
> 300 Patients	1.58	(1.39, 1.80)	<0.0001

Table 5-44 Continued

Practice Start Date				**<0.0001**
2006	-	Referent		
2007	0.83	(0.76,	0.90)	<0.0001
2008	0.92	(0.80,	1.05)	0.2057
2009	1.33	(1.17,	1.50)	<0.0001
Urban/Rural Classification of Practice				**<0.0001**
Large Urban Area	-	Referent		
Other Urban Area	1.21	(1.12,	1.31)	<0.0001
Small Towns	0.98	(0.86,	1.11)	0.7268
Rural	0.30	(0.19,	0.47)	<0.0001
SIMD Profile of Childsmile Patients Attending a Practice				**0.0002**
1	-	Referent		
2	1.15	(1.03,	1.28)	0.0154
3	1.08	(0.96,	1.23)	0.2058
4-5	2.03	(1.43,	2.88)	<0.0001

Figure 5-1 ROC plot indicating the C-index which is equal to the area under the curve for the Practice Profile Model



5.4.2 Practice Interaction Model

Each univariately significant variable in the Practice Interaction group (section 5.3.35) was firstly subjected to a forward stepwise fitting routine by logistic regression. This is summarised below in Table 5-42:

Table 5-45 Forward Model Fitting for Variable Group: Practice Interaction

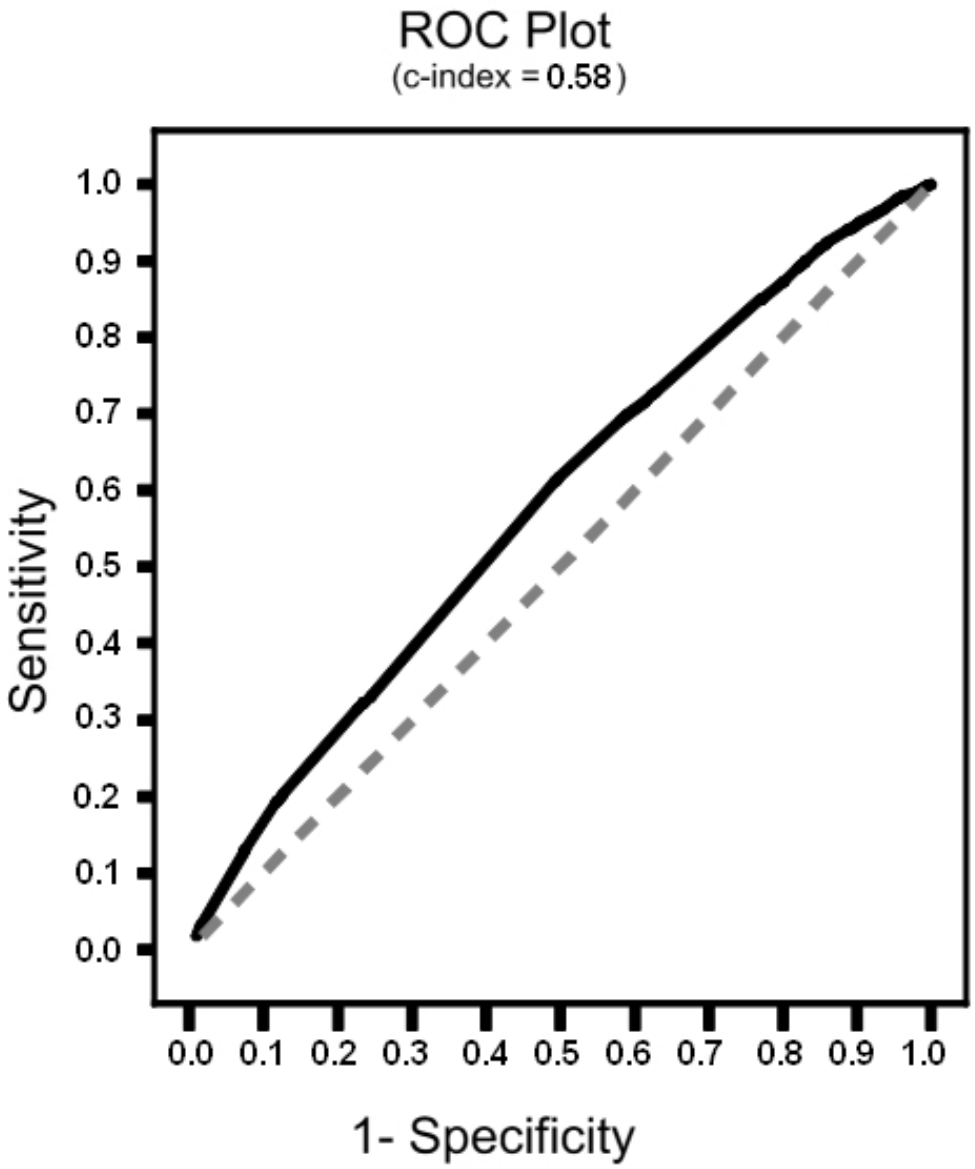
Step	Variable	Df	χ^2	p	C-index
1	Result of Last Scheduled Appointment	1	104.99	<0.0001	0.53
2	Year of First Kept Appointment	3	130.14	<0.0001	0.56
3	Year of first appointment (Outcome 'Failed to Attend')	3	38.30	<0.0001	0.57
4	Data-zone (Child Versus Practice)	1	24.19	<0.0001	0.58
5	Dietary Advice Given at First Kept Appointment	1	10.37	0.0013	0.58

A backward stepwise fitting routine by logistic regression was then subjected to each univariately significant variable in the Practice Interaction group. Both the forward and backward methods produced the same model.

Table 5-46 Final Model for Variable Group: Practice Interaction

Variable	OR	95% CI	P
Result of Last Scheduled Appointment			**<0.0001**
Attended	1.79	(1.62, 1.97)	<0.0001
FTA	-	Referent	
Year of First Kept Appointment			**<0.0001**
2006	2.10	(1.74, 2.52)	<0.0001
2007	1.53	(1.39, 1.68)	<0.0001
2008	1.05	(0.97, 1.14)	0.2614
2009	-	Referent	
Data-zone (Child Versus Practice)			**<0.0001**
In Data-zone	-	Referent	
Not in Data-zone	1.19	(1.11, 1.27)	<0.0001
Dietary Advice Given at First Kept Appointment			**0.0013**
Yes	1.25	(1.09, 1.43)	0.0013
No	-	Referent	
Year of first appointment (Outcome 'Failed to Attend')			**<0.0001**
2006-2007	-	Referent	
2008	0.86	(0.64, 1.15)	0.2990
2009	1.50	(1.11, 2.03)	0.0092
No FTA	1.48	(1.22, 1.80)	<0.0001

Figure 5-2 ROC plot indicating the C-index which is equal to the area under the curve for the Practice Interaction Model



5.4.3 Patient Profile Model

The forward stepwise fitting routine by logistic regression for the univariately significant variables in the Patient Profile group (section 5.3.35) is summarised in Table 5-47:

Table 5-47 Forward Model Fitting for Variable Group: Patient Profile Group

Step	Variable	Df	χ^2	p	C-index
1	Age at First Kept Appointment	4	138.02	<0.0001	0.55
2	Community Health Partnership	12	122.70	<0.0001	0.58
3	Age at First Failed to Attend Appointment	5	92.60	<0.0001	0.59
4	Year of Birth	3	38.04	<0.0001	0.59
5	Urban/Rural Classification	3	23.21	<0.0001	0.60
6	SIMD	4	25.65	<0.0001	0.60
7	Caries Risk Assessment Smoker	2	14.53	0.0007	0.60
8	Caries Risk Assessment: Pain	1	9.05	0.0026	0.60
9	Dental Health Support Worker Contact	1	6.10	0.0135	0.60
10	Age at First Appointment	4	9.54	0.0489	0.60

Each univariately significant variable in the Practice Profile group was then subjected to a backward stepwise fitting routine by logistic regression. This is summarised below in Table 5-48.

Table 5-48 Backward Model Fitting for Variable Group: Patient Profile Group

Step	Variable	Df	χ^2	p	C-index
1	Health Board – REMOVED	1	0.03	0.85	0.60
2	Age of Mother - REMOVED	5	6.53	0.26	0.60
3	Age at First Kept Appointment - REMOVED	4	8.68	0.07	0.60

The backward routine produced a model with the same c-index, but with different variables than the forward routine. ‘Age at First Kept Appointment’ was in the forward model but not the backward model whereas ‘Caries Risk Assessment: Risk Total’ and ‘Caries Risk Assessment: Decay Likely’ were retained in the backward

model but not included in the forward model. As the forward model had fewer variables, it was preferred. The final model for this group was as follows:

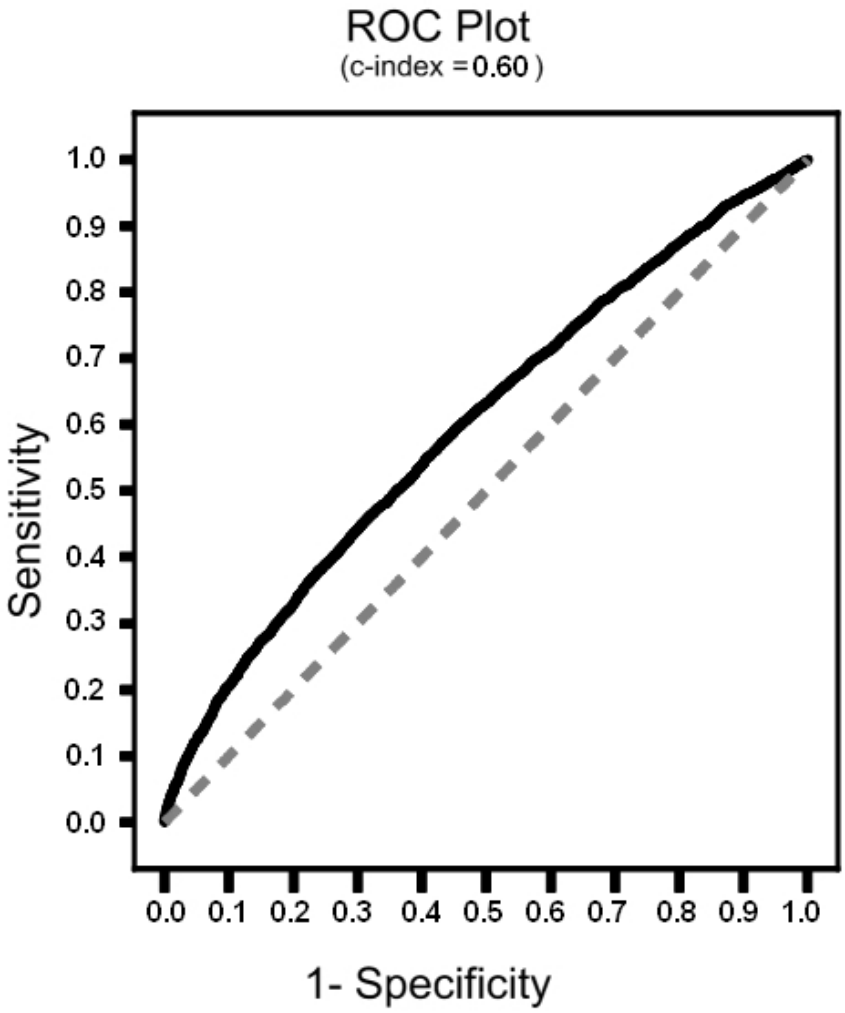
Table 5-49 Final Model for Variable Group: Patient Profile

Variable	OR	95% CI	p
Age at First Kept Appointment			**0.0734**
< 6 months	1.10	(0.77, 1.57)	0.6096
6-11 months	0.82	(0.53, 1.27)	0.3740
12-23 months	0.63	(0.38, 1.03)	0.0660
24-35 months	0.78	(0.43, 1.39)	0.3939
> 35 months	-	Referent	
Community Health Partnership			**<0.0001**
North Lanarkshire	-	Referent	
South Lanarkshire	1.11	(0.97, 1.27)	0.1363
East Glasgow	1.05	(0.91, 1.22)	0.4668
East Ayrshire	1.76	(1.48, 2.09)	<0.0001
North Glasgow	1.02	(0.88, 1.18)	0.7847
North Ayrshire	1.49	(1.25, 1.78)	<0.0001
South West Glasgow	0.84	(0.72, 0.98)	0.0229
Inverclyde	1.01	(0.83, 1.23)	0.9252
South East Glasgow	0.72	(0.61, 0.86)	0.0002
Renfrewshire	1.14	(0.96, 1.36)	0.1345
South Ayrshire	1.20	(0.95, 1.50)	0.1262
West Glasgow	1.36	(1.06, 1.76)	0.0172
Other	1.44	(1.08, 1.91)	0.0130
Age at First Failed to Attend Appointment			**<0.0001**
< 6 months	-	Referent	
6-11 months	0.91	(0.74, 1.13)	0.3979
12-23 months	1.60	(1.30, 1.96)	<0.0001
24-35 months	2.01	(1.56, 2.58)	<0.0001
> 35 months	2.06	(1.50, 2.83)	<0.0001
No FTA	1.39	(1.16, 1.66)	0.0004
Year of Birth			**<0.0001**
2005-2006	1.44	(1.26, 1.65)	<0.0001
2007	1.32	(1.17, 1.49)	<0.0001
2008	1.08	(0.96, 1.22)	0.1943
2009	-	Referent	
Urban/Rural Classification			**<0.0001**
Large Urban Areas	-	Referent	
Other Urban Areas	1.03	(0.90, 1.19)	0.6513
Small Towns	0.76	(0.65, 0.88)	0.0003
Rural	1.01	(0.87, 1.19)	0.8741
SIMD			**<0.0001**
1	-	Referent	
2	1.00	(0.91, 1.09)	0.9274
3	1.18	(1.06, 1.31)	0.0029
4	1.17	(1.04, 1.32)	0.0105
5	1.31	(1.13, 1.52)	0.0003

Table 5-49 Continued

Caries Risk Assessment: Smoker				**0.0005**
Yes	-	Referent		
No	1.20	(1.08,	1.32)	0.0005
No CRA	NA	NA	NA	NA
Caries Risk Assessment: Pain				**0.0017**
Yes	-	Referent		
No	1.19	(1.06,	1.33)	0.0024
No CRA	1.24	(1.10,	1.41)	0.0007
Dental Health Support Worker Contact				**0.0089**
Yes	-	Referent		
No	1.31	(1.07,	1.60)	0.0089
Age at First Appointment				**0.0549**
< 6 months	1.73	(1.21,	2.49)	0.0028
6-11 months	1.55	(0.99,	2.42)	0.0536
12-23 months	1.59	(0.96,	2.62)	0.0724
24-35 months	1.23	(0.68,	2.23)	0.4872
> 35 months	-	Referent		

Figure 5-3 ROC plot indicating the C-index which is equal to the area under the curve for the Patient Profile Model



5.4.4 'Winning Candidates' Model

The independently significant variables from the three group models were collected together in a 'winning candidates' model and were firstly subjected to a forward stepwise fitting routine by logistic regression. This is summarised below in Table 5-50:

Table 5.50 'Winning Candidates' Forward Model Fitting of Independently Significant Variables

Step	Variable	Df	χ^2	p	C-index
1	Age at First Kept Appointment	4	138.02	<0.0001	0.55
2	Result of Last Scheduled Appointment	1	127.29	<0.0001	0.57
3	Age at First Failed to Attend Appointment	5	273.14	<0.0001	0.61
4	Total Number of Childsmile Patients in Practice	3	98.10	<0.0001	0.62
5	Community Health Partnership	12	150.55	<0.0001	0.63
6	Year of first appointment (Outcome 'Failed to Attend')	3	91.15	<0.0001	0.64
7	Practice Start Date	3	58.99	<0.0001	0.64
8	Year of First Kept Appointment	3	68.13	<0.0001	0.65
9	Urban/Rural Classification of Practice	3	38.86	<0.0001	0.65
10	SIMD Profile of Childsmile Patients Attending a Practice	3	30.83	<0.0001	0.65
11	SIMD	4	25.33	<0.0001	0.66
12	Year of Birth	3	14.97	0.0018	0.66
13	Dietary Advice Given at First Kept Appointment	1	9.58	0.0020	0.66
14	Caries Risk Assessment: Smoker	2	11.14	0.0038	0.66
15	Dental Health Support Worker Contact	1	6.98	0.0083	0.66
16	Age at First Appointment	4	13.51	0.0090	0.66
17	Caries Risk Assessment: Pain	1	6.43	0.0112	0.66
18	Urban/Rural Classification	3	10.75	0.0131	0.66
19	Data-zone (Child Versus Practice)	1	4.19	0.0407	0.66

After step 11, the c-index was not increased by the inclusion of the eight following variables indicating that these variables had negligible impact on the predictive

ability of this model. The independently significant variables from the three group models were then subjected to a backward stepwise fitting routine by logistic regression. This is summarised in Table 5-51:

Table 5-51 'Winning Candidates' Backward Model Fitting of Independently Significant Variables

Step	Variable	Df	χ^2	p	C-index
1	Age at First Kept Appointment - REMOVED	4	4.29	0.37	0.66

The backward routine produced a model with the same c-index, but one less variable than the forward routine. Age at First Kept Appointment was in the forward model but not the backward model. As the backward model had fewer variables, it was preferred. The final model for this group was as follows:

Table 5-52 'Winning Candidates' Model for Retention

Variable	OR	95% CI		P
Total Number of Childsmile Patients in Practice				**<0.0001**
< 101 Patients	-	Referent		
101-200 Patients	1.45	(1.32,	1.59)	<0.0001
201-300 Patients	1.72	(1.53,	1.93)	<0.0001
> 300 Patients	1.89	(1.63,	2.19)	<0.0001
Practice Start Date				**<0.0001**
2006	-	Referent		
2007	0.94	(0.85,	1.04)	0.2410
2008	1.05	(0.90,	1.22)	0.5395
2009	1.82	(1.57,	2.11)	<0.0001
Urban/Rural Classification of Practice				**<0.0001**
Large Urban Area	-	Referent		
Other Urban Area	1.04	(0.89,	1.20)	0.6422
Small Towns	0.97	(0.80,	1.17)	0.7120
Rural	0.25	(0.16,	0.40)	<0.0001
SIMD Profile of Childsmile Patients Attending a Practice				**<0.0001**
1	-	Referent		
2	1.23	(1.07,	1.41)	0.0033
3	1.10	(0.94,	1.30)	0.2467
4-5	2.33	(1.60,	3.39)	<0.0001
Year of First Kept Appointment				**0.0001**
2006	1.42	(1.07,	1.88)	0.0151
2007	1.13	(0.95,	1.34)	0.1785
2008	0.90	(0.80,	1.01)	0.0734
2009	-	Referent		

