

FLUORIDE INTERVENTIONS IN EARLY  
YEARS EDUCATION SETTINGS

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University  
of Glasgow

# International Expert Discussion Workshop October 4

# 2022

# INTRODUCTION

On October 4 2022, the Fluoride Interventions in Early Years Education Settings workshop connected 28 international experts in oral health.

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Attendees shared their expertise, best practice and lessons learned from supervised toothbrushing and fluoride varnish programmes, and evaluated the latest evidence from fluoride-based intervention schemes in nurseries/kindergartens and primary schools from around the world.

The workshop was hosted virtually by the University of Glasgow Childsmile Evaluation Team, with attendees divided into three groups for facilitator-guided discussion following a presentation on the benchmarking of fluoride intervention programmes in Scotland and South-East Europe.

Participants were encouraged to discuss issues related to fluoride-based interventions in early years education settings, including resourcing, sustainability, and how programmes may be impacted by public health and economic crises.

The workshop objectives and an overview of the discussions are provided in this report.

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Recent evidence suggests a need to assess the relative merits of fluoride-based interventions for children in early years educational settings

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# EXECUTIVE SUMMARY

Supervised toothbrushing programmes and other fluoride-based interventions are widely used in efforts to improve children's oral health, prevent early childhood caries and reduce oral health inequalities in many parts of the world.

Early childhood caries is a preventable but widespread dental condition affecting over 600 million children worldwide (NDIP, 2020). It can cause considerable pain, lead to infection and disrupt everyday family life. Early childhood caries also impacts healthcare systems, carrying a substantial economic burden.

The World Health Organization has set a clear priority to eradicate early childhood caries through a series of interventions, including health promotion, nutrition, and population-based fluoride exposure, delivered in multiple settings including schools and communities, as well as through preventative dental health services.

However, recent evidence suggests a need to assess the relative merits of fluoride-based interventions for children in educational settings as part of population oral health improvement policies and programmes.

This international expert workshop was organised to appraise new evidence and trial data in a systematic way.

An initial survey was undertaken in August 2022 to gather opinions relating to fluoride-based interventions delivered in early years educational settings (nursery/kindergarten [children aged approx. 2-5 years] or primary schools [children aged approx. 6-12] years) for preventing early childhood caries.

During the workshop, experts were presented with this initial survey feedback, in addition to preliminary findings from a systematic overview the organisers had undertaken. This overview involved appraising and extracting evidence from randomised controlled trials, observational studies, and cost/economic studies, as well as the body of available systematic reviews from 20 countries.

Participants were presented with evidence on the efficacy of particular fluoride-based interventions and invited to consider whether this is sufficient to continue to support or to introduce such programmes.

During the expert discussions, three main themes came to the fore:

01

### Feasibility

Programme logistics are complex, requiring the support of parents, educational providers, and staff, as well as dental and oral health professionals. This isn't always forthcoming, as interventions take up valuable classroom time and space. The setting may also lack access to funding, specialised staff and/or equipment.

02

### Sustainability

Attendees discussed the expense and practicality of alternatives to single-use plastics, as well as considering the benefits of early intervention in preventing future dental procedures and appointments, acknowledging also that preventing dental disease would have a major environmental benefit.

03

### Affordability

The cost of community-based children's oral health programmes depends on a range of factors, including the need for staff support (e.g. for fluoride varnish). Available funding is usually the limiting factor in deciding whether interventions are universal (population-wide) or targeted at those at high risk of caries.

## EXPERT OPINION

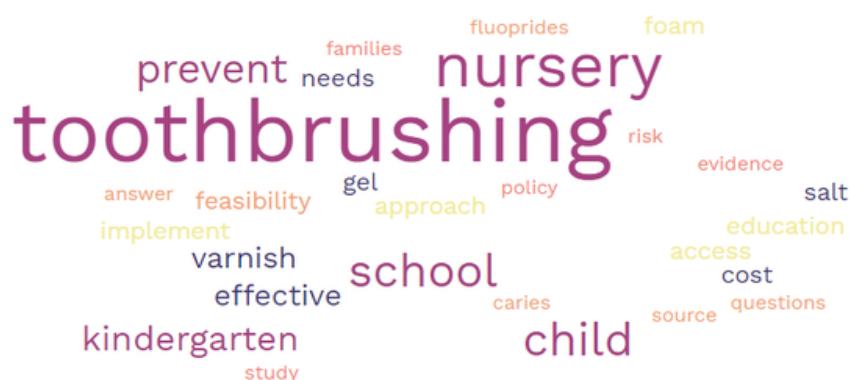


- Supervised toothbrushing is the highest priority intervention, particularly in areas with limited resources. Ideally, it would be universal and extended to older children.
- Providers need to consider whether there is sufficient added benefit (in terms of effectiveness and cost-effectiveness) from fluoride varnish programmes in education settings where toothbrushing is in place.
- Water fluoridation is unlikely to replace fluoride delivery programmes in education in the near future. In addition, there are social/behavioural benefits to toothbrushing.

# WORKSHOP OBJECTIVES

The primary aim of the workshop was to bring together experts in children's oral health, both in the UK and internationally, in order to:

- Share good practice and evidence from evaluation of the different fluoride-based intervention programmes being carried out in Scotland, England, Wales, and Northern Ireland.
- Consider the different requirements and limitations applicable to programmes in low/middle-income countries.
- Review the initial opinions from a Modified Delphi survey assessing expert consensus on various fluoride-based interventions.
- Facilitate discussion to critically evaluate the latest data relating to supervised toothbrushing and other fluoride-based interventions in early years education settings based on a rigorous systematic overview.
- Provide updated expert opinions in light of this new evidence which will be used to inform future benchmarking of fluoride-based intervention programmes in Scotland and South-East Europe.



# KEY FACTS

**Key message:**  
Engage parents and caregivers, nursery staff and school health personnel in the prevention of ECC and promotion of oral health.

There is moderate to high-certainty evidence that fluoride toothpaste of 1,000 ppm fluoride or above **prevents dental caries** in both the permanent and primary dentition.

- Delivering Better Oral Health, 2021

Despite considerable improvement in caries since the early 2000s when the National Dental Inspection Programme started, **clear oral health inequalities remain in Scotland**, and this needs to be the focus of oral health improvement activity within the Childsmile Programme.

- National Dental Inspection Program (NDIP), 2022

Early childhood caries risk factors are linked to family lifestyle and community norms.

- WHO, 2019

The Childsmile Nursery and Childsmile School programmes deliver a **range of preventive care interventions for children** from nursery/kindergarten age until they leave primary/elementary school.

- Childsmile, 2018

Designed to Smile (Wales) exemplifies the potential for successful utilisation of the **extended skills of the whole dental team** [...] to ensure that further reductions in the childhood levels of dental decay in Wales are realised.

- Nic Iomhair *et al*, 2020

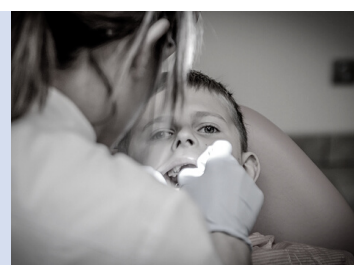
# SURVEY RESULTS

For interventions in the educational setting both in high and low/middle-income countries, and taking into account effectiveness and cost-effectiveness, safety and feasibility, the expert panel showed a **high level of consensus** on which interventions should be prioritised.



Highest priority:  
Supervised toothbrushing in early  
years education settings

Second highest priority:  
Fluoride varnish application in  
early years education settings



Lower priority:  
Fluoride mouthrinse, fluoride gels/  
foams and fluoridated milk\*

Lowest priority<sup>†</sup>:  
Fluoridated salt, and other supplements  
such as tablets and lozenges



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\*A high proportion of respondents were unsure about the safety and cost-effectiveness of such programmes.

† There was less consensus on feasibility/applicability in low/middle-income countries with some participants ranking these slightly higher.



Experts agreed that fluoride-based interventions should be implemented over and above dental health education for children.