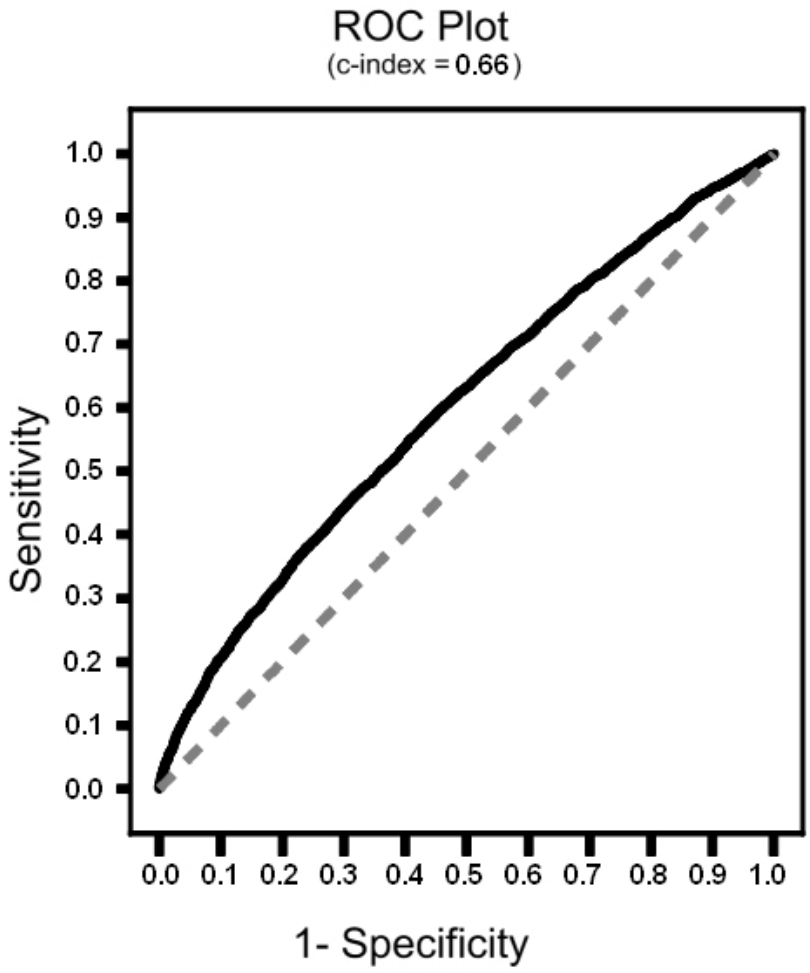
Table 5-52 Continued

Result of Last Scheduled Appointment				**<0.0001**
Attended	3.98	(3.43,	4.63)	<0.0001
FTA	-	Referent		
Data-zone (Child Versus Practice)				**0.0385**
In Data-zone	-	Referent		
Not in Data-zone	1.08	(1.00,	1.16)	0.0385
Dietary Advice Given at First Kept Appointment				**0.0028**
Yes	1.24	(1.08,	1.43)	0.0028
No	-	Referent		
Year of first appointment (Outcome 'Failed to Attend')				**<0.0001**
2006-2007	-	Referent		
2008	0.68	(0.50,	0.93)	0.0158
2009	1.16	(0.83,	1.61)	0.3790
No FTA	2.09	(1.61,	2.72)	<0.0001
Age at First Appointment				**<0.0001**
< 6 months	2.09	(1.62,	2.70)	<0.0001
6-11 months	1.40	(1.11,	1.78)	0.0054
12-23 months	1.05	(0.86,	1.29)	0.6259
24-35 months	1.01	(0.84,	1.21)	0.9508
> 35 months	-	Referent		
Community Health Partnership				**<0.0001**
North Lanarkshire	-	Referent		
South Lanarkshire	1.23	(1.06,	1.42)	0.0050
East Glasgow	1.35	(1.15,	1.56)	0.0003
East Ayrshire	1.95	(1.61,	2.35)	<0.0001
North Glasgow	1.21	(1.01,	1.45)	0.0432
North Ayrshire	1.75	(1.43,	2.13)	<0.0001
South West Glasgow	0.99	(0.84,	1.17)	0.9072
Inverclyde	0.85	(0.69,	1.06)	0.1408
South East Glasgow	0.80	(0.67,	0.97)	0.0191
Renfrewshire	1.45	(1.20,	1.75)	0.0001
South Ayrshire	1.84	(1.43,	2.38)	<0.0001
West Glasgow	1.41	(1.08,	1.85)	0.0114
Other	1.52	(1.13,	2.04)	0.0054
Age at First Failed to Attend Appointment				**<0.0001**
< 6 months	-	Referent		
6-11 months	0.81	(0.65,	1.01)	0.0642
12-23 months	1.60	(1.27,	2.02)	<0.0001
24-35 months	2.01	(1.53,	2.66)	<0.0001
> 35 months	2.07	(1.46,	2.93)	<0.0001
No FTA	0.53	(0.42,	0.67)	<0.0001
Urban/Rural Classification				**0.0169**
Large Urban Area	-	Referent		
Other Urban Area	1.00	(0.84,	1.18)	0.9563
Small Towns	0.78	(0.64,	0.95)	0.0116
Rural	1.01	(0.84,	1.20)	0.9537

Table 5-52 Continued

Year of Birth				**0.0001**
2006	1.47	(1.17,	1.85)	0.0010
2007	1.47	(1.24,	1.74)	<0.0001
2008	1.18	(1.03,	1.34)	0.0137
2009	-	Referent		
SIMD				**0.0002**
1	-	Referent		
2	1.00	(0.91,	1.10)	1.0000
3	1.20	(1.08,	1.35)	0.0010
4	1.15	(1.02,	1.30)	0.0283
5	1.30	(1.11,	1.51)	0.0009
Caries Risk Assessment: Pain				**0.0049**
Yes	-	Referent		
No	1.17	(1.04,	1.31)	0.0093
No CRA	1.23	(1.08,	1.40)	0.0015
Caries Risk Assessment: Smoker				**0.0017**
Yes	-	Referent		
No	1.18	(1.06,	1.31)	0.0017
No CRA	NA	NA	NA	NA
Dental Health Support Worker Contact				**0.0039**
Yes	-	Referent		
No	1.35	(1.10,	1.67)	0.0039

Figure 5-4 ROC plot indicating the C-index which is equal to the area under the curve for the 'Winning Candidates' model



This model has the highest c-index of all the models in this study.

5.4.5 Childsmile Model

Table 5-53 Childsmile Model by Significance

Variable	Chi-Square	Df	p	C-index
Total Number of Childsmile Patients in Practice	119.60	3	<0.001	0.55
Age at First Kept Appointment	138.21	4	<0.001	0.55
Urban/Rural Classification of Practice	87.55	3	<0.001	0.53
Result of Last Scheduled Appointment	106.38	1	<0.001	0.53
Urban/Rural Classification	51.75	3	<0.001	0.53
SIMD	30.42	4	<0.001	0.52
Result of First Scheduled Appointment	36.15	1	<0.001	0.51
Fluoride Varnish Application at First Kept Appointment	5.31	1	0.021	0.51
Dietary Advice Given at First Kept Appointment	16.05	1	<0.001	0.51
SIMD Profile of Childsmile Patients Attending a Practice	7.85	3	0.049	0.51

The univariately significant variables that Childsmile could potentially exploit to improve retention (Table 5-53) were firstly subjected to a forward stepwise fitting routine by logistic regression. This is summarised below in table 5-54:

Table 5-54 Model Fitting for Childsmile Variables

Step	Variable	Df	χ^2	P	C-index
1	Age at First Kept Appointment	4	138.02	<0.0001	0.55
2	Result of Last Scheduled Appointment	1	127.30	<0.0001	0.57
3	Total Number of Childsmile Patients in Practice	3	110.60	<0.0001	0.59
4	Urban/Rural Classification of Practice	3	51.61	<0.0001	0.60
5	SIMD Profile of Childsmile Patients Attending a Practice	3	22.98	<0.0001	0.60
6	Result of First Scheduled Appointment	1	14.80	0.0001	0.60
7	SIMD	4	21.06	0.0003	0.60
8	Dietary Advice Given at First Kept Appointment	1	13.21	0.0003	0.61
9	Urban/Rural Classification	3	8.40	0.0385	0.61

After step 4, there was only a small improvement in the c-index following the inclusion of the five following variables indicating that these variables had negligible impact on the predictability of this model. A backward stepwise fitting routine by logistic regression was then subjected to each univariately significant variable. Both the forward and backward methods produced the same model.

The variable 'Fluoride Varnish Application at First Kept Appointment' was the only variable that was found not to be independently significant of the other variables and is therefore not included in the Childsmile model. The final model including those variables that Childsmile could potentially exploit over to improve retention was as follows:

Table 5-55 Childsmile Model for Retention

Variable	OR	95% CI	p
Age at First Kept Appointment			**<0.0001**
< 6 months	1.44	(1.26, 1.64)	<0.0001
6-11 months	0.98	(0.85, 1.12)	0.7530
12-23 months	0.86	(0.74, 0.99)	0.0401
24-35 months	0.97	(0.83, 1.14)	0.7243
> 35 months	-	Referent	
Result of Last Scheduled Appointment			**<0.0001**
Attended	1.69	(1.53, 1.86)	<0.0001
FTA	-	Referent	
Total Number of Childsmile Patients in Practice			**<0.0001**
< 101 Patients	-	Referent	
101-200 Patients	1.25	(1.15, 1.35)	<0.0001
201-300 Patients	1.36	(1.23, 1.50)	<0.0001
> 300 Patients	1.60	(1.42, 1.80)	<0.0001
Urban/Rural Classification of Practice			**<0.0001**
Large Urban Area	-	Referent	
Other Urban Area	1.14	(1.00, 1.31)	0.0556
Small Towns	1.02	(0.86, 1.23)	0.7985
Rural	0.32	(0.20, 0.51)	<0.0001
SIMD Profile of Childsmile Patients Attending a Practice			**<0.0001**
1	-	Referent	
2	1.13	(1.01, 1.26)	0.0300
3	1.02	(0.90, 1.17)	0.7163
4-5	1.94	(1.36, 2.75)	0.0002
Result of First Scheduled Appointment			**0.0003**
Attended	1.26	(1.11, 1.44)	0.0003
FTA	-	Referent	

Table 5-55 Continued

SIMD				**0.0004**
1	-	Referent		
2	0.95	(0.87,	1.04)	0.2336
3	1.12	(1.00,	1.24)	0.0413
4	1.10	(0.99,	1.25)	0.0857
5	1.27	(1.10,	1.47)	0.0012
Dietary Advice Given at First Kept Appointment				**0.0003**
Yes	1.29	(1.13,	1.48)	0.0003
No	-	Referent		
Urban/Rural Classification				**0.0386**
Large Urban Area	-	Referent		
Other Urban Area	1.12	(0.98,	1.28)	0.1097
Small Towns	0.92	(0.77,	1.09)	0.3263
Rural	1.13	(0.97,	1.32)	0.1221

Figure 5-5 ROC plot indicating the C-index which is equal to the area under the curve for the Childsmile model

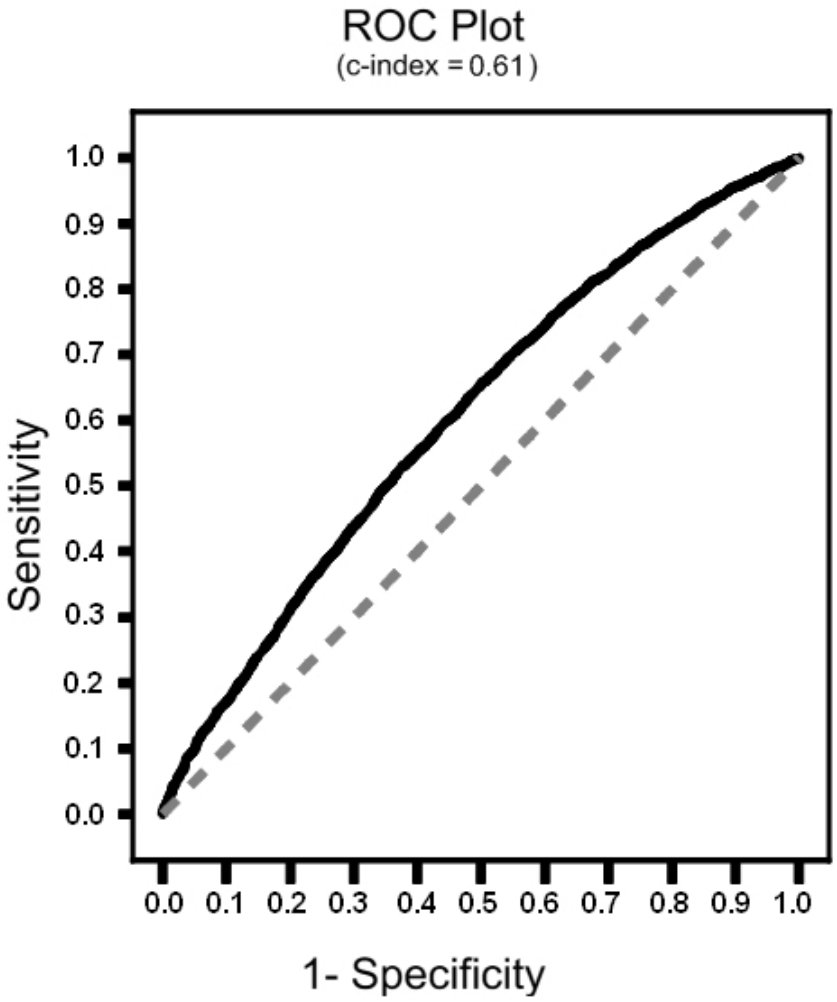


Figure 5-6 Predicted Probabilities of Retention using Childsmile Model

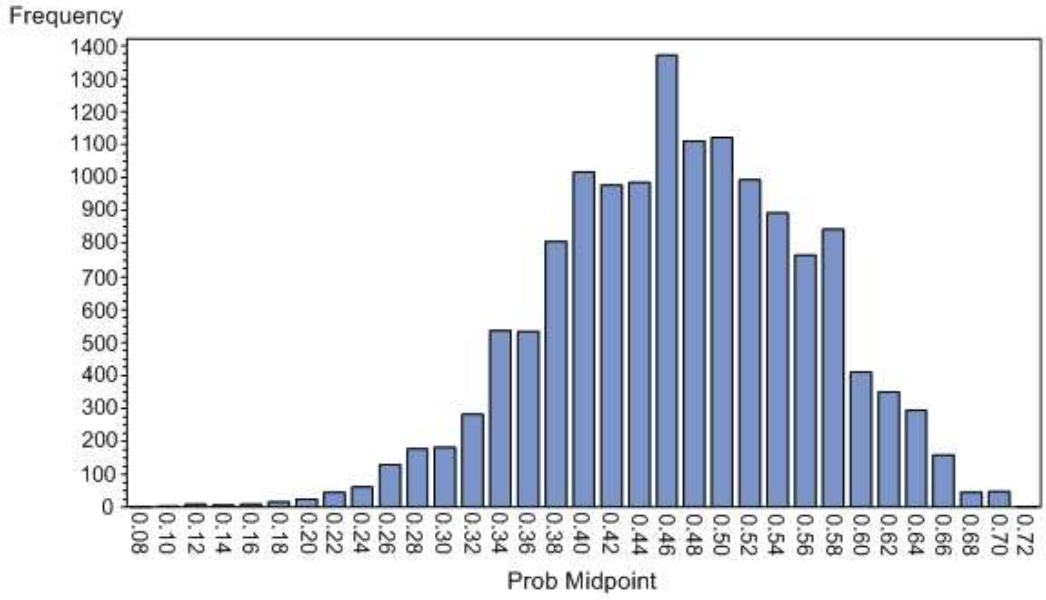
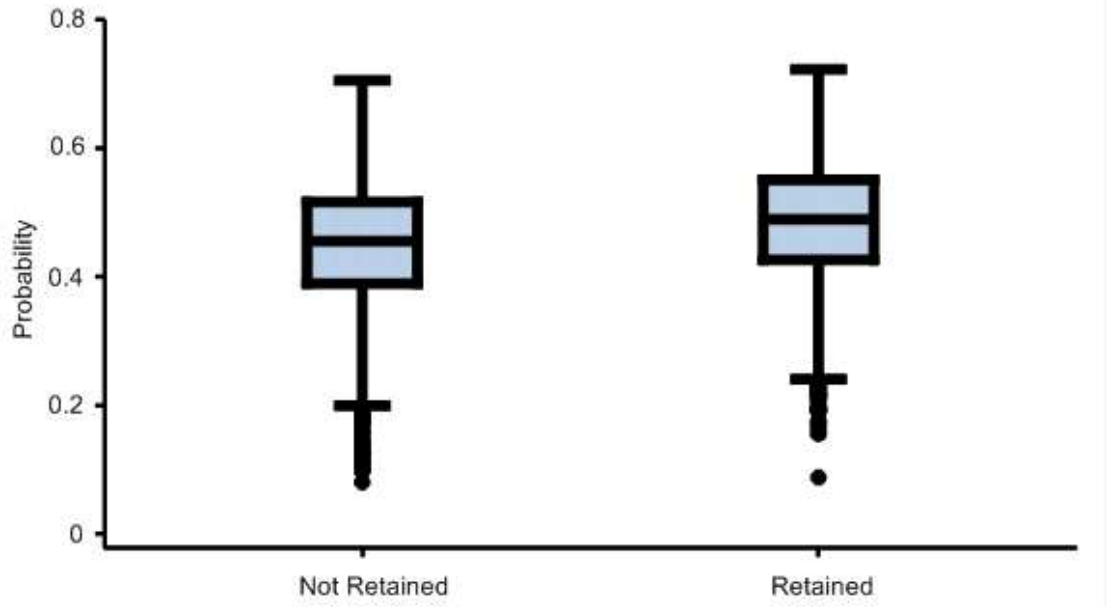


Figure 5-7 Boxplots indicating Probability of Retention using Childsmile Model (Children Retained versus Children Not Retained)



With a C-value of 0.61, the Childsmile Model has low predictability meaning that the model cannot discriminate between all the children that were retained and those that were not retained in Childsmile Practice. This is apparent in the boxplots where the calculated probability of retention is only slightly higher for those children who were actually retained.