Areas where the expert panel reached a moderate consensus (showed some disagreement):



Whether rigorous observational studies are sufficient to support policy/practice in the absence of randomized controlled trials



Whether nursery/school fluoride varnish interventions should be implemented over and above supervised toothbrushing with fluoride

Areas of little consensus (high disagreement):



Whether nursery/school fluoride-based interventions should be implemented in areas or countries with community fluoridated water



The balance between nursery/school fluoride-based interventions and supporting children to brush using fluoride toothpaste on a regular basis at home

(Childsmile in Scotland has both these components, providing materials and behavioural support in the home setting)

# WORKSHOP SUMMARY

The World Health Organization has set out a global framework to guide programme development, implementation, monitoring and evaluation for the prevention of early childhood caries. This recommends fluoride exposure as part of nursery (kindergarten)/school routines.

This expert discussion workshop was part of a wider project outlined by workshop organisers from the University of Glasgow Dental School.

Following the workshop, findings are now being used to inform a second work stream with partner countries from South East Europe employing early childhood caries prevention programmes. A longer term aim is to identify ways to support future implementation of the WHO early childhood caries [manual](#).

- [Stream 1 – Systematic overview; survey and workshop gathering expert views on the evidence and policy context for fluoride in educational settings](#)
- [Stream 2 - Benchmarking fluoride-based intervention programmes in Scotland and South-East Europe](#)

Dr Lamis Abuhaloob provided a summary of preliminary findings from the organisers' systematic overview examining fluoride-based interventions in early years education settings. Data are being extracted from 76 papers out of a cohort of 1,951 initially identified, after removal for duplication, wrong setting (i.e. not early years education) and wrong design (e.g. educational interventions). Initial data were provided to the expert panel.

Dr Abuhaloob highlighted the overarching research question for the delegates to consider: What are the policy and practice implications of the current evidence on the effectiveness and cost-effectiveness of fluoride-based interventions in early education settings to prevent early childhood caries?

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*Systematic reviews, randomised controlled trials, observational studies and cost/economic studies from 20 countries.*

In addition, the experts were encouraged to consider the following during the discussion session:

- What is the evidence for targeting interventions (e.g. at more socioeconomically deprived groups or those with high caries experience)?
- What are the comparators/treatment as usual/background exposures in populations studied and what effect do they have?
- Are single or combined interventions indicated?
- What evidence is there for intervention intensity (e.g. frequency, duration)?
- What are the implementation barriers/facilitators to consider?

Dr Ross then presented the results from two survey rounds. In round 1, experts ranked fluoride-based interventions in order of priority for high and for low/middle-income countries, taking safety and efficacy into account.

In round 2, respondents were presented with evidence from the systematic overview and asked first to evaluate their agreement with a series of statements, then whether their opinions remained consistent from round 1.

The workshop participants were then given time to review the evidence before being separated into three 'breakout rooms' with a facilitator to guide discussion and provide question prompts. A summary of these discussions is included in this report.

The workshop concluded with a summary from each group's facilitator, followed by a general discussion led by Dr Ross, where the experts agreed there is no 'one-size-fits-all' fluoride-intervention programme – context and setting must be carefully considered.



There is no 'one-size-fits-all'  
fluoride-intervention  
programme

# EXPERT DISCUSSIONS

There were three grouped discussions, themes from which are collated here:

Supervised toothbrushing establishes healthy behaviour from an early age. Classic studies fail to capture all benefits of supervised toothbrushing e.g. the potential lifelong benefit of forming a healthy habit.

The population-wide approach (with opt-out consent) is supported but experts agree that targeting the most socioeconomically deprived in the first instance should be the priority. With limited resources, experts would prefer to target the most socioeconomically deprived children for longer (to older age), rather than aim for universality (it can be challenging to target schools based on geographical indicators of socioeconomic need).

Following Scotland's lead, failing to introduce universal supervised toothbrushing throughout the UK is a lost opportunity. There are issues with commissioning arrangements e.g. where responsibility lies with local authorities (and their budgets).

Fluoride interventions in education settings are not currently the most environmentally sustainable programmes; recycling plastic and examining elements such as staff travel is likely to be a focus in future. But with regard to environmental sustainability, preventing a preventable disease is ultimately the most sustainable thing you can do. Reducing carbon footprint should be the end product, rather than the first product.

Regarding the benefits of supervised toothbrushing in low/middle-income countries, context is important – preschool may not be an appropriate setting as some countries don't provide free nursery care.

In areas with water fluoridation, evidence of additional benefit from toothbrushing is emerging. Children still get dental caries in water fluoridated areas and therefore require other interventions. Water fluoridation programmes should be continued but are unlikely to be introduced in the UK more widely.