Chapter 6 – Discussion

6.1 Key Findings

As suggested by previous research [Gift, 1984], factors linked to deprivation, accessibility, and current health status were found to influence retention. Children from the least deprived areas were the most likely to be retained, whilst those from the most deprived areas were the least likely. Although there were no data available for the current health status of the child, the results indicated that the current oral health status of the parent/carer was linked to retention. Children whose parent's last visit to a dental practice was for pain relief were less likely to be retained. There was also evidence to suggest that there was lower attendance amongst children whose parent/carers smoke.

The results suggested that these three factors (deprivation, accessibility and current health status) were not mutually exclusive in determining the odds of retention, and that other factors such as the age of the child and the dental practice that they attended should also be considered. There is also evidence to suggest that those delivering Childsmile, whether that is the dental practice or the dental health support worker (DHSW), were not equipped to deal with the ever growing demand for Childsmile Practice. Retention rates worsened as the programme grew, and the results indicated that DHSWs were not contacting those families who had not been attending appointments.

Due to the high number of patients that were available for the analysis in this study, the p-values for many of the variables were significant. No individual variable was found to be predictive of retention although many variables particularly those in both the 'winning candidates' and Childsmile models, could indicate the likelihood of retention. Therefore the magnitude and size of the odds ratio of each category within the variables was analysed to see which groups of children were more/less likely to be retained within Childsmile Practice.

The computer programme designed to analyse the data in the study was able to provide insight into factors related to retention. This resulted in a number of recommendations for the Childsmile programme to help it improve retention. This model could also be used to continue to monitor retention on Childsmile taking into

account these findings. This research tool is also easily adapted to provide data linkage between other data sources including oral health data from the *National Dental Inspection Programme* (NDIP). It can also be readily modified to test other related questions in the evaluation of Childsmile.

6.2 Determinants of Retention

Of the data available, the literature review suggested that low deprivation, accessibility of dental practices, or having no current health issues would increase retention [Gift, 1984].

6.2.1 Deprivation

The SIMD quintile score of the that area the child lived in was used as the indicator of their deprivation status. After being analysed univariately, it was shown that SIMD was a highly significant variant for calculating the odds of retention. However, with a c-index of 0.52 (section 5.3.22), it had a low level of predictability. When SIMD was added to the Childsmile prediction model, it had a minimal impact on the predictability of the model.

Children living in an area with a SIMD score of 5 (least deprived) had the highest odds of being retained in Childsmile Practice when compared against those living in more deprived areas. Although rates of retention were slightly lower in SIMD 2 compared to SIMD 1, the overall pattern of the data suggests that there is a correlation between deprivation and retention. SIMD is a measure of deprivation that is based on area deprivation rather than household deprivation. Whilst SIMD can be a proxy for household deprivation, it should be considered that when using an area level deprivation score that the level of household deprivation across an area will vary. This means that the level of deprivation for an individual household may not always match the deprivation level of the area it is within [Macintyre, Maciver and Soomans, 1993].However, the socioeconomic status of an area in relation to accessing services such as public transport and health care remains relevant regardless of the household deprivation status. Although it could be expected that persons with analogous household deprivation levels would produce similar results as each other regardless of their geographical location, within reason, it is more likely that the outcomes are a result of a combination between both the household and the area deprivation levels [McCulloch, 2000].

These findings provide significant statistical evidence to support the insignificant findings of the Jamieson and Thompson study of 2006. This study which used questionnaires to assess oral health inequalities amongst adults in New Zealand suggested a level of correlation between deprivation (area and household) and engagement with dental services. However their results were insignificant which may have been due in part to the low number of participants in this study (n = 431). Although the Jamieson and Thompson study had analysed adult engagement, in Childsmile Practice it was the parent or carer who was responsible for the child's engagement. Therefore Jamieson and Thompson's suggestion of a link between area deprivation and dental services engagement is consistent with the significant statistical results of this study which has also found a link between area deprivation and dental attendance.

6.2.2 Accessibility

Accessibility has been shown to impact on the utilisation of dental service [Gibson 2003]. The variables that were available in this study for analysing the impact of accessibility on retention within Childsmile Practice were 'Mean SIMD', 'Urban/Rural Classification of Practice' and 'Urban/Rural Classification'.

6.2.2.1 Accessibility – SIMD Profile of Practice

Results from previous NDIP reports have indicated that children who lived in areas of high deprivation had greater levels of decay from a young age and were therefore most at need of early dental interventions [McMahon et al, 2010]. The results of the analysis of the SIMD profile of the dental practices, with regards to their Childsmile patients, indicated that these practices were predominately delivering Childsmile interventions to those most in need of the service as intended by the programme [Turner et al, 2010]. Only 1% of patients had attended a Childsmile dental practice where the mean SIMD of the patients had been from the two most affluent quintiles. As the initial phases of Childsmile was targeted towards children residing in one of the three most deprived SIMD quintiles, it would be expected that the SIMD profiles would predominantly reflect these higher levels of deprivation. Due to the financial reward available to practitioners for enrolling children in Childsmile practice, it could be expected that dental practices were more open to taking patients from all backgrounds. However in relation to retaining children in Childsmile dental practices after the first appointment, there

remained a level of inequality. The results indicated that the odds of being retained lowered as the mean SIMD of the practice became more deprived.

6.2.2.2 Urban/Rural Classifications

There were 1149 children living in a rural setting but only 121 children had visited a dental practice in a rural location. These 121 children had the lowest odds of retention (OR=0.37) compared with those living in an Urban Area. This suggests that there may have been poor access to dental practices delivering Childsmile in rural settings, and that families had to travel outwith their local area to attend an appointment. As the cohort was mainly comprised of children living in one of the three most deprived SIMD quintiles, with low income and poor access to public transport being amongst the indicators used to calculate a SIMD score, it could be expected that families living in a rural setting would have additional travel costs associated with accessing a Childsmile dental practice, and would therefore have lower retention rates than those living in an urban area where there are a greater number of practices available that are delivering Childsmile. However those who lived in a rural area had significantly higher odds (OR = 1.20) of retention than those living in a 'Large Urban Area'. This is only slightly lower than the odds of those living in an 'Other Urban Area' (OR = 1.28). Children who lived in the most deprived SIMD quintile were most likely to live in a 'Large Urban Area' [Scottish Government, 2010c]. This could explain why those living in a rural setting were more likely to be retained in Childsmile than those from a 'Large Urban Area' as children that live in the more deprived quintiles were less likely to be retained (see section 6.1.1).

As already discussed, when considering factors such as transportation, it may have been expected that access to dental services and therefore retention would have been lower for children residing in a high deprivation rural area. However the recent Levin et al [2010] comparison of the dental health of 5 years from urban and rural areas in Scotland, where children living in rural Scotland were identified as having better oral health, found that transport was not a factor with regards to rural children accessing dental service. Their study also reported that as there were a high proportion of salaried services in rural areas, both permanent and mobile, this could improve access to dental services in rural areas. The Childsmile retention results provided contrasting results; while children from rural areas were more likely to be retained, those attending a dental practice in a rural area were

the least likely to be retained. Children residing in rural areas were also more likely to attend a dental practice not in a rural setting. As families from rural areas traditionally have to travel outwith the rural setting to access services, travelling to attend a Childsmile Practice appointment have been better suited to the routine of these families. However, the results partly support the aforementioned study when considering the urban rural classification of the child's address. There were inequalities with regards to access in favour of those residing within a rural area, although there remains poor access to dental services that are actually situated in rural areas, although this may be as a result of the low numbers of non-salaried General Dental Services (GDS) in rural settings.

6.2.3 Current Health Status

There were no variables that captured either the child's general or oral health status. There were however, data available on the health status of 47% of the parents/carers of the participants via the caries risk assessment completed by a health visitor (HV) . These data identified if the parent/carer of the child was a smoker as well as indicating if their last visit to a dental practice was to obtain pain relief. These will be discussed in turn.

6.2.3.1 Smoking in the Residence of the Child

The results of the analysis indicated that children who did not reside with a smoker were significantly more likely to be retained in Childsmile (OR = 1.21) than those that did reside with a smoker, although it did not alter the c-value of the 'winning candidates' model and therefore provides minimal additional predictability of retention.

There is evidence from Lopez and Baelum [2007], that those who smoke were less likely to attend a dental practice. The clustering of risk factors related to poor health in Scotland had been found to increase with the prevalence of one or more risk factor [Lawder et al, 2010]. The presented study generates further evidence to support the finding on risk factor clustering as the results suggest that young children in Scotland are less likely to attend a dental practice regularly if one of their parents or carers is a smoker even when adjusted for deprivation. The odds of retention were also lower as the total number of caries risk factors identified increased adding further support to the clustering hypothesis.

Furthermore, in *The Scottish Health Survey 2003* [Scottish Government, 2005b], 3% of both male and female respondents who stated that they did not smoke were found to be smokers after saliva tests were used for validation of their responses. It should therefore be expected that not all parents who were given a CRA will have reported that they were smokers to the health visitor (HV).

6.2.3.2 Parent's Last Visit to Dental Practice was to obtain Pain Relief

Children whose parent's/ carer's last visit to a dental practice were reported as being to obtain pain relief were significantly less likely to be retained than those whose parent's last visit was reported as a routine check-up. Generally people from a deprived area are more likely to have attended a dentist for pain relief than for a regular check-up [Craft and Grouche, 1980]. It can therefore be concluded that there is a plausible link between parent's/carer's dental attendance patterns and whether or not their child will be retained in Childsmile as retention in this study can also be used as an indicator of regular attendance.

Similarly to whether the child resided with a smoker, the reason for their parent's last visit to a dental practice could indicate how likely a child was to be retained but could not add any predictability to the 'winning candidates' model. As this information was also gathered as part of the CRA, it was not included in the final Childsmile model as this assessment is no longer completed.

6.2.4 Other determinants

6.2.4.1 Age of the Child

In the Childsmile model, the age of the child when they first attended a Childsmile Practice appointment was found to be the most strongly predicative variable for retention.

A possible explanation for this finding could be that parents with younger children are more motivated and willing to accept help from health services. Families may also have viewed the interventions at Childsmile Practice as being aimed towards younger children, and therefore those families that attended for the first time when the child was older, may have felt the information was less relevant for them, resulting in the family not returning to the dental practice.This finding contradicts Scottish dental registration statistics which indicated that general

dental registration and participation (attendance at least once within two years) goes up with age; children aged 0-2 dental registration and participation was lower than that of 3-5 year olds [ISD Scotland, 2010d].

6.2.4.2 Result of the Last Scheduled Appointment

The result of the last scheduled appointment increased the c-value in both the 'winning candidates' and Childsmile models. Although the results indicated what would have been expected, that those children whose last scheduled appointment was kept would be more likely to be retained than those that failed to attend their last scheduled appointment, the finding that 82% of the children who were not retained had actually attended their last scheduled appointment was notable. When an appointment is not kept, a dental practice should complete a 'GP17'form to indicate that the patient did not attend that appointment. This result has two possible explanations: (i) Childsmile dental practices were not always recording when an appointment was not kept by a patient, which was possible as there were no financial incentives for the dental practices to record this information, or (ii) that in some cases, children were not being scheduled with a second appointment by the dental practice and therefore were not being offered the opportunity to be retained in Childsmile Practice.

The results indicated that most families in Childsmile were from a deprived area and were therefore at an increased risk of low dental attendance as well as poor dental health and therefore dental practices should be trying to ensure that families ,if they are to attend and engage, are retained in Childsmile Practice. The practice can do this by scheduling a second appointment on the day the family attended their first appointment, or if that is not possible, by contacting the family at a later date. There are recommendations from the Scottish Dental Clinical Effectiveness Programme's (SDCEP) *Oral Health and Assessment and Review* document [2011] which state that children who are at an increased risk of poor oral health should be assessed a minimum of every twelve months at a dental practice and that the date of the next appointment should be agreed at the current appointment. The SDCEP [2010] further recommend that children should be receiving a fluoride varnish application (FVA) twice a year so return appointments are essential to ensure that this is completed.

Prior research suggests that staff working in dental practices may develop a negative attitude towards groups of patients when there are high rates of non-attendance from a particular group i.e. deprived social groups. [Mofidi, Rozier and King, 2002]. With high rates of non-retention of children who attended a dental practice where the Childsmile patient profile was deprived (see section 6.2.2.1), it is possible that a prevalence of negative attitudes towards Childsmile patients already exists amongst dental practice staff. This in turn may have led to dental practices being less willing to allocate appointments to Childsmile patients when instead, these appointments could be allocated to non-Childsmile patients who may have been more likely to attend.

6.2.4.3 Number of Childsmile Patients Attending

The total number of patients who attended a Childsmile dental practice was found to increase the c-index of both models thus making the models more predictive of retention. Patients attending a dental practice that delivered Childsmile interventions to high numbers of children were more likely to be retained than those who had attended a practice that had only delivered to low numbers of Childsmile patients. A possible explanation for this finding was that practices delivering Childsmile to greater numbers of children would potentially have a higher number of staff trained to deliver Childsmile than those delivering to lower numbers of children. This could also suggest that as Childsmile expanded, larger dental practices were better equipped to deliver to the growing number of children being referred to them. These larger practices may also have been better equipped for treating children as well as being more orientated towards seeing young children. Further research would be required to link dental practice staffing levels and practice space with retention in Childsmile. Another possible explanation for this finding is that those practices that had delivered Childsmile to greater numbers of children were more motivated to delivering Childsmile than other practices, which is in turn supported by the larger numbers of children seen.

6.3 Retention Rates across Time

Retention rates in Childsmile have worryingly decreased with time. Children who either attended their first appointment or had their first scheduled appointment in the earlier years of the programme (2006-2007) were significantly more likely to be retained than those who started Childsmile at a later date. This was not a result of

shorter follow-ups for children first seen in the latter years, as children were only assessed for retention one whole year after their initial attendance. This allowed equal opportunity for all in the study to be retained. The variable 'Year of first appointments (Outcome 'Failed to Attend')' was univariately significant. However this significance may have been due to the large number of children (92%) who attended the first appointment as none of the individual categories within this variable were found to be significant. This variable followed the same pattern as the two other date variables ('year of first appointment' and 'year of first kept appointment'); retention rates generally decreased every year since the programme began. Although retention was lower in the latter years, the odds of retention improved slightly in 2009, although not significantly. This slight improvement could be explained by the change in the payments system as described in section 4.5.2.6. Until 2009, there was no financial incentive for a dental practice to see a Childsmile patient for a second time which may partly explain the gradual decrease in retention observed prior to 2009. As Childsmile was expanding and more patients were being referred into it each year, there may not have been enough Childsmile dental practices and trained dental nurses to deliver the programme to the growing number of patients being referred, although this hypothesis would require further research. Another possible explanation is that dental practices were motivated to deliver Childsmile Practice at the onset of the programme and that this motivation had decreased with time.

6.4 Health Boards and Community Health Partnerships

Of the three health boards analysed in this study: Ayrshire and Arran (A&A), Greater Glasgow and Clyde (GGC) and Lanarkshire (LAN), retention was highest in A&A and lowest in GGC. This difference could be due to the greater number of deprived children living within GGC which contains the highest proportion of the 15% most deprived data-zones in Scotland (30%) compared to the 17% which live within A&A. This pattern of retention was also reflected in the Community Health Partnerships (CHPs). Of the 13 CHPs analysed, the three A&A CHPs were all within the top four CHPs for rates of retention, whereas three of the four CHPs with the lowest rates of retention were in GGC. Childsmile co-ordinators oversee the delivery of Childsmile in each individual health board. Unlike in GGC, the co-ordinators for A&A and LAN have been in that job role since the onset on the

programme. This consistency may have leant towards a better level of co-operation between Childsmile staff and dental staff which may in turn have led to higher retention in these two health boards.

6.5 Dental Health Support Workers & Health Visitors

The primary role of the DHSW was to facilitate children and their parents into attending Childsmile dental practices. However their role also included offering continued support to families who required additional assistance even after they had initially attended a Childsmile dental practice. The DHSWs were also responsible for contacting families that had stopped attending the Childsmile dental practice to try and re-engage them back into the programme. The role of a facilitator, with regards to regular communication with the participants, has been credited for the high levels of retention in other public health programmes such as *Parents Matter* [Armistead et al, 2004]. However, the results of the presented study suggest that DHSW interaction with the family after they had attended a Childsmile dental practice did not improve the odds of retention. Both variables that analysed DHSW contact were significant, but this would have been due to the high number of participants in the study as the number of recorded DHSW contacts were considerably low, particularly for those children that had failed to attend a Childsmile appointment, n = 123 (3%).

After the recording of Childsmile Practice dental activity moved from the 'Record of Child/Parent Contact' form to the 'GP17' form, a formal process of the dental practice informing DHSWs of non-attendees was no longer available which may account for the low number of families that were subsequently contacted. It should also be considered that as Childsmile Practice expanded each year, the workload of the DHSWs would have increased, which may have led to a decreased capacity to contact families that had already joined Childsmile Practice as they would primarily have been focused on facilitating new families into Childsmile Practice. This provides further evidence that as Childsmile expanded, the levels of staff required to ensure that Childsmile was being delivered as envisaged may not have been adequate as the DHSWs may have been more focussed on contacting new children rather than those already in the programme who required additional support.

Children who were referred into Childsmile Practice via a Health Visitor (HV) were more likely to be retained than those who were not. HVs have been involved in child health for a long time in Scotland and this may have resulted in HVs being perceived as a higher authoritative health figure than a dental practitioner or a DHSW, which is itself a relatively new job role. This hypothesis is supported by Zittel-Palamara et al [2005] who suggested that using established authoritative figures such as social workers, HVs and their equivalents can improve access to dental services.

6.6 Unknown factors

Although there were a limited amount of data available that could be linked to the current health status of the parents/carers of the children in this study, there were not any data available for the current health status of the children themselves. Children with on-going non-dental related health issues may have had their health care prioritised towards the child's primary health concern at the detriment of their dental care which could have resulted in these children not being retained within Childsmile. Although there were no data on the current oral health status of children that had attended a Childsmile appointment available, McMahon et al [2011] reported that oral health inspections of three years old children in Glasgow had indicated that poor oral health existed amongst children in this age group, suggesting that those most at need weren't being referred into or engaging with Childsmile.

Although a child may not have been retained in Childsmile Practice, it is unknown whether the child continued to attend the dental practice to receive non-Childsmile treatments i.e. restoration and extraction of decayed teeth. In the cases where a child may have had a severe or on-going oral health problem, the interventions offered by Childsmile would not have been adequate enough to treat the child as preventive care is the focus of Childsmile. Therefore, it is possible that these children were given non-Childsmile treatment instead, which better suited their needs when they attended the dental practice. However, as there was a financial incentive for continuous enrolment in Childsmile, children may have continued to be recorded as attending a Childsmile appointment as part of their wider treatment.

It was suggested by the Children Dental Health Project [2010] that pregnant mothers were less likely to utilise dental services. As the results of this study have suggested that the attendance habits of a child may reflect those of their parent/carer, it could be expected that children in Childsmile Practice whose mother is pregnant would be less likely to be retained.

Although the 'HVCRA' form was intended to record the number of children in each family, the quality of these data were poor and could not be interpreted to ascertain if the children in this study had older siblings who had previously attended a Childsmile appointment. A possible hypothesis is that parents/carers with older children who had previously attended Childsmile, particularly in the cases where there was more than one older child, may have felt a repetition in the information provided and therefore thought it not necessary for the younger child to continue attending. A second hypothesis is that children with older siblings would have been more likely to be retained as the family may have been more highly motivated towards Childsmile due to their prior involvement and any health benefits they had gained from attendance. This hypothesis is supported by an audit of four dental practices delivering Childsmile in LAN which indicated that attendance was poorer when the child was the first sibling from a family to attend the practice, however the number of children who had a sibling that had already attended was too low to make this finding significant [Watters, 2010] and therefore attendance and retention with regards to siblings remains inconclusive.

It was also unknown which member of the dental practice team (dentist, hygienist or dental nurse) had delivered the Childsmile interventions. Similarly, it was unknown what level of experience the staff delivering Childsmile had with working with children, although it could be expected that those practices used to treating children prior to Childsmile would have higher retention rates due to both past experience, as well as the practice being better suited towards children.

Similarly, the 'HVCRA' form was used to collect data on the ethnicity of the child. Although a key was available for reference when completing this section, this field was often either uncompleted or HVs used a different code to indicate ethnicity from the one described in the forms guidance notes (see appendix 2). The use of this field was deemed unreliable for analysis by the Childsmile programme for all studies that it is involved in. Conway et al [2007] completed a study, prior to the

onset of Childsmile, which analysed dental caries prevalence in five year old children from different ethnic groups in Glasgow. They reported that children from minority ethnic groups had higher rates of tooth decay than the majority white ethnic group over and above deprivation. This suggests that ethnicity may have been a relevant factor.

6.7 Attendance Models

The results of this research provide support for some elements of Andersen's attendance model, *"Predisposing ->Enabling ->Need ->Use",* [Andersen and Newmen, 1973] but are less supportive of other elements. Also, Andersen's model does not consider factors that are independent of the patient such as the characteristics of the dental practice providing the service.

6.7.1 Predisposing Factors

Of the children initially referred into Childsmile from a Health Visitor (n=22,564), 63% initially attended a Childsmile dental appointment whilst only 29% were subsequently retained within the programme. Although the risk of dental caries in Scottish children was amongst the highest in Europe at the onset of Childsmile [Scottish Executive, 2005], the predisposing factor that the risk of a disease would lead to higher uptake of a service was not reflected in Childsmile Practice. Andersen states that because oral health is generally not life threatening, utilisation of dental health services may be lower than other health services. This could partly explain the low uptake and retention within Childsmile.

Socioeconomic factors such as deprivation status and socio-demographic factors (age, sex, race and education) were also highlighted by Andersen as being predisposing factors. As Childsmile Practice was initially targeting towards deprived communities, higher levels of uptake of the programme from this social group were to be expected. However, it was children who were from an affluent area that were the most likely to have continued engagement with the programme. Although data on race was unavailable for this research, the Conway et al study [2007] on the prevalence of dental caries across differing ethnic groups in Glasgow prior to the onset of Childsmile does suggest that race could have been a factor. There were no available data related to education and the age of the mother was not independently significant and therefore the full effectiveness of this section of

Andersen's model could not be determined. However, Conway's findings, coupled with the results of the deprivation analysis with regards to retention, suggest that at least some of these factors proposed by Andersen could be validated by this study.

6.7.2 Enabling Factors

Andersen's model divided the 'enabling factors' into two categories. Being able to afford the cost of treatment was suggested by Anderson as being as being an enabling factor. However, Childsmile is a free service and despite this, retention remains low. This suggests that cost is not an enabling factor with regards to Childsmile.

The second enabling category was being able to access local dental services. The results of this study found that retention is highest in urban areas where practices delivering Childsmile and patients attending were most abundant. Contradictory, children living in a rural area were more likely to re-engage with dental services if they attended out with the local area. Although this enabling factor of Andersen's model is apparent when the patient resides in an urban setting, there must be other enabling factors to be considered when considering rural access to dental services.

6.7.3 Need Factors

The 'need factor' considers a person's own perspective of their current health status. In this study, this factor could be represented by the current oral health status of the child's parent. It could be suggested that if the parent does not feel a requirement to access oral health services on a regular basis, then this perspective would impact on their child's attendance rates which was reflected in the result of this study.

6.8 Retention Model

6.8.1 Usefulness of Model

The model designed for analysing on-going Childsmile attendance has been a useful research tool. It challenged the findings of previous research in this field indicating that there are other factors apart from deprivation, accessibility and current

health status which are linked to a young child's on-going engagement with dental services. For example: the age of a child; the appropriateness of the interventions being delivered to them; and the role that the dental practice and those promoting Childsmile have to play in ensuring that not only is the right level of support available to those accessing the service, but also for those delivering the service. The model has also highlighted new evidence of a link between retention of children in dental services (which can be redefined as regular dental attendance) and their parent's/carer's dental attendance behaviour.

The initial grouping of covariates into three groups that shared similar characteristics allowed for any variable that was not independently significant to be removed from the model. For example, the results of the univariate logistic regression of the variable 'Age of the Mother' suggested that this variable was significant for retention in Childsmile. However, when added to the stepwise logistic regression, the results indicated that it was not independently significant. This is supported by further analysis of this variable (section 5.3.24). When the 'Age of the Mother' was adjusted for the SIMD score of the patient, none of the categories within this variable were significant which indicated that this variable was partly a proxy for SIMD. This additional analysis provided validation that the stepwise logistic regression algorithm recognised that there were relationships between the variables in the study. It should be noted that when the significant variable 'Caries Risk Assesment: Smoker' was adjusted for the child's SIMD score (section 5.3.26), deprivation was found to have very little impact on this variable and it was retained within the 'winning candidates model'. These findings suggest that the steps taken within this analysis allow for high levels of multicollinearity to be identified, although those variables that share a small level of correlation but maintain a high level of independent significance will remain within the model.

6.8.3 Future Use and Adaptability of Model

There is potential to use this analysis programme which links the various sources of Childsmile for future cohorts of children attending Childsmile Practice to see if the findings and recommendations of this study have improved retention. It can also be used to continue to highlight those factors that are influencing retention, so that Childsmile can adapt its services to suit the needs of those most at need as recommended in the WHO's *Ottawa Charter for Health Promotions* [1986], which

the foundations of Childsmile are built upon [Macpherson et al, 2010b]. The model could also incorporate currently unavailable data to see if there are other factors that are influencing retention within Childsmile practice over and above from those identified here.

The model can also be easily adapted to analyse initial attendance at a Childsmile Dental Practice to research which factors influenced a child's initial enrolment in Childsmile Practice [Turner et al, 2010] . It can also be adapted to analyses the various stages of the Childsmile Practice Pathway (Figure 4-2).

Another potential future use of the model is to link Childsmile data with NDIP data, as well as non-Childsmile dental treatment data, to see if those children who had attended a Childsmile dental practice had better oral health than those who had not. This linkage would also allow the analysis of whether children's poor attendance and non-retention at a Childsmile dental practice was linked to poor oral health in Scotland.

6.9 Limitations of the Study

6.9.1 Data Limitations

The recording of data such as the DHSW home visit prior to the families visit to the dental practice (appendix 3), DHSW courtesy contact after the initial dental appointment (appendix 8), and direct referrals from dental practices (appendix 4) had not been entered onto a database by Childsmile and were therefore unavailable for analysis.

There were key data missing that was related to DHSW contacts with the participants prior to their initial appointment with a Childsmile dental practice. As not all Children who attended a Childsmile dental practice were contacted by a DHSW prior to their attendance at a dental practice, these data would have allowed an analysis of whether DHSW involvement prior to the first appointment had an influence on retention. It would be expected that this interaction would have a greater effect on the initial appointment. Data were also missing on whether the family had their own existing dentist and whether or not the Childsmile dental practice that the child attended was the dental practice that the family would normally have visited.

The child and their family's experiences at their initial Childsmile Practice appointment, as well as any issues they may have had with regards to this visit, were recorded by a DHSW. It was also recorded at this time whether or not a second Childsmile appointment had been arranged. If a second appointment had not been arranged, this could have provided an opportunity for the DHSW to arrange the appointment and thus improve retention. However low numbers of the *DHSW Courtesy Visit form* which collected this data were returned (n=2216) compared to the much larger number of children who had attended a Childsmile appointment (n=7434) in the same time period. This suggested that the courtesy visit was not being completed as intended.

Data indicating if a child had been referred into Childsmile directly from a dental practice after previously attending the practice for a non-Childsmile appointment was not available for this study. This data would have allowed for the analysis of whether or not prior engagement with a dental practice would have increased retention in Childsmile.

Other unavailable data has already been discussed in section 6.6 (health status of the child, non-Childsmile dental interaction, ethnicity and whether the child had older siblings).

6.9.2 Qualitative Data

The only data analysed in this study were quantitative as no qualitative data were available. As discussed in the section 2.6, Gift [1984] suggested that the four categories that influence continued engagement with dental services were (i) demographic socioeconomic status, (ii) accessibility of dental services , (iii) current health status, and (iv) perceptions and attitudes towards dentistry. Of the four categories, only demographic and socioeconomic status and accessibility of dental services were captured by the data available. However, there were limitations with regards to individual socioeconomic status as area deprivation was used as a proxy for this.

There were data available that related to the current health status of the participants and their families in terms of the CRAs. However additional data related to the DHSW courtesy contact may have highlighted any health issues that

were impacting on the families' engagement with dental services. Data from this form may have also provided some data for analysis based on perceptions of dentistry and whether this influenced both their experience at their first appointment and their likelihood to return to the continue engagement with Childsmile.

6.10 Strength of Data

The data collected were for a national oral health programme (although it was only available in three health boards at the onset of this study) and therefore a large amount of data for 14,213 individual patients was available for analysis. The area of residence of these children was spread across all five SIMD quintiles although there were more children from the more deprived quintiles as they were targeted by the programme. The data also included children that lived in both urban and rural settings which meant that these data contained a good subsection of the child population of the three Scottish health boards analysed in this study.

The data used to determine whether or not the child was retained in Childsmile Practice was based on data used for calculating payments for dental practice for their Childsmile activity and therefore there was an incentive for the return of these data from dental practices.

Although there were limitations in the data as discussed in section 6.8.1, the strengths of these data allowed for an analysis that could generate an accurate account of retention within the Childsmile Practice programme.

Chapter 7 – Conclusions and Recommendations

Dental caries is one of the most common childhood diseases in the world [World Health Organisation,2003]. Scotland had amongst the highest rates of dental caries in Western Europe and prior to the introduction of Childsmile in 2006, more than half of five-year-olds in Scotland showed obvious signs of tooth decay [Scottish Health Boards' Dental Epidemiological Programme, 1999] . Prior research [Enjary et al, 2006] had suggested that dental caries is linked to deprivation and these finding are supported by the *National Dental Inspection Programme* (NDIP) results for Scotland which has continuously reported that higher levels of dental caries are most prevalent in areas of high deprivation [Macpherson et al, 2010a]. In 2006, Childsmile, the national oral health programme, was launched by the Scottish Government. It aimed to address the issues of poor child dental health and oral health inequalities in Scotland by providing preventive dental treatment to Scottish children, particularly for those living in areas of deprivation. Through re-orientating dental practices towards prevention and engaging with children via both trained dental nurses and dental health support workers (DHSWs), with the latter also being trained in recruiting children into Childsmile, over 14,000 children from three health boards in Scotland had attended a Childsmile dental practice appointment at least once by 2010. However, despite best efforts, only around 50% of these children were retained in Childsmile Practice in the twelve months following their initial appointment and rates of retention have generally decreased with time.

This study set out to investigate the factors associated with retention in Childsmile. The literature available for this topic indicated that there were several factors which were attributed to retention in and utilisation of dental services namely: socio-economic status; accessibility of dental services; a person's current health status; and individual attitudes towards dentistry [Gift, 1984]. Public health programmes that had high rates of retention were often found to provide financial support to families to compensate them for the costs occurred when attending appointments. These programmes also provided multiple reminders and efficient methods of re-establishing contact with families who had not been attending appointments. There were high levels of data linked to Childsmile dental attendance available which allowed this study to investigate if there was any evidence in the data to support that these four factors were the key factors for

retention in an oral health programme aimed at pre-school children. This was done by building a computer programme to firstly link the various data-sources that were available for this study into a single database. The variables in this database were then analysed whilst simultaneously producing a series of models to indicate those children that were more likely to be retained in Childsmile.

The key results indicated that children from the most deprived areas were the least likely to be retained in Childsmile and that the health status and prior dental attendance habits of the children's parents/carers were linked to retention, thus proving collaborative evidence to support previous findings. In addition, children aged less than six months when they first attended a Childsmile dental practice had the best odds of retention. There was also new evidence to suggest that there is a possible link between a child's ongoing dental attendance and their parent's/carer's smoking habits. Other findings suggested that many children were not being given an opportunity to re-attend by the dental practice due to a lower than expected number of recorded FTAs whilst results also indicated that the role of the DHSW to facilitate children that were not attending back into Childsmile was not being completed as envisaged by the programme .

7.1 Conclusions

7.1.1 Factors Associated with Retention

The first aim of the study was to explore which individual patient and dental practice related factors were associated with continuous attendance in the Childsmile Practice programme. The second aim was to produce a model that could predict retention in Childsmile.

After completion of the analysis the subsequent conclusions with regards to the hypotheses (section 3.2) have been made:

7.1.1.1 Socioeconomic Status

That socioeconomic status (measured by area-based deprivation) assigned to both the patients and the location of the dental practices delivering Childsmile will have a significant influence on whether or not a child is retained in Childsmile.

It has been suggested that Childsmile is beginning to address inequality in children's oral health in Scotland [McMahon et al, 2011] although there may be inequality within Childsmile itself with low levels of children being retained that are from a deprived background. Although a level of inequality was expected, particularly when the programme was targeting those from a deprived area, the level of children from deprived backgrounds not being retained should be of concern to those steering Childsmile. Short-term contact, even if just once at an early age with Childsmile may still be beneficial and although many children do not re-engage with Childsmile Practice, many can be re-established into Childsmile as part of the nursery and school component.

7.1.1.2 Accessibility

Accessibility, defined by both the location of the dental practice delivering Childsmile and the location of the children in the programme will significantly impact on rates of retention.

There is poor access to dental practices in rural areas delivering Childsmile Practice. The majority of families which reside in a rural area have to travel to urban settings to attend Childsmile Practice appointments where dental practices delivering the programme are more abundant. Travelling to access services, including dental services, may better suit the routine of many of these families and has therefore increased retention rates. However, those families who are not travelling out with the rural setting, perhaps due to poor access to transport, an indicator of deprivation [Scottish Government, 2009], are the least likely to be retained. This therefore suggests that within the rural setting, it is not only the location of the individual patient or practice that is impacting on retention but a combination of both locations.

7.1.1.3 Parental Oral Health

Children whose parents have poor oral health will be less likely to be retained.

Children's retention in Childsmile is partly reflective of their parent's/carer's oral health status (which itself is a proxy for dental attendance).

7.1.1.4 Other factors

There are other factors in addition to deprivation, accessibility and the oral health status of the child's parent, including a combination of factors, which will predict retention.

No individual factor can be contributed as the sole predictor of retention within Childsmile Practice, nor is there a model that can predict those individual children who would be retained. However, the statistical significance of the chosen model is certainly strong enough to enable rational targeting of resources to increase retention in the future.

The continued growth of Childsmile Practice may have had a negative impact on the ability of those delivering the service to do so fully. Dental Health Support Workers (DHSW's) and dental practices may not have been able to cope with the ever increasing demand for Childsmile Practice and this may have resulted in the prioritising of recruiting and delivering to new patients at the expense of retaining those already interacting with Childsmile.

Dental practices are required to take a greater level of responsibility to ensure that children are being retained in Childsmile Practice by arranging follow up appointments for their patients and engaging with DHSWs following appointments that were not kept. Dental practice attitudes need to adapt to see the long term benefits a programme like Childsmile can achieve rather than the focusing on the financial rewards for retaining children. The inclusion of Childsmile within the Statement of Dental Remuneration from October 2011 will place Childsmile into mainstream dentistry which in turn could change perceptions.

7.1.2 Research Model

The second aim of the study was to create a model that could be used for further analysis of attendance and retention patterns for Childsmile Practice.

The model has produced outcomes that could potentially be utilised by those implementing Childsmile to improve retention rates within Childsmile Practice. The model could analyse future cohorts of children attending Childsmile Practice to indicate if the implementation of changes based on the findings of this study have

improved retention on Childsmile. The model is also capable of linking other data sources such as NDIP data to investigate the impact Childsmile is having on individual patient oral health.

7.2 Recommendations

After the completion of the study to investigate which factors influence children aged 0 to 5 years on-going engagement with Childsmile Practice, the following recommendations have be drawn:

The rates of retention have decreased since the initiation of the programme and in order to improve retention, inequality and therefore the oral health of the children in Scotland, action is required to help address this slide.

There is some evidence, although not comprehensive, to suggest that as Childsmile has grown, those delivering Childsmile, whether a dental practice or a DHSW, have been unable to interact fully with the increasing number of patients being referred to them. Childsmile should maintain a high level of frequent contact with each dental practice to ensure that it has an adequate number of trained dental nurses to deliver Childsmile Practice, not only to those being seen for the first time but also to those who should be continuing to attend Childsmile. This information should also be relayed to DHSWs so that referrals to Childsmile dental practices are spread rationally. Additional support and training is also required for DHSWs to ensure that they are able to reach those patients who require additional support so that they can be reinstated into Childsmile. As the results indicated that DHSW contact was not increasing the odds of retention, a new strategy and further training is required for the DHSWs so that they can improve on their rate on re-engaging children with dental practices.