Evidence for benefit of fluoride varnish in addition to supervised toothbrushing is questionable – experts need to consider whether the approach is cost-effective given the questionable emerging health economics data. Fluoride varnish application may be more beneficial in settings without supervised daily toothbrushing. The ability of UK clinical trials to determine effectiveness for caries prevention was questioned. UK studies may not show an effect where global studies do. Pooling the evidence together can sometimes reveal an effect.

There was some organisational resistance to supervised toothbrushing during and post-COVID-19 in Scotland; local knowledge and relationships are key to implementing programmes in educational settings. Since the COVID-19 pandemic, schools are now better equipped to discuss infection prevention and be more involved in children's health.

Some fluoride interventions have the potential to be suboptimal, wasting time, money and resources. Multiple fluoride-based interventions can be implemented – experts do not have concerns about fluorosis in the age groups concerned.

Experts shouldn't think purely in terms of caries prevention effectiveness – need to consider knock-on effects, acceptability, the practicality of interventions, and common risk factors with e.g. obesity. Focussing only on caries prevention risks missing other potentially synergistic benefits. Sugar reduction must occur alongside fluoride-based intervention.



# CONCLUSIONS

The workshop enabled experts to critically discuss evidence, policy and practice, and implementation issues with respect to fluoride-based interventions. There was a UK focus but a fair international input.

A variety of issues were raised during the discussions but some areas of high consensus are summarised here:



## Supervised toothbrushing

- Should be the highest priority intervention.
- The setting, local needs and resources must be considered.
- Universal programmes are optimal but funding determines whether intervention possible. If not, target at socioeconomically deprived areas.

## Fluoride varnish

Experts are cautious about removing existing fluoride varnish programmes in education settings, but agree further discussions are needed about effectiveness and value for money when used in addition to supervised toothbrushing, and about possible reallocation of resources.



## Areas for further study

- Impact of COVID-19 pandemic.
- Effect of cost-of-living crisis.
- Wider social benefits of child toothbrushing.
- Workforce requirements to optimise fluoride programmes in education and community settings.



# NEXT STEPS

01

## Synthesise

Synthesise and report on findings from the systematic overview on fluoride-based interventions in early years education settings

02

## Facilitate

Facilitate further discussion-based workshop and benchmarking exercise with partners from South-East European countries engaged in early childhood caries prevention

03

## Report

Report to the Borrow foundation on results of the research

04

## Engage

Engage further with policy makers in the UK and internationally, guided by the WHO implementation manual, to implement the most effective and cost-effective programmes for child oral health and general health and wellbeing

# APPENDICES

## University of Glasgow and Childsmile Evaluation Team

Principal Investigator	Dr Al Ross
Lead Researcher	Dr Lamis Abuhaloob
Researchers	Mr Bill Wright Dr Alex Blokland
Project Administrator	Ms Nicola Bodys
Co-applicants	Professor David Conway Professor Lorna Macpherson



# PANEL SURVEYS

The questions for panel surveys were derived from the systematic overview and appraisal of evidence, the WHO implementation manual for early childhood caries prevention, and other key policy documents such as *Delivering better oral health: an evidence-based toolkit for prevention* from NHS England.

In round 1, the organisers gathered some initial opinions on fluoride-based interventions delivered in early years educational settings.

Round 2 fed back collated opinions from round 1 for review/reflection, and gathered opinions on short summaries based on initial findings from the systematic overview.

There were fixed-response ('Likert scale') items, and free-response ('open-ended') items.

## Example of a fixed-response item:

Thinking of supervised toothbrushing delivered in nurseries or primary schools, please say how much you agree with the following statement on a scale of 1-5, where 1= Strongly Disagree and 5= Strongly Agree

*Supervised toothbrushing in nurseries/schools is effective for preventing caries*

## Example of an open-ended item:

*Please use this space to add further comment and/or give any specific opinions you may have on supervised toothbrushing in the nursery/school setting, for example with respect to: supervision; frequency; fluoride concentration; safety; effectiveness; cost-effectiveness; age; targeting populations to reduce inequalities etc.*

Survey results from both rounds were fed into workshop discussions and are being collated for publication.

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The Scottish Government

The Childsmile Executive



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