Dental practices should be encouraged to take a greater level of responsibility in ensuring that families return to their practice for a Childsmile appointment by either scheduling a subsequent appointment whilst the family is attendance at the practice or if that is not possible, they should contact the family at a later date to initiate an appointment. The responsibility of scheduling a follow up appointment should not fall solely on the family. Childsmile should also implement a formal

method of communication between the dental practices and DHSWs to ensure that the DHSWs are aware of those children who have not attended their appointments.

Prior research has indicated that providing financial compensation to families to cover the costs of travel and childcare has increased retention and Childsmile should consider providing a similar scheme. A pilot study using a control group may indicate if this method could improve the low rates of retention currently experienced within Childsmile Practice, although the ethics of such a proposal would need to be considered due to the use of public money which funds Childsmile.

Recent research [Perry, 2011] has indicated that the use of mobile phone text messages (SMS) to remind patients in Scotland of scheduled dental appointments is a cost effective method of increasing attendance and therefore practices delivering Childsmile Practice should be encouraged to use SMS. An automated SMS service is available using Kodak R4 practice software which is currently used by CDS practices participating in Childsmile Practice whilst GDS practices can use the Electronic Data Interchange with the cost of installation and maintenance of this interchange funded by the Scottish Government Health Directories [PSD, no date]. When no mobile telephone number is available, patients should be phoned at the provided land line number twenty-four hours before their appointment as this has previously been found to increase attendance in Childsmile Practice [Watters, 2010].

7.3 Further Research

Further qualitative and quantitative research is required to investigate the link between parental attendance rates and that of their children to investigate the impact parental attitudes and perception of dentistry is having on their child's attendance. This would also be an opportunity to gain further evidence to support the findings of this study that children whose parents smoke are more likely to have poor rates of attendance.

There is a shortage of research into retention in longitudinal studies for periods greater than one year. A follow up study analysing patters of retention for longer periods of time i.e. 2 or 3 years could provide this information as well as providing

essential information on the factors that are associated with long term retention in Childsmile Practice.

The impact of whether or not an older sibling had already attended Childsmile Practice on retention remains inconclusive and further research is required to ascertain if families attending for the first time require further support to ensure that they engage fully with the programme.

Research is required to investigate the link between dental practice staffing levels and space within the practice with regards to attendance and retention in Childsmile.

Validation of the model used for analyses can be completed either by future analyses of later cohorts or by using the model to analyse other Childsmile related data.

Childsmile has been delivering oral health interventions for five years and whilst NDIP results have shown that there has been an improvement in children's oral health during this time, a study linking Childsmile data with individual children's dental caries data should be completed to investigate what evidence there is to support the role played by Childsmile in this improvement. This data linkage could also be used to research if poor retention in Childsmile Practice is an early indicator of poor oral health later in childhood.

References

Aligne CA, Moss ME, Auinger P, Weitzman M., 2003. Association of Paediatric Dental Caries With Passive Smoking. *The Journal of the American Medical Association,* 289(10), pp. 1258-1264.

Altman DG, Bland JM,.1994. Diagnostic tests 3: receiver operating characteristic plots. *British Medical Journal*, 309, pp. 188.

Andersen R, Newman JF., 1973. Societal and Individual Determinants of Medical Care Utilization in the United States. *The Milbank Memorial Fund Quarterly. Health and Society,* 51(1), pp. 95-124.

Armfield JM, Spencer AJ, Stewart JF., 2005. Dental fear in Australia: who's afraid of the dentist? *Australian Dental Journal*, 51(1), pp. 78- 85.

Armfield JM, Stewart JF, Spencer AJ., 2007. The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health,* [online] Available at http://www.biomedcentral.com/1472-6831/7/1 [Accessed 9 September 2011].

Armfield JM, Slade GD, Spencer AJ., 2009. Dental fear and adult oral health in Australia. *Community Dentistry and Oral Epidemiology,* 37(3), pp. 220-230.

Armistead LP, Clark H, Barber CN, Dorsey S, Hughley J, Favours M, Wyckoff SC., 2004. Participant Retention in the Parents Matter! Program: Strategies and Outcome. *Journal of Child and Family Studies,* 13(1), pp. 67-80.

Ayhan H, Suskan E, Yildirim S., 1996. The effect of nursing or rampant caries on height, body weight and head circumference. *The Journal of Clinical Paediatric Dentistry,* 20(3), pp. 209-12.

Ball G., 2008. *Improving Oral Health in Fife,* [Online] Available at http://scholar.googleusercontent.com/scholar?q=cache:-

vQzIAoXNcUJ:scholar.google.com/+g+ball+improving+oral+health+fife&hl=en&as_sdt=0,5 [Accessed 07 February 2012].

Ballard P., 2008, *Health Improvement National Performance Framework,* [Online] (Updated 26 March 2008) Available at http://www.thpc.scot.nhs.uk/Presentations/Dirmeetings/260308/Health%20Improvement%20National%20Performance%20Framework.ppt [Accessed 12 June 2010].

Baranowski T, Simons-Morton B, Hooks P, Henske J, Tierman K, Dunn JK, Burkhalter H, Harper J, Palmer J., 1990. A Centre-Based Programme for Exercise Change among Black-American Families. *Health Education & Behaviour,* 17(2), pp. 179-196.

Bawden JW., 2007. Fluoride Varnish: a Useful New Tool for Public Health Dentistry. *Journal of Public Health Dentistry,* 58(4), pp. 266-269.

Becker MH, Drachman RH, Kirscht JP., 1972. Motivations as Predictors of Health Behaviour. *Health Services Report,* 87(9), pp. 852-862.

Bruzzese J, Gallagher R, McCann- Doyle S, Reiss PT, Wijetunga NA., 2009. Effective Methods to Improve Recruitment and Retention in School-Bases Substance Use Prevention Studies. *Journal of School Health,* 79(9), pp. 400-407.

Butani Y, Gansky SA, Weintraub JA., Parental Perception of Oral Health Status of Children in Mainstream and Special Education Classrooms. *Special Care in Dentistry,* [online] Available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3106150/pdf/nihms291600.pdf [Accessed 15 September 2011].

Children's Dental Health Project, 2010. *Improving Access to Perinatal Oral Health Care: Strategies & Considerations for Health Plans.* [Online] Washington, D.C.: National Institute for Health Care Management. Available at http://nihcm.org/pdf/NIHCM-OralHealth-Final.pdf [Accessed 15 September 2011].

Childsmile. *Welcome to Childsmile.* [Online] Available at: http://www.child-smile.org/ [Accessed 27 May 2010].

Childsmile(a). *Why use fluoride varnish?* [Online] Available at: http://www.child-smile.org.uk/professionals/about-childsmile/why-use-fluoride-varnish.aspx [accessed 20 March 2011].

Childsmile(b). *Hidden Sugars*. [Online] Available at http://www.child-smile.org.uk/parents-and-carers/hidden-sugars.aspx [accessed 20 March 2012].

Childsmile, 2010. *Childsmile Service Agreement*. [Online] Available at: http://www.child-smile.org.uk/uploads/documents/12764-ChildsmileServiceAgreement.pdf [Accessed 31 August 2011].

Childsmile, 2011. *Programme Manual for Childsmile Staff*. [Online] Available at: http://www.child-smile.org.uk/uploads/documents/16214-childsmileProgrammeManual.pdf [Accessed 31 August 2011].

Community Health Partnerships, 2010. *Community Health Partnerships*. [Onine] Available at http://www.chp.scot.nhs.uk/ [Accessed 04 January 2012].

Conway DI, Macpherson LMD, Stephen KW, Harper Gilmour W, Petterson LG., 2005. Prevalence of dental fluorosis in children from non-water-fluoridated Halmstad, Sweden: fluoride toothpaste use in infancy. *Acta Odontologica Scandinavica,* 63, pp. 56-63.

Cordell HJ, Clayton DG, 2002. A unified Stepwise Regression Procedure for Evaluating Effects of Polymorphisms within a Gene Using Case/Control or Family Data: Application to *HLA* in Type 1 Diabetes. *American Journal of Human Genetics,* 70(1), pp.124-141.

Craft M, Croucher R., 1980. Factors that influence dental visiting amongst young adults 16-20 years old. *Community Dentistry and Oral Epidemiology,* 8(7) pp. 347-350.

Cunningham CE, Bremner R, Boyle M., 1995. Large group community-based parenting programs for families of preschoolers at risk for disruptive behaviour

disorders: utilization, cost effectiveness, and outcome. *Journal of Child Psychology and Psychiatry,* 36(7), pp.1141-1159.

Davies AR, Allen HM, Manning WG, Holtby, Bailit HL, Ware JE., 1987. *Explaining Dental Utilization Behaviour*. [online] Santa Monica, California: The RAND Corporation. Available at http://www.rand.org/pubs/reports/2007/R3528.pdf [Accessed 15 September 2011].

Donaldson AN, Everitt B, Newton T, Steele J, Sherriff M, Bower E., 2008. The Effects of Social Class and Dental Attendance on Oral Health. *Journal of Dental research,* 87(1), pp. 60-64.

Edelstein BL., 2009. Solving the problem of early childhood caries. *Arch Paediatrics Adolescent Medicine,* 163(7), pp.667-668.

Elkan R, Robinson J, Williams D, Blair M., 2001. Universal vs. selective services: the case of British health visiting. *Journal of Advanced Nursing,* 33(1), pp.113-119.

Enjary C, Tubert-Jeannin S, Manevy R, Roger-Leroi V, Riordan PJ., 2006 Dental status and measures of deprivation in Clermont-Ferrand, France. *Community Dental* Oral Epidemiology, 34, pp.363–371.

Featherstone JDB., 2007. Prevention and reversal of dental caries: Role of low level lluoride. *Community Dentistry and Oral Epidemiology,* 27(1), pp.31-40.

Friel S, Hope A, Kelleher C, Comer S, Sadlier D., 2002. Impact evaluation of an oral health intervention amongst primary school children in Ireland. *Health Promotion International,* 17(2) pp.119-126.

Fomon SJ, Ekstrand J, Ziegler EE., 2000. Fluoride Intake and Prevalence of Dental Fluorosis: Trends in Fluoride Intake with Special Attention to Infants. *Journal of Public Health Dentistry,* 60(3), pp.131-139.

Fox PC., 2007. Xersostomia: Recognition and Management. *American Dental Hygienists' Association,* [online] Available at http://colgateprofessional.ca/LeadershipCA-

EN/ProfessionalEducation/Articles/Resources/pdf/profed_art_acess-supplement-2008-xerostimia.pdf [Accessed 08 February 2012].
Gehshan S, Wyatt M., 2007. *Improving Oral Health Care for Young Children.* Washington: National Academy for State Health Policy.

Gibson B., 2003. Access to dental services. In Gulliford M, Morgan M, eds. Access to health care. London: Routledge. Ch. 9.

Gibson S, Williams S., 1999. Dental Caries in Pre-School Children: Associations with Social Class, Toothbrushing Habit and Consumption of Sugars and Sugar-Containing Foods. *Caries Research,* 33(2), pp. 101-113.

Gift HC., 1984 Utilization of professional dental services, In. *Social sciences and dentistry- a critical biography, Vol 2,* Cohen LK, Bryant PS, editors. London Quintessence Publishing Co. Ltd., pp. 202-266.

Glasgow RE, Vogt TM, Boles SM., 1999. Evaluating the Public Health Impact of Health Promotion Interventions: The RE-AIM Framework. *American Journal of Public Health,* 89(9), pp. 1132-1327.

Goncy EA, Roley ME, van Dulmen MHM., 2009. Strategies for Retaining Participants in Longitudinal Research with Economically Disadvantaged and Ethnically Diverse Samples. In DL Streiner, S Sidani, eds. 2009. *When research goes off the rails: why it happens and what you can do about it*. New York: The Guilford Press.

Gratix D, Taylor GO, Lennon MA., 1990. Mother's dental attendance patterns and their children's dental attendance and dental health. *British Dental Journal*, 168, pp.441-443.

Günay H, Kristina Dmoch-Bockhorn K, Günay Y, Geurtsen W., 1998. Effect on caries experience of a long-term preventive program for mothers and children starting during pregnancy. *Clinical Oral Investigations,* 2, pp.137-142.

Harrell FE, Lee KL, Califf RM, Pryor DB, Rosati RA., 1984. Regression modelling strategies for improved prognostic prediction. *Statistics in Medicine,* 3 ,pp.143-152.

Harrell FE, Lee KL, Mark DB., 1996. Multivariate prognostic models: issues in developing models, evaluating assumptions and adequacy, and measuring and reducing errors. *Statistics in Medicine,* 15, pp. 361–387.

Health Scotland, 2009. *What is Childsmile?* [Online] (Updated November 2009) Available at http://www.healthscotland.com/uploads/documents/10999-Childsmile%20(What%20is%20Childsmile).pdf [Accessed 26 May 2010].

Heinrichs N,. 2006. The effects of two different incentives on recruitment rates of families into a preventive program. *Journal of Primary Prevention,* 27(4), pp.345-365.

Hodbell MH,. 1995. Availability of Services. In: Mautsch W, Sheiham A, eds. *Promoting Oral Health in Deprived Communities*. Berlin: German Foundation for International Development, pp.303-310.

Hoddinott P, Tappin D, Wright C., 2008. Breast Feeding. *British Medical Journal*, 336, pp.881-887.

Horta BL, Bahl R, Martines JC, Victoria CG., 2007. *Evidence of the long-term effects of breastfeeding*. [Online] Geneva: World Health Organisation. Available at http://whqlibdoc.who.int/publications/2007/9789241595230_eng.pdf .

Hosmer DW, Lemeshow S., 1989. *Applied Logistic Regression*. Chichester, UK: John Wiley.

Ingoldsby EM,. 2010. Review of Interventions to Improve Family Engagement and Retention in Parent and Child Mental Health Programs. *Journal of Child and Family Studies*, 19(5), pp.629-645.

ISD Scotland, 2004. *Workforce Planning for Dentistry in Scotland*. Edinburgh: NHS Education for Scotland.

ISD Scotland, 2010a. *Deprivation*. [Online] Available at http://www.isdscotland.org/deprivation/ [Accessed 18 January 2012].

ISD Scotland, 2010b. *General Dental Services*. [Online] Available at http://www.isdscotland.org/Health-Topics/Dental-Care/General-Dental-Service/ [Accessed 30 December 2011].

ISD Scotland, 2010c. *Community Dental Services*. [Online] Available at http://www.isdscotland.org/Health-Topics/Dental-Care/Community-Dental-Service/ [Accessed 30 December 2011].

ISD Scotland, 2010d. *Registration and Participation analysis in NHS General Dental Service (GDS)*. [Online] Available at http://www.isdscotland.org/Health-Topics/Dental-Care/General-Dental-Service/registration-and-participation.asp [Accessed 26 March 2012].

ISD Scotland, 2011. *Childhood Hospital Admissions*. [Online] (Updated 29 March 2011) Available at http://showcc.nhsscotland.com/isd/6468.html [Accessed 30 August 2011].

Jamieson LM, Thomson WM., 2006. Adult Oral Health Inequalities Described Using Area-based and Household-based Socioeconomic Status Measures. *Journal of Public Health Dentistry*, 66(2), pp.104-109.

Jones CM, Tinaoff N, Edelstein BL, Schneider DA, DeBerry-Summer B, Kanda MB, Brocato RJ, Blum-Kemelor D, Mitchell P., 2000. Creating Partnerships for Improving Oral Health of Low-Income Children. *Journal of Public Health Dentistry*, 60(3), pp.193-196.

Kay E, Locker D., 1998. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dental Health*, 15(3), pp. 132-144.

Korfmacher J, O'Brien R, Hiatt S, Olds D., 1999. Differences in program implementation between nurses and paraprofessionals providing home visits during pregnancy and infancy: a randomized trial. *American Journal of Public health*, 89(12), pp. 1847-1851.

Lawder R, Harding O, Stockton D, Fischbacher C, Brewster DH, Chalmers J, Finlayson A, Conway DI., 2010. Is the Scottish population living dangerously? Prevalence of multiple risk factors: the Scottish Health Survey 2003. *BMC Public Health*, [online] Available at http://www.biomedcentral.com/content/pdf/1471-2458-10-330.pdf [Accessed 06 March 2012].

Lee RE, McGinnes KA, Sallis JF, Castro CM, Chen AH, Hickmann SA., 1997. Active vs. passive methods of recruiting ethnic minority women to a health promotion programme. *Annals of Behavioural Medicine* , 19(4), pp. 378-384.

Levin KA, Davies CA, Douglas GVA, Pitts NB., 2010. Urban-rural differences in dental caries of 5-yeard old children in Scotland. *Social Science & Medicine,* 71(11), pp 2020- 2027.

Lida H, Auinger P, Billings RJ, Weitzman M., 2006. Association Between Infant Breastfeeding and Early Childhood Caries in the United States. *Paediatrics*, 120(4), pp 944-952.

Locker D., 2000. Deprivation and Oral Health. *Community Dentistry and Oral Epidemiology,* 28, pp. 161-169.

Lopez R, Baelum V., 2007. Factors associated with dental attendance among adolescents in Santiago, Chile. *BMC Oral Health,* [online] Available at http://www.biomedcentral.com/content/pdf/1472-6831-7-4.pdf [Accessed 15 September 2011].

Love JM, Kisker EE, Ross C, Raikes H, Constantine J, Boller K, Brooks-Gunn J, Chazan-Cohen Rachel, Tarullo LB, Brady-Smith C, Fuligni AS, Schochet P, Paulsell D, Vogel C., 2005. The Effectiveness of Early Head Start for 3-Year-Old Children and Their Parents: Lessons for Policy and Progress. *Developmental Psychology,* 41(6), pp. 885-901.

Low W, Tan S, Schwartz S., 1999. The effect of severe caries on the quality of life in young children. *Paediatric Dentistry,* 21(6), pp.326-326.

Macintyre S, Maciver S, Sooman A., 1993. Area, Class and Health: Should we be focussing on Places or People? *Journal of Social Policy,* 22, pp. 213-234.

Macintyre S., 2007. *Inequalities in health in Scotland: what are they and what can we do about them?* Glasgow: MRC Social & Public Health Sciences Unit.

Macpherson LMD, Conway DI, Goold S, Jones CM, McCall DR, Merrett MCW, Pitts NB., 2010. National Dental Inspection Programme of Scotland, Report of the 2010 Survey of P1 Children, *Scottish Dental Epidemiological Co-ordinating Committee*.

Macpherson LMD, Ball GE, Brewster L, Duane B, Hodged C-L, Wright W, Rodgers J, McCall DR, Turner S, Conway DI., 2010. Childsmile: the national child oral health improvement programme in Scotland. Part 1: establishment and development. *British Dental Journal,* 209, pp.73-78.

Manski RJ, Madger LS., 1998. Demographic and socioeconomic predictors of dental care utilization. *The Journal of the American Dental Association,* 129(2), pp. 192-200.

Marinho VCC, Higgins JPT, Stuart Logan S, Sheiham A., 2003. Topical fluoride (toothpastes, mouthrinses, gels or varnishes) for preventing dental caries in children and adolescents. *The Cochrane Database of Systematic Reviews,* [online] Available at http://www2.cochrane.org/reviews/en/ab002782.html [Accessed 04 June 2010].

Marinho VCC, Higgins JPT, Stuart Logan S, Sheiham A., 2009. Intervention Review: Topical fluoride (toothpastes, mouthrinses, gels or varnishes) for preventing dental caries in children and adolescents. *The Cochrane Library,* [online]. Available at http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD002782/image_n/CD002782_abstract.pdf (The Cochrane Collaboration) [Accessed 04 June 2010].

McCulloch A., 2000. Ward-level deprivation and individual social and economic outcomes in the British Household Panel Study. *Environment and Planning,* 33, pp. 667-684.

McGrath C, Bedi R., 2001. Can dental attendance improve quality of life? *British Dental Journal,* 190(5), pp. 262-265.

McKay MM, Stoewe J, McCadam K, Gonzales J., 1998. Increasing access to child mental health services for urban children and their caregivers. *Health and Social Work,* 23(1), pp.9-15.

McMahon AD, Blair Y, McCall DR, Macpherson LMD., 2010. The dental health of three-year-old children in Greater Glasgow, Scotland. *British Dental Journal,* [Online] Available at http://nature.com/bdj/journal/v209/n4/full/sj.bdj.2010.723.html [Accessed 08 February 2012].

McMahon AD, Blair Y, McCall DR, Macpherson LMD., 2011. Reductions in dental decay in 3-year old children in Greater Glasgow and Clyde: repeated population inspection studies over four years. *BMC Oral Health,* [Online] Available at http://biomedcentral.com/1472-6831/11/29 [Accessed 08 February 2012].

Medicare, 2011. *What Is Medicare?* [Online] (Updated September 2011) Available at http://medicare.gov/publications/pubs/pdf/11306.pdf [Accessed 09 February 2012].

Meng X, Heft MW, Bradley MM , Lang PJ., 2007. Effect of fear on dental utilization behaviours and oral health outcome. *Community Dental Oral Epidemiology,* 35, pp. 292-301.

Merrett MCW, Goold S, Jones CM, McCall DR, Macpherson LMD, Nugent Z and Topping GVA., 2008. National Dental Inspection Programme of Scotland, Report of the 2008 Survey of P1 Children, *Scottish Dental Epidemiological Co-ordinating Committee*.

Meskin LH., 2001. Look who's practicing dentistry. *The Journal of the American Dental Association,* 132, pp. 1352-1353.

Milgrom P, Mancl L, King B, Weinstein P, Wells N, Jeffcott E., 1998. An Explanatory Model of the Dental Care Utilization of Low-Income Children. *Medical Care*, 36(4), pp. 554-566.

Milgrom P, Ly DKA, Tut OK, Mancl L, Roberts MC, Briand K, Gancio MJ., 2009. Xylitol Paediatric Topical Oral Syrup to Prevent Dental Caries. *Archer Paediatric Adolescent Medicine,* 163 (7), pp.601-607.

Minkovitz CS, Hughart N, Strobino D, Sharfstein D, Grason H, Hou W, MillerT, Bishai D, Augustyn M McLearn KT, Guyer BG., 2003. A Practice-Based Intervention to Enhance Quality of Care in the First 3 Years of Life: The Healthy Steps for Young Children Program. *Journal of the American Medical Association,* 290(23), pp. 3081-3091.

Mofidi M, Rozier RG, King RS., 2002. Problems With Access to Dental Care for Medicaid-Insured Children: What Caregivers Think. *American Journal of Public Health,* 92(1), pp.53-58.

Moles DR, Frost C, Grundy C., 2001. Inequalities in availability of National Health Service general dental practitioners in England and Wales. *British Dental Journal*, 190(10), pp. 548-553.

Moynihan P, Peterson PE., 2004. Diet, nutrition and the prevention of dental diseases. *Public Health Nutrition,* 7(1A), pp. 201-226.

Newton JT, Williams AC, Bower EJ., 2007. Access to dental services in Scotland: an analysis of dentist-population ratios. *British Dental Journal,* [online] Available at http://www.nature.com/bdj/journal/v204/n3/pdf/bdj.2007.1107.pdf [Accessed 14 September 2011].

NC Department of Health and Human Services., 2010. *Into the Mouths of Babes.* [Online] (Updated 12 October 2010) Available at http://www.ncdhhs.gov/dph/oralhealth/partners/IMB.htm [Accessed 14 September 2011].

NHS Greater Glasgow and Clyde., 2011. *Community Health Index*. [Online] Available at http://www.nhsgg.org.uk/content/default.asp?page=home_CHI [Accessed 30 December 2011].

NYU Child Study Centre. *Care at the CSC*. [Online] Available at http://www.aboutourkids.org/families/care_at_the_csc/parenting_institute [Accessed 30 January 2012].

Nutbeam D., 1998. Health promotion glossary. *Health Promotion International*, 13(4), pp. 349-364.

Olson DG, Levy RL, Evans CA, Olson SK., 1981. Enhancement of High Risk Children's Utilization of Dental Services. *American Journal of Public Health,* 71(6), pp. 631-634.

Parents Matter, *Parents Matter! Program*. [Online] Available at: http://www.cdcnpin.org/parentsmatter/program.asp [Accessed 02 September 2011].

Pattussi MP, Marcenes W, Croucher R, Sheiham A., 2001. Social deprivation, income inequality, social cohesion and dental caries in Brazilian school children. *Social Sciences & Medicine*. 53(7), pp.915-925.

Perry JGW., 2011. A Preliminary Investigation into the Effect of the Use of the Short Message Service (SMS) on Patient Attendance at an NHS Dental Access Centre in Scotland. *Primary Dental Care*, 18(4), pp.145-149.

Petersen PE, Kwan S., 2004. Evaluation of community-based oral health promotion and oral disease prevention – WHO recommendations for improved evidence in public health practice. *Community Oral Health,* 21(Supplement), pp. 319-329.

Practice Services Division. *General EDI Questions*. [online] Available at http://psd.scot.nhs.uk/professionals/dental/edi-general.html [Accessed 07 February 2012].

Race for Health., 2008. *Bradford and Airedale PCT … Smile with the Prophet: oral health programme*. [Online] Available at http://www.raceforhealth.org/resources/case_studies/bradford_and_airdale_teaching/smile_with_the_prophet_oral_health_programme [Accessed 08 February 2012].

Reisine S., 1987. A path analysis of the utilization of dental services. *Community Dental Oral Epidemiology*, 15 pp. 119-24.

Richards W, Ameen J., 2002. The impact of attendance patterns on oral health in a general dental practice. *British Dental Journal,* 193(12), pp.697-702.

Riley JL III, Gilbert GH, Heft MW., 2006. Dental attitudes: proximal basis for oral health disparities in adults. *Community Dental and Oral Epidemiology,* 34, pp. 289–98.

Rodd HD, Davidson LE, Bateman PM, Lunn HD., 2002. Caries experience and dental attendance of Somali children living in a British City. *European Journal of Paediatric Dentistry,* 3(4), pp.210-216.

Rozier RG, Sutton BK, Bawden JW, Haupt K, Slade GD, King RS., 2003. Prevention of Early Childhood Caries in North Carolina Medical Practices: Implications for Research and Practice. *Journal of Dental Education,* 67(8), pp. 876-885.

Sanders AE, Spencer AJ, Slade GD., 2006. Evaluating the role of dental behaviour in oral health inequalities. *Community Dental Oral Epidemiology*, 34, pp. 71-79.

Schou L, Wrigh C., 1994. Mother's educational level, dental health behaviours and responses to a dental health campaign in relation to their 5 year old children's caries experience. *Health Bulletin,* 52, pp. 232-239.

Scottish Dental Clinical Effectiveness Programme., 2010. *Prevention and Management of Dental Caries in Children.* [online] Available at http://www.sdcep.org.uk/index.aspx?o=2858 [Accessed 20 March 2012].

Scottish Dental Clinical Effectiveness Programme., 2011. *Oral Health Assessment and Review*. [online] Available at http://www.sdcep.org.uk/index.aspx?o=3079 [Accessed 06 March 2012].

Scottish Dental Epidemiological Co-ordinating Society., 2003. *Scotland's National Dental Inspections Programme 2003*. [Online] Available at http://www.dundee.ac.uk/dhsru/publications/ndip/index.htm [Accessed 09 June 2010].

Scottish Executive., 2005. An action plan for improving oral health and modernising NHS dental services. Edinburgh: Scottish Executive.

Scottish Government, 2005. *Scottish Neighbourhood Statistics Guide*. [Online] (Updated 07 April 2006] Available at http://www.scotland.gov.uk/Publications/2005/02/20697/52626 [Accessed 01 January 2012].

Scottish Government, 2005b. *The Scottish Health Survey 2003*. [Online] (Updated 25 November 2005). Available at http://www.scotland.gov.uk/Publications/2005/11/25145024/50278 [Accessed 06 March 2012].

Scottish Government, 2009. *Scottish Index of Multiple Deprivation: 2009 General Report*. [Online] (Updated November 2009). Available at http://www.scotland.gov.uk/Publications/2009/10/28104046/3 [Accessed 17 June 2010].

Scottish Government, 2010. *NHS Scotland Performance - Targets*. [Online] (Updated 08 March 2010) Available at http://www.scotland.gov.uk/Topics/Health/NHS-Scotland/17273/targets [Accessed 10 June 2010].

Scottish Government, 2010b. *Scottish Health Survey 2009*. [Online] (Updated September 2010). Available at http://www.scotland.gov.uk/news/releases/2010/09/28083315 .

Scottish Government, 2010c. *Socio-Economic Briefing on Rural Scotland: Identifying Fragile Rural Scotland.* [Online] (Updated July 2010) Available at http://www.scotland.gov.uk/Publications/2010/07/30101940/2 [Accessed 10 January 2012].

Scottish Health Boards' Dental Epidemiological Programme.,1999. *Aggregated Data SHBDEP 1987-1999.* [Online] University of Dundee. Available at http://www.dundee.ac.uk/dhsru/publications/comp8799.htm [Accessed 08 February 2012].

Scottish Health Boards' Dental Epidemiological Programme.,2002. *The dental health of 5 year olds in Greater Glasgow 2001/2002.* University of Dundee.

Scottish Intercollegiate Guidelines Network., 2005. *83 Prevention and management of dental decay in the pre-school child.* Edinburgh: Scottish Intercollegiate Guidelines Network.

Scottish Neighbourhood Statistics., 2009. *Area Profiles.* [Online] Available at http://www.sns.gov.uk/Reports/AreaProfile.aspx [Accessed 17 June 2010].

Shaw D, Macpherson L, Conway D., 2009. Tackling Socially Determined Dental Inequalities: Ethical aspects of Childsmile, the National Oral Health Demonstration Programme in Scotland. *Bioethics,* 23(2), pp.131-139.

Shuller AA, Willumsen T, Holst D., 2003. Are there differences in oral health behaviour between individuals with high and low dental fear? *Community Dentistry and Oral Epidemiology,* 31, pp.116-121.

Sheiham A., 2006. Dental Caries affects body weight, growth and quality of life in pre-school children. *British Dental Journal*, 201 (10), pp.625-626.

Skaret E, Raadal M, Kvale G, Berg E., 2000. Factors related to missed and cancelled dental appointments among adolecents in Norway. *European Journal of Oral Sciences,* 108, pp. 175-183.

Smith GD, Hart C, Blane D, Hole D., 1998. Adverse socioeconomic conditions in childhood and cause specific adult mortality: prospective observational study. *British Medical Journal,* 316, pp. 1631- 1635.

Sweeney PC, Nugent Z, Pitts NB.,1999. Deprivation and dental caries status of 5-year-old children in Scotland. *Community Dentistry and Oral Epidemiology,* 27, pp. 152-159.

Szapocznik J, Perez-Vidal A, Brickman AL, Foote FH, Santisteban D, Hervis O, Kurtines WM., 1988. Engaging adolescent drug abusers and their families in treatment: A strategic structural systems approach. *Journal of Consulting and Clinical Psychology,* 56(4), pp.552-557.

Taani DQ., 2002. Dental attendance and anxiety among public and private school children in Jordan. *International Dental Journal,* 52(1), pp. 25-29.

Thomson WM, Stewart JF, Carter KD, Spencer AJ., Dental anxiety among Australians. *International Dental Journal,* 46(4), pp. 320-324.

Tudor Hart J,. 1971. The inverse care law. *Lancet* [online] (updated 14 October 2011) Available at http://www.sochealth.co.uk/history/inversecare.htm [Accessed 22 March 2012].

Turner S, Brewster L, Kidd J, Gnich W, Ball GE, Milburn K, Pitts NB, Goold S, Conway DI, Macpherson LMD., 2010. Childsmile: the national child oral health improvement programme in Scotland. Part 2: Monitoring and delivery. *British Dental Journal*, 209, pp.79-83.

Valaitis R, Hesch R, Passarelli C, Sheehan D, Sinton J., 2000. A Systematic Review of the Relationship Between Breastfeeding and Early Childhood Caries. *Canadian Journal of Public Health*, 91(6), pp.411-417.

Vargas CM, Ronzio CR, Hayes KL., 2008. Oral Health Status of Children and Adolescents by Rural Residence, United States. *The Journal of Rural Health,* 19(3), pp. 260-268.

Watt BD, Hoyland M, Best D, Dadds MR., 2007. Treatment participation among children with conduct problems and the role of telephone reminders. *Journal of Child and Family Studies,* 16, pp.522-530.

Watters K., 2010. *Final Audit Report Childsmile Group 2*. Hamilton: Lanarkshire Dental Audit Committee.

Weintraub JA, Ramos-Gomez F, Jue B, Shain S, Hoover CI, Featherstone JDB, Gansky SA., 2006. Fluoride varnish efficacy in preventing early childhood caries. *Journal of Dental Research*, 85(2), pp.172-176.

Wendt LK, Hallonsten AL, Koch G, Birkhed D., 1994. Oral hygiene in relation to caries development and immigrant status in infants and toddlers. *Scandinavian Journal of Dental Research,* 102, pp.269-273.

Wigen IT, Skaret E, Wang NJ., 2009. Dental Avoidance behaviour in parent and child as risk indicators for caries in 5-year-old children. *International Journal of Paediatric Dentistry,* 19, pp. 431-437.

Wilford J, McMahon AD, Peters J, Pickvance S, Jackson A, Blank L, Craig D, O Rourke, MacDonald EB., 2008. Predicting job loss in those off sick. *Occupational Medicine,* 58, pp.99-106.

World Health Organisation. 1986. *The Ottawa Charter for Health Promotion*. [Online] Available at: http://www.who.int/healthpromotion/conferences/previous/ottawa/en/ [Accessed 26 May 2010].

World Health Organisation. *WHO Oral Health Country/Area Profile Programme*. [Online] Available at: http://www.whocollab.od.mah.se/index.html [Accessed 27 May 2010].

World Health Organisation, 2003. *Dental Diseases and Oral Health*. [Online] Available at: http://www.who.int/oral_health/publications/en/orh_fact_sheet.pdf [Accessed 06 June 2010].

Zittel-Palamara K, Fabiano JA, Davis EL, Waldrop DP, Wysocki JA, Goldberg LJ., 2005. Improving Patient Retention and Access to Oral Health Care: The CARES Program. *Journal of Dental Education*, 69(8), pp 912-918.

Appendices

Appendix 1 – Description of Childsmile Practice Payments

July 2006 – June 2009 (inclusive)

During the initial demonstration phase, General Dental Services (GDS) delivering Childsmile received the following payments:

- **Childsmile enrolment capitation:** £15 per annum – child aged 0-11 months; £20 per annum – child aged 12-23 months; £25 per annum – child aged 24-35 months; £30 per annum – child aged 36-47 months.

Only children born after 1st January 2005 were eligible for the Childsmile enrolment fee.

- **Standard payment (allowance):** £500 per quarter related to number of children enrolled (first year of participation only); standard payment in subsequent years dependant on enrolments

- **Training allowance (per practice):** £1,400 (Year 1); £400 (Year 2); £400 (Year 3)

July 2009 – September 2011 (inclusive)

During the interim demonstration phase, GDS delivering Childsmile received the following payments:

- **Childsmile Payment**: 0-35 months (inclusive) - £5.00 per annum (all children in receipt of care in accordance with Childsmile protocol (SIMD1-5 inclusively)

- **Childsmile Additional Support Payment:** 0-35 months (inclusive) & child's postcode in the 3 most deprived SIMD quintiles - £17.10 per annum.

Only children born after 1st January 2005 and who had attended in the previous 15 months (12 months plus 3 months for a time lag in data processing) were eligible for the Childsmile Payment & the Childsmile Additional Support Payment.

- **Fluoride Varnish Fee:** £6 per application (can only be claimed once within any 6 month period for children enrolled in Childsmile and born on or after 1st January 2005. *(Practices advised to start application from 18 months).*

- **Training Allowance:** Training allowance per nurse on completion of 6 day training - £540.

- **Protected Income:** Protected income of £2,000 during first year of delivery providing a minimum of 45 children aged 0-35 months (inclusive) who's postcode is in the 3 most deprived SIMD quintiles have been enrolled in Childsmile.

Appendix 2 – Health Visitor Caries Risk Assessment Form

Health Visitor Caries Risk Assessment – Draft copy

1. Child details *(block capitals)*

Surname .....
First name(s) .....
Address.....
.....
.....
Full postcode ☐☐☐☐ / ☐☐☐

CHI ☐☐☐☐☐☐☐☐☐☐

DOB ...../...../ 20... Age (weeks) ☐☐

Tel .....

Ethnicity.....Main language spoken.....

Interpreter required Yes ☐ No ☐

Gender M ☐ F ☐ Child's position in the family ☐

Age of mother at child's birth date ☐☐ years

2. Health Visitor details *(block capitals or ink stamp on each copy)*

Surname.....
First name.....
Address.....
.....
Full postcode ☐☐☐☐ / ☐☐☐

Tel .....

3. Name(s) of legal parent / guardian

.....
.....
Relationship to child
.....

4. Caries Risk Assessment

Please answer YES or NO as appropriate at each of the following statements:

	YES	NO
This child lives in an area of high DepCat *(Please refer to the list of high DepCat postcode sectors available via your local CHP)*	☐	☐
This child is **not** exclusively breastfed	☐	☐
Someone in this household smokes	☐	☐
The reason for the parent / carer's last dental visit was to obtain relief of pain	☐	☐
After considering all other known caries risk factors, this child may be more likely to get tooth decay	☐	☐

Please refer this child to the Childsmile Programme if you have marked 'YES' at any of the above.

5a. Outcome – NO REFERRAL

Advise to seek routine dental care ☐ No consent ☐ Other ☐ *(please specify)*.....

Signed.....(Assessing Health Visitor) Date.....

5b. Outcome – REFERRAL MADE

If child referred to Childsmile, please complete remainder of form

Referral made to Childsmile ☐

The named child received a Caries Risk Assessment on ...../...../20..... The outcome has been explained and the legal parent / guardian has agreed to his / her referral to the Dental Health Support Worker.

Referred to: ..... (DHSW) Base:.....

Signed ..... (Assessing HV) DHSW to contact HV prior to visit ☐

6. Parental consent *(block capitals)*

I (name).....legal parent / guardian of..... (child's name) agree to be contacted by a Dental Health Support Worker to receive further information on my child taking part in the Childsmile Programme. I agree to my child's details being passed to the Dental Health Support Worker.

Signed.....Date.....

HV to retain 1 copy for file. Send remaining 2 copies to DHSW.
DHSW – keep 1 copy for file. Send 1 copy to monitoring.

Guidance notes
for use in completing the HV Caries Risk Assessment form

Childsmile Caries Risk Assessment forms should be completed only by registered Health Visitors.

This form is produced in triplicate.
Please use a blue/black ballpoint pen to complete the monitoring form.
Ensure that all text entered on top copy is legible on all copies.
If using ink stamps, please stamp on each copy.

Complete all details in full using block capitals.

1: **Child details**
- Post code: use capital letters and leave surplus boxes empty e.g. G 1 3 _ / 4 Z Y
- CHI: complete each of the 10 boxes.
- DOB e.g. 18 August 2005 - please enter 18/08/2005.
- Age: calculate the child's age in weeks.
- Telephone Number: Include area code e.g. 0141 XXX ZZZZ.
- Ethnicity: legal parent/guardian should be asked to declare the child's ethnicity:-

White: include Scottish, other British, Irish and any other white background
Mixed: include any mixed background
Indian:
Pakistani:
Bangladeshi:
Chinese:
Other Asian:
Caribbean:
African:
Other Black:
Other Ethnic background: any other background other than the above

- Enter the main language spoken by the family.
- Please √ (tick) either Yes or No if a interpreter is required.
- Child's position in the family i.e. are they 1st, 2nd, 3rd etc. child born.
- Age of mother at date of child's birth: calculate in years (disregard part years).

2: **Health Visitor details**
- Enter name and details of address and telephone number (including area code) of base.
- If using ink stamp, please stamp on each copy.

3: **Name(s) of legal parent/guardian**
- Enter first name and surname of legal parent(s)/guardian(s).
- Relationship to child: e.g. mother, father, legal guardian.

4: **Caries Risk Assessment**
- ***Please answer all of the statements***, by ticking (√) either Yes or No for each statement.
- DepCat 5/6/7 or 1st quintiles SIMD: refer to postcode/DepCat/SIMD listing.
- Caries risk factors: refer to listing of caries risk factors (available from Lead Health Visitor or Childsmile Programme Team).
- If ANY of the caries risk assessment statements have been ticked YES, complete the remainder of the form
- If ALL of the caries risk assessment statements have been ticked NO, enter (√) tick in "advised to seek routine dental care" box

5: **INVITATION made**
- enter √ tick in box if legal parent/guardian accepts invitation into Childsmile
- If the legal parent/guardian declines invitation, please enter (√) tick in declined box and give reason why in the space provided
- If you wish the DHSW to contact you prior to contacting the family tick (√) the appropriate box.
- Sign and date the form.

6: **Parental consent**
- Print name of legal parent/guardian and child's name clearly in the spaces provided.
- Ensure that the named legal parent/guardian signs and dates the form.

Before separating the three copies of this form, please check that all sections are complete and that all text appears clearly on each copy. It may be necessary to overwrite any faint text.

The HV should retain a copy for file. Send remaining 2 copies to DHSW. The DHSW should keep a copy for file, and send 1 copy to monitoring.

Appendix 3 – Dental Health Support Worker – First Visit Form

Dental Health Support Worker - First Visit – Draft copy

1. Child details *(block capitals)*

Surname ……
First name(s) ……
Address……
……
……
Full postcode☐☐☐☐ /☐☐☐

CHI ☐☐☐☐☐☐☐☐☐☐

DOB ……/……..20……..

Tel ……

Age (months) ☐☐

Name of legal parent / guardian
……

……

Relationship to child……..

2. Dental Health Support Worker details *(block capitals or sticker affixed to each copy)*

Surname……

First name ……

DHSW Number ☐☐☐☐☐ (e.g. SW01)

Address of base……
……
……
Full postcode☐☐☐☐ / ☐☐☐

Tel ……

3. Introduction to Programme

Was the Childsmile Programme explained to the legal parent / guardian today? Yes ☐ No ☐

Does the family have their own existing dentist? Yes ☐ No ☐

If yes, details of existing dental practice……..

Has a Childsmile practice been selected? ? Yes ☐ No ☐

If yes, please give details of dental practice selected below
Practice name…… Programme Practice Number ☐☐☐☐
Practice address……
……Tel ……..
Full postcode ☐☐☐☐ / ☐☐☐

If no, please give reason
☐ Want to go to own dentist
☐ No practice chosen but still want to be part of Childsmile
☐ Do not want to participate *(please give reason)* ……

4. Parental consent *(block capitals)*

I (name)……legal parent /guardian of…….. (child's name) agree to my child enrolling in the Childsmile Programme. I understand that my child will receive a programme of infant dental care. In order that my child receives appropriate dental care, I agree to my child's details being shared among the Dental Care Team. I consent for my child's details to be used along with other participating children's information in evaluation of the Childsmile Programme. However, I understand that no information which could identify my child will be made public.

Signed……Date……

5. Date and time of dental practice appointment

Date…… Time……

6. Notes (e.g. groups attended, best time to contact, preferred setting for visit etc.)

Signature of DHSW…… Date……

DHSW to retain 1 copy for file. Send 1 copy to monitoring / 1 copy to identified practice (photocopy form and send to HV if requested)

Guidance notes
for completion of DHSW First Visit monitoring form.

This form is produced in triplicate.
Please use blue/black ballpoint pen to complete this monitoring form.
Ensure that all text entered on top copy is legible on all copies.
If using stickers, please affix one to each copy.

Complete all details in full using block capitals.

1: Child details

- Complete what details you can using block capitals in advance of the appointment.
- Post code: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 Z Y
- CHI: complete each of the 10 boxes.
- DOB: enter full details of date of birth.
- Telephone Number: include area code e.g. 0141 XXX ZZZZ.
- Age: calculate the child's age in months; disregard part months.
- Name of legal parent/guardian; enter full first and surnames.
- Relationship to child: e.g. mother,father, legal guardian.

2: Dental Health Support Worker details

- Complete what details you can using block capitals in advance of the appointment.
- Post code of base: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 A B
- Telephone Number of base: Include area code e.g. 0141 XXX ZZZZ.
- DHSW Number: each DHSW has a unique identification number.
- If using pre-printed stickers, please ensure that each page has an identical sticker.

3: Introduction to Programme

- Please complete all sections.
- Answer each question by entering a √ (tick) in the appropriate boxes.
- Leave the inappropriate boxes empty.
- Programme Practice Number: refer to listing of unique codes.

4: Parental Consent

- Once the DHSW has described the Childsmile Programme to the legal parent/guardian it is essential that the legal parent/guardian provide written consent for their child/charge to enrol in the Programme.
- It is ***essential*** that the signatory is given adequate time to read the parental consent section before signing and dating the form.

5: Date and time of dental practice appointment:

- Record the details of the appointment that the legal parent/guardian has agreed with you and the Dental Practice.
- These may not be known at the time of the first home visit, in which case, the details may be entered later once they have been confirmed.

6: Notes

- This space is intended for any orther notes that would help in organising/supporting the child's participation in Childsmile. Use this to note e.g. any mother and baby groups attended, the best times to make contact with the family etc.

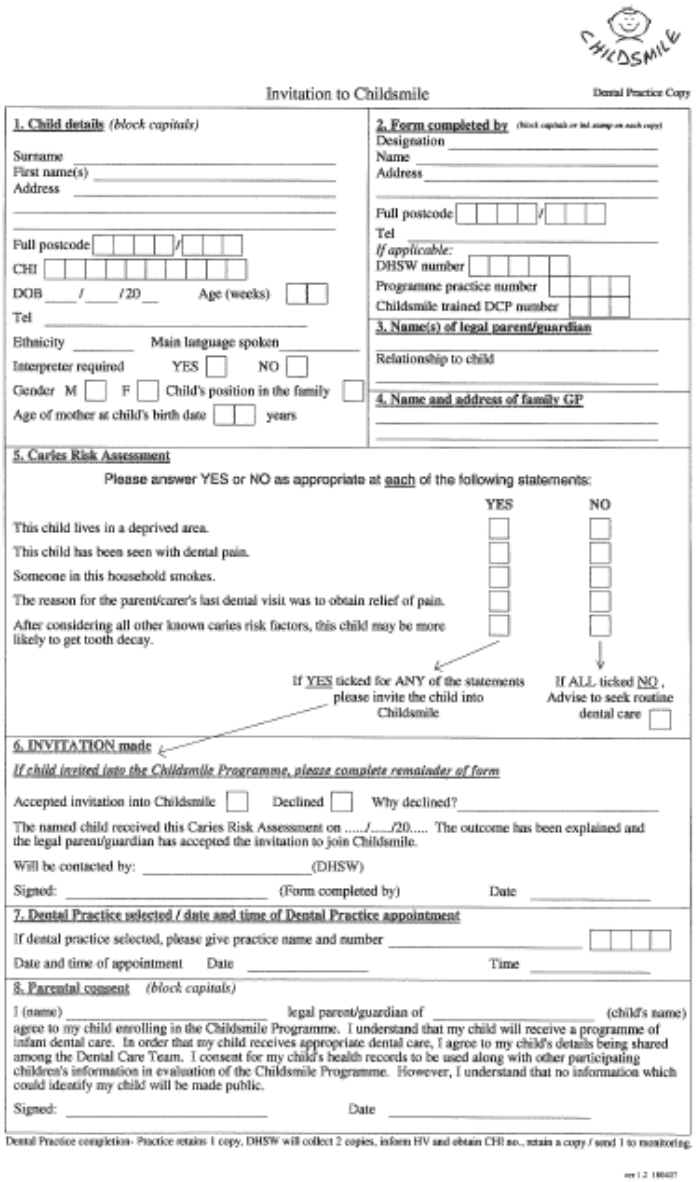
Signature of DHSW

- The DHSW should sign and date the form at the end of the visit.

Before separating the three copies of this form, please check that all sections are complete and that all text appears clearly on each copy. It may be necessary to overwrite any faint text.

The DHSW should retain a copy for file. Send a copy to monitoring and one copy to the identified Childsmile practice if chosen by the family (photocopy form and send to HV if requested). If no Childsmile practice chosen, please send 3rd copy of the form to the family's Health Visitor if requested.

Appendix 4 – Invitation to Childsmile Form



Invitation to Childsmile

Dental Practice Copy

1. Child details *(block capitals)*

Surname _____
First name(s) _____
Address _____
_____
_____
Full postcode ☐☐☐☐/☐☐☐
CHI ☐☐☐☐☐☐☐☐☐☐
DOB ___/___/20__ Age (weeks) ☐☐
Tel _____
Ethnicity _____ Main language spoken _____
Interpreter required YES ☐ NO ☐
Gender M ☐ F ☐ Child's position in the family ☐
Age of mother at child's birth date ☐☐ years

2. Form completed by (block capitals or ink stamp on each copy)

Designation _____
Name _____
Address _____
_____
Full postcode ☐☐☐☐/☐☐☐
Tel _____
If applicable:
DHSW number ☐☐☐☐☐
Programme practice number ☐☐☐☐
Childsmile trained DCP number ☐☐☐

3. Name(s) of legal parent/guardian

_____
Relationship to child
_____

4. Name and address of family GP

_____
_____

5. Caries Risk Assessment

Please answer YES or NO as appropriate at each of the following statements:

	YES	NO
This child lives in a deprived area.	☐	☐
This child has been seen with dental pain.	☐	☐
Someone in this household smokes.	☐	☐
The reason for the parent/carer's last dental visit was to obtain relief of pain.	☐	☐
After considering all other known caries risk factors, this child may be more likely to get tooth decay.	☐	☐

If YES ticked for ANY of the statements please invite the child into Childsmile

If ALL ticked NO, Advise to seek routine dental care ☐

6. INVITATION made

If child invited into the Childsmile Programme, please complete remainder of form

Accepted invitation into Childsmile ☐ Declined ☐ Why declined? _____

The named child received this Caries Risk Assessment on ...../...../20..... The outcome has been explained and the legal parent/guardian has accepted the invitation to join Childsmile.

Will be contacted by: _____(DHSW)

Signed: _____ (Form completed by) Date _____

7. Dental Practice selected / date and time of Dental Practice appointment

If dental practice selected, please give practice name and number _____ ☐☐☐☐

Date and time of appointment Date _____ Time _____

8. Parental consent *(block capitals)*

I (name) _____ legal parent/guardian of _____ (child's name) agree to my child enrolling in the Childsmile Programme. I understand that my child will receive a programme of infant dental care. In order that my child receives appropriate dental care, I agree to my child's details being shared among the Dental Care Team. I consent for my child's health records to be used along with other participating children's information in evaluation of the Childsmile Programme. However, I understand that no information which could identify my child will be made public.

Signed: _____ Date _____

Dental Practice completion- Practice retains 1 copy, DHSW will collect 2 copies, inform HV and obtain CHI no., retain a copy / send 1 to monitoring.

ver 1.2 180407

Guidance notes
for use in completing the Invitation to Childsmile form

This form is produced in triplicate. Please use a blue/black ballpoint pen to complete the monitoring form. If using ink stamps, please stamp on each copy.

Complete all details in full using block capitals.

1: Child details

- Post code: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 Z Y
- CHI: complete each of the 10 boxes.
- DOB e.g. 18 August 2005 - please enter 18/08/2005.
- Age: calculate the child's age in weeks.
- Telephone Number: Include area code e.g. 0141 XXX ZZZZ.
- Ethnicity: legal parent/guardian should be asked to declare the child's ethnicity:-

White: include Scottish, other British, Irish and any other white background
Mixed: include any mixed background
Indian:
Pakistani:
Bangladeshi:
Chinese:
Other Asian:
Caribbean:
African:
Other Black:
Other Ethnic background: any other background other than the above

- Enter the main language spoken by the family.
- Please tick (√) either Yes or No if a interpreter is required.
- Child's position in the family i.e. are they 1st, 2nd, 3rd etc. child born.
- Age of mother at date of child's birth: calculate in years (disregard part years).

2: Form completed by

- Enter designation, name and details of address and telephone number (including area code) of where you work.
- If applicable, enter relevant numbers (unique DHSW or Programme Practice and Childsmile trained DCP number).

3: Name(s) of legal parent/guardian

- Enter first name and surname of legal parent(s)/guardian(s).
- Relationship to child: e.g. mother, father, legal guardian.

4: Name and address of family GP

- Enter name and details of address of family GP.

5: Caries Risk Assessment

- ***Please answer all of the statements***, by ticking (√) either Yes or No for each statement.
- If the child has been seen with dental pain at any time and in any practice (including this visit), tick (√) Yes
- Caries risk factors: refer to listing of caries risk factors (available from Childsmile Programme Team).
- If ANY of the caries risk assessment statements have been ticked YES, complete the remainder of the form
- If ALL of the caries risk assessment statements have been ticked NO, enter (√) tick in "advised to seek routine dental care" box

6: INVITATION made

- enter (√) tick in box if legal parent/guardian accepts invitation into Childsmile
- If the legal parent/guardian declines invitation, please enter (√) tick in declined box and give reason why in the space provided
- If you wish the DHSW to contact you prior to contacting the family tick (√) the appropriate box.
- Sign and date the form.

7: Dental Practice selected / date and time of dental practice appointment

- If dental practice selected, please enter practice name and 4 digit number
- Record the details of the appointment that the legal parent/guardian has agreed with you and the Dental Practice

8: Parental consent

- Once the Childsmile Programme has been described to the legal parent/guardian it is essential that the legal parent/guardian provide written consent for their child/charge to enrol in the Programme.
- It is essential that the signatory is given adequate time to read the parental consent section before signing and dating the form

Before separating the three copies of this form, please check that all sections are complete and that all text appears clearly on each copy. It may be necessary to overwrite any faint text.

Appendix 5 – Record of Child/Parent Contact Form

Record of Child/ Parent Contact – Draft copy

1. Child details *(block capitals)*
Surname ……
First name(s)……
Address……
Full postcode ☐☐☐☐ / ☐☐☐
CHI ☐☐☐☐☐☐☐☐☐☐
DOB ……/…… /20… Age (months) ☐☐

2. Notice of Change of Address
Address……
……
……
Full postcode ☐☐☐☐ / ☐☐☐
Tel……

3. Visit details

Planned Location
Dental Practice ☐ Home ☐
Other (please state)……

Date of planned visit …../…../20….

Which planned visit?
3 months ☐
6 months ☐
1 year ☐
18 months ☐
2 years ☐
30 months ☐
3 years ☐
Extra visit ☐

Attendance	Yes	Cancelled Visit	Failed to Attend
At Dental Practice	☐ (section 4)	☐ (sections 5+ 9)	☐ (sections 5 +9)
At home / other	☐ (section 5)	☐ (sections 5 + 9	☐ (section5 + 9)

4. Dental Practice Visit
Is this the child's first visit to this practice? Yes ☐ No ☐

Attendees
Individual family ☐
Group of families ☐
If group, number of families ☐ Number

5. Programme advice delivered by
Dental Health Support Worker Number ☐☐☐☐☐ (e.g. SW01)
Practice Number ☐☐☐☐
Childsmile trained DCP Number ☐☐☐
Supplementary contact Hygienist ☐ Dentist ☐

6. Information received by

	Insert number Male	Female
Legal parent/guardian	☐	☐
Grandparent	☐	☐
Partner of parent	☐	☐
Other (please specify)……	☐	☐

7. Description of advice/intervention
Accompanied by DHSW Yes ☐ No ☐
Did the child's NHS dental registration start today? (GP17 form completed) Yes ☐ No ☐

CORE ADVICE
Dietary ☐
Teething ☐
Sugar-free medicine ☐
Tooth brushing / paste ☐
Tooth brushing demonstration ☐

RESOURCES ISSUED
Dental Pack ☐
Health Information ☐
Other ……

At 6 months
Tommee Tippee cup issued ☐

At 12 months +
Tooth eruption ☐
Introduction to dental team ☐
Clinical prevention ☐
please specify……

Duration of discussion (mins) ☐☐

3 x DNA = DHSW home visit req. ☐

8. Date and time of next visit
Dental Practice visit ……
Home visit ……

9. Reason for cancelled/failed appointment/further notes

10. Advice givers and parent/carers signature
Advice giver……Date……
Parent/carers……Date……

Dental Practice Visit – Practice retains 1 copy. DHSW will collect 2 copies, retain a copy / send 1 to monitoring (photocopy form and send to HV if requested)
DHSW home visit – DHSW retains 1 copy, send 1 copy to monitoring and 1 to identified practice (photocopy form and send to HV if requested)

Guidance notes
for completing Record of Child/Parent Contact form

Please complete a fresh form for every face-to-face contact with child/parent/carer.

This form is produced in triplicate.
Please use blue/black ink ballpoint to complete this monitoring form.
Ensure that all text entered on top copy is legible on all copies.

1: Child details
- Complete all details in full using block capitals in advance of the appointment.
- Post code: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 Z Y
- CHI: complete each of the 10 boxes.
- DOB: enter full details of date of birth.
- Age: calculate the child's age in months; disregard part months.

2: Notice of change of address
- If there has been a change of address since the previous visit, record the new address etc. in Section 2.

3: Visit Details
- Describe the planned visit by entering √(tick) in relevant boxes.
- Record the detail of actual attendance/non-attendance by entering √ (tick) in appropriate boxes. Leave inappropriate boxes blank.

4: Dental Practice visit
- Complete this section when a Childsmile appointment takes place in a dental practice.

5: Childsmile programme advice delivered by:
- Enter the unique codes in the appropriate boxes.
- Supplementary contact: enter √ (tick) in the appropriate box (This will be an exceptional occurrence).

6: Information received by:
- Enter the number of male and female adults accompanying the child, giving their relationship(s) to the child.

7: Description of the advice/intervention
- Enter √ (tick) in the appropriate boxes.
- Multiple entries are possible in CORE ADVICE and RESOURCES ISSUED sections.
- Record the duration of the discussion in minutes.
- If there have been three consecutive 'did not attends' (DNA) enter √ (tick).

8: Date and Time of next meeting
- Record details of next planned visit.

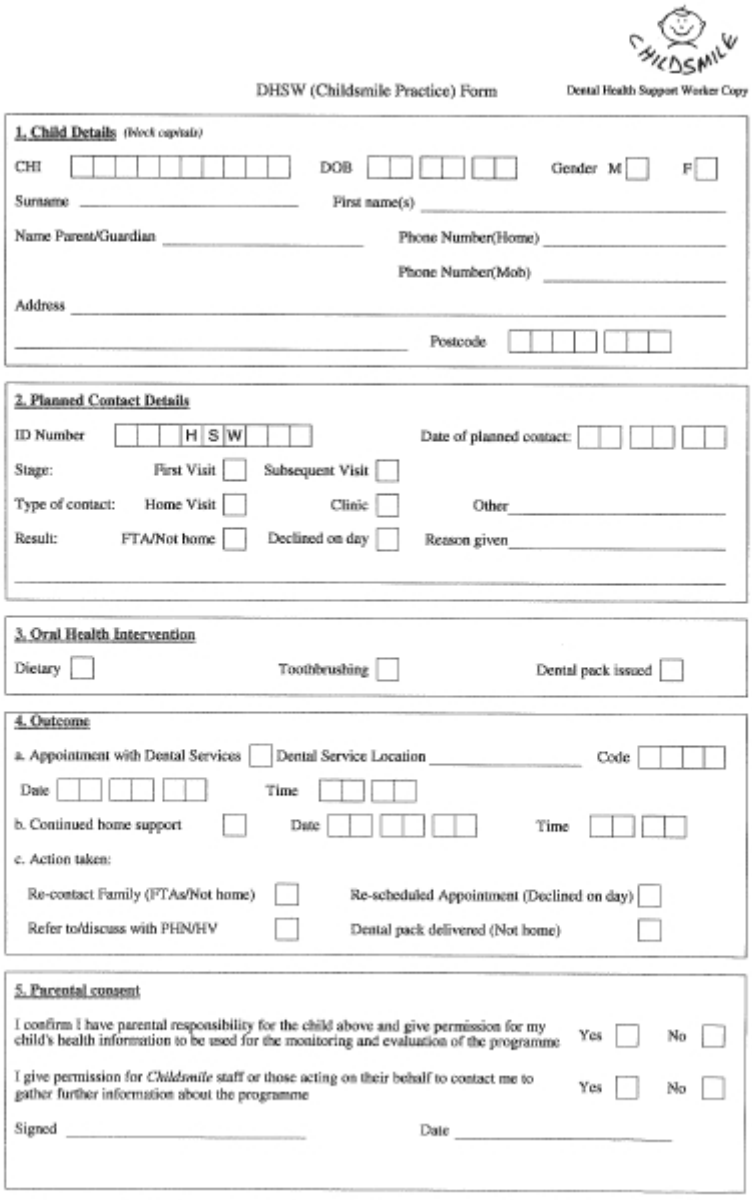
9: Reason for not attending appointment/further notes
- Record reason for cancellation/non-attendance if known.
- Also, use this space for any relevant short notes.

10: Advice givers and parent/carers signature
- Add signature of parent/carer and signature of DHSW or DCP who has given advice and record the date.

Before separating the three copies of this form, please check that all sections are complete and that all text appears clearly on each copy. It may be necessary to overwrite any faint text.

If a Dental Practice Visit - the practice retains 1 copy. The DHSW will collect 2 copies, retain a copy and send 1 to monitoring. If requested, the form should be photocopied by the DHSW and sent to the HV.
If a DHSW home visit - the DHSW retains 1 copy, sends 1 copy to monitoring and 1 copy to the identified Childsmile practice if chosen (photocopy form and send to HV if requested). If no Childsmile practice chosen, please send the 3rd copy of the form to the family's HV if requested.

Appendix 6 - DHSW (Childsmile Practice) Form



DHSW (Childsmile Practice) Form

Dental Health Support Worker Copy

1. Child Details *(block capitals)*

CHI ☐☐☐☐☐☐☐☐☐☐ DOB ☐☐ ☐☐ ☐☐ Gender M ☐ F ☐

Surname _____ First name(s) _____

Name Parent/Guardian _____ Phone Number(Home) _____

Phone Number(Mob) _____

Address _____

_____ Postcode ☐☐☐ ☐☐☐

2. Planned Contact Details

ID Number ☐☐☐ H S W ☐☐☐ Date of planned contact: ☐☐ ☐☐ ☐☐

Stage: First Visit ☐ Subsequent Visit ☐

Type of contact: Home Visit ☐ Clinic ☐ Other _____

Result: FTA/Not home ☐ Declined on day ☐ Reason given _____

_____

3. Oral Health Intervention

Dietary ☐ Toothbrushing ☐ Dental pack issued ☐

4. Outcome

a. Appointment with Dental Services ☐ Dental Service Location _____ Code ☐☐☐☐

Date ☐☐ ☐☐ ☐☐ Time ☐☐ ☐☐

b. Continued home support ☐ Date ☐☐ ☐☐ ☐☐ Time ☐☐ ☐☐

c. Action taken:

Re-contact Family (FTAs/Not home) ☐ Re-scheduled Appointment (Declined on day) ☐

Refer to/discuss with PHN/HV ☐ Dental pack delivered (Not home) ☐

5. Parental consent

I confirm I have parental responsibility for the child above and give permission for my child's health information to be used for the monitoring and evaluation of the programme Yes ☐ No ☐

I give permission for *Childsmile* staff or those acting on their behalf to contact me to gather further information about the programme Yes ☐ No ☐

Signed _____ Date _____

Guidance notes for completing DHSW (Childsmile Practice) form

Please complete a new form for every **planned contact** with the family

This form is produced in triplicate (Monitoring/Dental Services/DHSW copies); Please use blue/black ink ballpoint to complete this form in **BLOCK CAPITALS;** *Ensure that all text entered on top copy is legible on all copies.*

1: CHILD DETAILS:

- **Complete** all details in full in advance of the appointment.
- **Postcode:** use BLOCK CAPITALS leaving surplus boxes empty e.g. | | G | 1 | 3 | / | 4 | Z | Y |
- **Please enter full CHI and DOB (THESE ARE BOTH REQUIRED TO ENABLE CROSS-CHECKING).**

2: PLANNED CONTACT DETAILS (COMPLETE IN FULL FOR *EVERY* PLANNED CONTACT WITH FAMILY):

- **The ID Number** | F | V | B | H | S | W | 0 | 0 | 9 | **will consist of: Health Board code, e.g. FVB = Forth Valley; Job Type (already populated for DHSW); and your unique ID number, e.g. 009.**
- **Date of planned contact** - Please record the date of the planned contact.
- **Stage** - Please specify if this is a first visit or a subsequent visit:

  THE 'FIRST VISIT' **BOX SHOULD BE TICKED WHEN THE DHSW HAS DELIVERED THE 3 MONTH INTERVENTION; OR HAS ATTEMPTED TO DELIVER THE 3 MONTH INTERVENTION: I.E. EACH ATTEMPT TO DELIVER THE 3 MONTH INTERVENTION MUST BE RECORDED AS A 'FIRST VISIT' ON EACH NEW FORM RAISED.**

  THE 'SUBSEQUENT VISIT' **BOX SHOULD BE TICKED ON ALL FORMS RAISED FOR FURTHER VISITS TO THE FAMILY AFTER THE SUCCESSFUL FIRST VISIT (I.E. AFTER THE 3 MONTH INTERVENTION).** ***PLEASE NOTE THAT THE FIRST VISIT MAY OCCASIONALLY TAKE PLACE WHEN CHILD IS OLDER THAN 3 MONTHS.***
- **Type of contact** - Please record whether scheduled contact was at the family home, a clinic or another location **(PLEASE RECORD WHERE)** or contact was by telephone.
- **Result** - Tick the **'FTA/NOT HOME'** box if the family did not attend the clinic or were not at home when DHSW called.

  Tick the **'DECLINED ON DAY'** box if family was at home/attended clinic but could not/would not complete scheduled intervention **(PLEASE RECORD REASON GIVEN).**

3: ORAL HEALTH OUTCOME:

- **A SUCCESSFUL** visit will result in the completion of the relevant boxes in Section 3 **(PLEASE TICK ALL THAT APPLY).**

4: OUTCOME:

- **A SUCCESSFUL FIRST** or **SUBSEQUENT** visit will result in the completion of sub-section 'a' and/or 'b' in this section.
- An **UNSUCCESSFUL FIRST** or **SUBSEQUENT** visit will result in completion of all applicable boxes in sub-section 'c' in this section: If a family failed to attend or were not at home, you should tick the box **'RE-CONTACT FAMILY'; 'RE-SCHEDULED APPOINTMENT'** is used when the family could not complete the appointment but were willing to re-schedule; if a family allowed the DHSW to visit, but then refused to engage **AND WOULD NOT RESCHEDULE** this should also be noted as **'DECLINED ON THE DAY'** in Section 2 **AND 'REFER TO/DISCUSS WITH PHN/HV'** should be ticked in Section 4.
- The DHSW can also tick **'REFER TO/DISCUSS WITH PHN/HV'** in Section 4 if he/she feels that there are other circumstances that may warrant this outcome.
- When a visit has been **UNSUCCESSFUL**, a dental pack should be delivered to the family home (when possible) and this should be recorded in the box in this Section (4) and not Section 3.

5: PARENTAL CONSENT: ***OBTAIN SIGNATURE ONCE ONLY - ON DAY OF FIRST SUCCESSFUL VISIT.***

Before separating the three copies of this form, please check that all sections are complete and that all text appears clearly on each copy. It may be necessary to overwrite any faint text.

Appendix 7 – GP17 Form

NHS Scotland

NHS National Services Scotland

CHILDSMILE West Region Office,
Level 8,
Glasgow Dental Hospital and School,
378 Sauchiehall Street,
GLASGOW,
G2 3JZ
Tel: 0141 211 9854
Fax: 0141 353 1593
Email: lynn.brewster@nhs.net
d.conway@dental.gla.ac.uk

4th June 2009

Re. Updated instructions for completing GP17 forms for *Childsmile*

The need for this instruction is to ensure that the GP17 forms can be processed appropriately for *Childsmile* monitoring and payment purposes. To enable the forms to be accepted and processed there is a need for the back of the form to be completed. Note this will not effect registration status and a separate GP17 form is required for GDS registration. GP17 forms need to be completed as detailed here for **every** *Childsmile* contact (including Failed to Attends (FTAs)) – or it will be returned:

Front of form

Part 1 The patient's Surname, Forename, Date of Birth, Sex, Address and Postcode need to be completed.

Part 2 Dentist's Name and Address ("stamp") including Health Board Number needs to be completed.

Date of Registration/Acceptance for treatment **AND**
Date of Completion of Treatment needs to be completed.
Please enter the date of the scheduled appointment in both.

Part 3 Other Treatment Section:
For every *Childsmile* contact an enrolment code (6100) needs to be completed. **Note:** an enrolment code is needed to ensure continuing *Childsmile* enrolment payment.

Use only the following *Childsmile* codes and please remember to enter 01 (for frequency) after each of the *Childsmile* codes:

Descriptor	Code	
Enrolment	6100	01
Dietary advice	6101	01
Toothbrushing/ fluoride advice	6102	01
Application of fluoride varnish	6103	01
Failed to attend (FTA) on day of appointment	6104	01

For processing purposes – "TOTAL £" - please enter zero as "0"

Back of form

Part 4a To ensure that the **Childsmile** GP17 form does not effect dental GDS registration status – and while the box might not be literally true – but to ensure the form is processed appropriately - for **all** children please check the second box:

"I am registered with another dentist at this practice"

UNLESS the child fails to attend FTA
If FTA on first visit please check the fourth box:
"I do not wish to be registered with any dentist"

If the FTA is not the first visit then check the second box as normal:
"I am registered with another dentist at this practice"

Part 4b Do not complete this section

Part 4c Check the box "I am under 18 year of age"

Check the box "I am the patient's parent, guardian or carer"

The signature section **must** be signed and dated by the parent **UNLESS** the patient fails to attend FTA. If FTA then please enter the letters "F T A" in the signature section.

Part 7 The Dentist's Signature must be completed – signed and dated by the dentist.

Part 8 Patient's must sign and date this section. **UNLESS** the patient fails to attend FTA. If FTA then please check the box in the bottom right corner: "PFTR"

Payment Schedule
Payments will continue to appear in Line 13 of the schedule – previous detailing of payments was a processing error and will not appear in future schedules.

GP17 Returns for *Childsmile*
All GP17s recording *Childsmile* activity must be returned to the following address:

Childsmile/PSD
PO Box 17373,
Gyle Square,
1 South Gyle Crescent,
EDINBURGH
EH12 1GJ

Yours sincerely

Lynn Brewster
Childsmile Programme Manager

David Conway
Consultant in Dental Public Health

Appendix 8 – Dental Health Support Worker – Courtesy Visit Form

Dental Health Support Worker – Courtesy Visit Form – Draft copy

1. Child details *(block capitals)*

Surname ……
First name(s) ……
Address……
……
……
Full postcode☐☐☐☐ /☐☐☐

CHI ☐☐☐☐☐☐☐☐☐☐

DOB ……/……..20……..

Tel ……

Age (months) ☐☐

Name of legal parent / guardian
……

……

Relationship to child……

2. Dental Health Support Worker details *(block capitals or sticker affixed to each copy)*

Surname……

First name ……

DHSW Number ☐☐☐☐☐ (e.g. SW01)

Address of base……
……
……
Full postcode ☐☐☐☐ / ☐☐☐

Tel ……

3. Details regarding family's first visit to the dental practice

Date of family's first visit to the practice ……/……..20……..

Date of courtesy visit ……/……..20……..

How did the family find their first visit to their participating Childsmile dental practice?
……
……
……

Does the family have any issues with regards to the first practice visit?
……
……
……

Has a second appointment to the dental practice been arranged? Yes ☐ No ☐

If yes, date and time of next appointment ……

If no, please explain why not ……

How child friendly was the practice?	Action Taken:
Notes: (e.g. information given on local activities/ amenities/ resources)	

Signature of DHSW……. Date……

DHSW to complete this form after the family's first visit to the Dental Practice (normally about 3 months of age). Retain copy for file, send copy to monitoring

Guidance notes
for completion of DHSW Courtesy Visit form.

Please use blue/black ballpoint pen to complete this monitoring form.

Complete all details in full using block capitals.

1: Child details

- Complete what details you can using block capitals in advance of the appointment.
- Post code: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 Z Y
- CHI: complete each of the 10 boxes.
- DOB: enter full details of date of birth.
- Telephone Number: Include area code e.g. 0141 XXX ZZZZ.
- Age: calculate the child's age in months; disregard part months.
- Name of legal parent/guardian; enter full first and surnames.
- Relationship to child: e.g. mother,father, legal guardian.

2: Dental Health Support Worker details

- Complete what details you can using block capitals in advance of the appointment.
- Post code of base: use capital letters and leave surplus boxes empty e.g. G 1 3 / 4 A B
- Telephone Number of base: Include area code e.g. 0141 XXX ZZZZ.
- DHSW Number: each DHSW has a unique identification number.
- If using pre-printed stickers, please ensure that you attached one to the form.

3: Details regarding family's first visit to the dental practice

- Please complete all sections.
- Date of family's first visit to the Dental Practice.
- Date of courtesy visit.
- Has the family arranged a second appointment to the dental practice?
  - If yes, enter date and time of next appointment.
  - If no, please explain why not.
- What did the family think about the practice - how child friendly was it? Was it child friendly in the waiting room/clinic room? What could be done to improve the facilities?
- What information have you given the family regarding activities and amenities available to them in their community.
- Any further action the DHSW needs to take (e.g. arrange next appointment if not already done so, give family more information regarding community activities etc.).

Signature of DHSW

- The DHSW should sign and date the form at the end of the visit.

The DHSW should retain a copy for file and send a copy to monitoring.